Hewlett Packard
Enterprise

HP StoreOpen Automation User Guide

Abstract

This document provides information about HP StoreOpen Automation, which presents an HP tape library, or library partition, as a file system on host computers running a supported operating system.

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1 Introduction

This guide provides information about HP StoreOpen Automation software, which is an application for reading and writing Linear Tape File System (LTFS) tapes on some versions of Microsoft Windows Server, Enterprise Linux, and MacOS. HP StoreOpen Automation makes tape self-describing, file-based, and easy to use. The software provides the ability to use standard file operations on tape media for accessing, managing and sharing files with an interface that behaves similarly to a hard disk. In addition, HP StoreOpen Automation provides the ability to share data across platforms, as you would with a USB drive or memory stick.

Features

- Compliant with the LTFS 2.2.0 format specification
- Provides software to use an HP StoreOpen Automation tape library (or library partition) with HP LTO-5, LTO-6, or LTO-7 tape cartridges as a file system.
- Based on Open Source software
- Supported on popular versions of Windows Server, Enterprise Linux, and Mac OS X

Benefits

HP tape libraries with HP LTO-5, LTO-6, and LTO-7 tape drives already deliver a wide range of benefits, such as encryption, partitioning, and TapeAssure. HP StoreOpen Automation extends these benefits with:

- *Direct access to the data stored on tape:* When a library is mounted, the files and directories on each cartridge appear on the desktop or command console in the same way as a disk directory listing.
- *Ease of use:* HP StoreOpen Automation increases ease of use. Simply drag and drop files between disk and tape. Or use familiar command line syntax, like `cp` and `ls`, to view and access your data.
- *Compatibility across your environment:* Tape media written using HP StoreOpen Automation is self-describing and interoperable with other LTFS solutions from HP, and from other vendors.
- *Increased data mobility:* Easily share content to increase data mobility; tapes written with HP StoreOpen Automation 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 HP tape libraries, and HP LTO-5, LTO-6, or LTO-7. Tapes can move across libraries and standalone LTFS installations with the ease of video cassettes. Files on tape can be accessed using straightforward drag-and-drop, and familiar command lines.

Intended usage

HP StoreOpen Automation presents the contents of tapes in a library as a file system volume. However, it is important to bear in mind that it is not a disk and, therefore, there are some best practices to ensure satisfactory performance and a good user experience.

1. HP StoreOpen Automation is designed to be used in a single-user environment, where the user has unrestricted access to all tapes and resources of the tape library or partition. Attempting to share the library or partition with multiple users or processes will result in poor performance due to the sequential access nature of tape. More importantly, it is also possible

for one user to overwrite another user's data. Methods to secure the library against shared usage are discussed in Linux shared object files (page 61).

2. For similar reasons, the tape library or partition should not be shared between different host PCs or servers. To share the library with multiple computers, use the library's partitioning and security features to ensure the LTFS tapes are only accessible to a single host computer.
3. The expected usage is to mount the tape library, and read or write data to the tape cartridges after it has identified the files on each piece of media in the library. Allow sufficient time for this identification process to complete. Media with barcodes may be imported and exported from the library for use with other LTFS solutions.
4. HP StoreOpen Automation will work in conjunction with Graphical User Interface (GUI) programs, such as Nautilus and Konqueror on Linux. However, be aware that these applications will pre-read files in the tape filesystem. Therefore, GUI software may result in poor performance. For optimum performance use a terminal console and issue command line (shell) commands to copy data, view directory contents, and so forth.

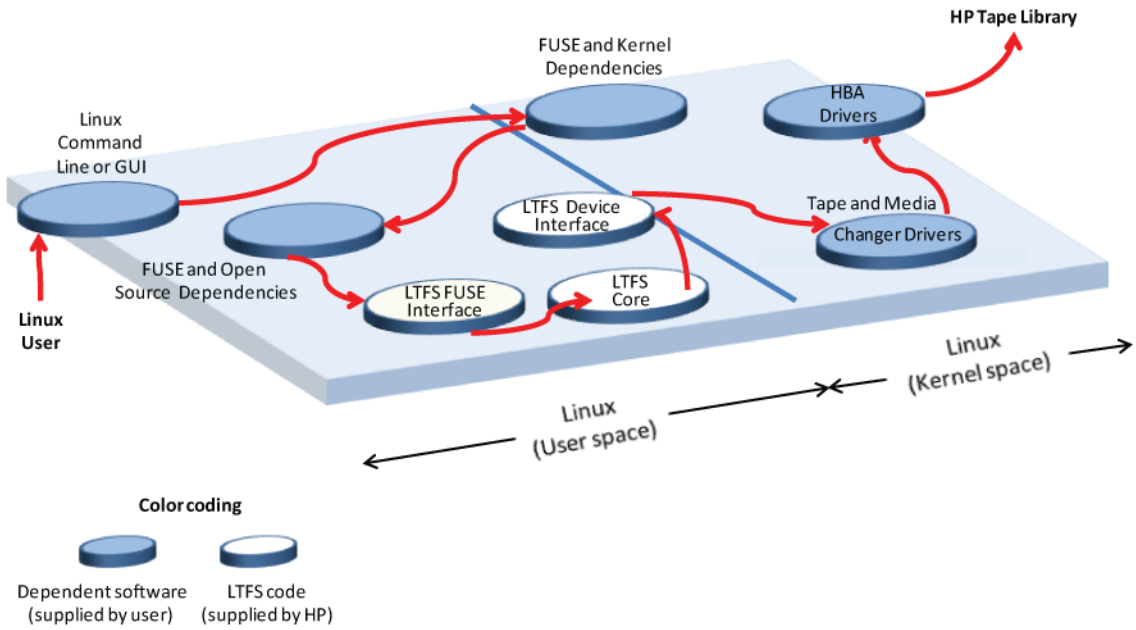
Architecture

HP StoreOpen Automation is a software application compatible with popular enterprise Linux and Mac OS operating systems. It makes use of the Open Source FUSE kernel mode subsystem available for all supported Linux systems. On the Apple Mac OS platform it uses the OSXFUSE module.

HP StoreOpen Automation also has dependencies on other Open Source applications, which the user must install prior to using the HP StoreOpen Automation software. These are discussed in Configure the open source software dependencies (page 9).

The following diagram illustrates a simplified information flow when initiating a file system command to an LTFS device.

Figure 1 LTFS architecture — Linux



NOTE: Responses to the filesystem commands flow in the reverse direction, from the library device to the user.

Supported configurations

NOTE: For the up-to-date version of the hardware and operating system support matrix for HP StoreOpen Automation, please refer to the Enterprise BURA Solution (EBS) Compatibility Matrix available at http://www.hp.com/go/BURACompatibility.

Supported operating systems:

- Microsoft Windows Server 2008 and 2008 R2 (x86_64)
- Microsoft Windows Server 2012 and 2012 R2 (x86_64)
- Red Hat Enterprise Linux 6.0 up to 6.7 (x86_64)
- Red Hat Enterprise Linux 7.0 up to 7.1 (x86_64)
- Mac OSX 10.7 through 10.10

Supported tape libraries:

The following HP LTO-5, LTO-6, and LTO-7 tape libraries and media are supported.

- HP 1x8 G2 Autoloader
- HP MSL2024 Tape Libraries
- MSL4048 Tape Libraries
- HP MSL6480 Tape Library
- HP ESL-G3 Tape Library (Not Supported on Mac OS X)

NOTE: HP StoreOpen Automation supports maximum four drives and 48 slots. If the library or partition contains more than 4 drives or 48 slots, you must do the library partition before using the library with SOA. This partition must not have more than 4 drives or 48 slots.

Minimum system configuration:

- Intel or AMD x86_64 platform
- Dual core processor, 2.4 GHz
- HP Supported Fiber Channel or SAS interface adaptor

  (Refer to the Enterprise BURA Solution (EBS) Compatibility Matrix available at http://www.hp.com/go/BURACompatibility to see the list supported SAS and FC adaptors supported by HP StoreOpen Automation.)
- Minimum 8 GB of RAM (16 GB recommended)
- 50 GB of Hard Disk space required for installation and storing temporary files.

IMPORTANT: HP StoreOpen Automation software uses significant amounts of memory. If the host's system memory is exhausted during operation, the software's behavior is unpredictable and it may fail to complete pending operations.

Configuration requirements

- Administrator privileges may be required depending on your system configuration.
- The tape library should contain only LTO-5, LTO-6, or LTO-7 media. Other media generations are tolerated, but will result in error conditions that impact the system performance.
- The tape library or partition should contain only LTO-5, LTO-6, or LTO-7drives. Other drive generations are tolerated, but will result in error conditions that impact the system performance.

- HP StoreOpen Automation supports maximum 4 drives and 48 slots. If the library or partition contains more than 4 drives or 48 slots, you must do the library partition before using the library with SOA. This partition must not have more than 4 drives or 48 slots.
- HP StoreOpen Automation must have connectivity to all of the tape drives and robotics in the library or partition.
- Make sure that the latest version of drivers for the HBA and tape library are installed. Refer to the HBA/Library user guide for details on setting up the hardware and drivers.
- All tapes in the library must have barcodes. HP StoreOpen Automation supports only 8 character barcodes with media identifier present in the barcode.
- Ensure only one user or application on the host computer has access to the tape library. For example, do not share the same library or partition with a backup application. If the host system also runs a backup application, partition the library so the backup application and the HP StoreOpen Automation user are accessing two separate partitions, with two separate sets of tapes.
- Ensure the library or partition is only accessible from a single host. The following methods are effective for ensuring a single host has access to the tape library or partition:
  - Direct connect Fibre Channel or SAS connections
  - HP's Secure Manager feature (available on ESL-G3 series tape libraries)
  - Zoned Fiber Channel fabric (switch zoning)
- Enable the library's encryption features, if you want the LTFS tapes to be encrypted.

IMPORTANT: To support auditing, HP tape libraries that are configured for encryption will not allow mixing tapes with encrypted and clear text in the same partition. Therefore, when enabling encryption, be sure the library or partition has new media, or media that can be overwritten (and encrypted) from the beginning of each tape. The library will not allow appending encrypted data to a tape cartridge that already contains clear text.

IMPORTANT: Encryption is a feature of the tape library, and is not a feature of your LTFS software, including HP StoreOpen Automation. Any tapes that are encrypted by the tape library can only be decrypted by the same, or a different, HP library that is authorized to access the same encryption keys that encrypted the data. See your tape library user guide for more information on the library's encryption features.

NOTE: Only the binaries supplied by HP are supported, not those built from the source. See the *HP Linear Tape File System (LTFS) Tape Drive and HP StoreOpen Automation Support Matrix* at http://www.hp.com/go/storeopen for the latest details on supported operating system configurations and supported HBA and hardware configurations.

NOTE: A tape drive firmware update might be required to use HP StoreOpen Automation. HP StoreOpen Automation checks whether the tape drives need updating.

2 Installation and configuration (Linux and Mac OS)

IMPORTANT: Do not run multiple instances of HP StoreOpen Automation on a single host machine. The software will only allow one instance to be running at any time.

IMPORTANT: Installing an instance of HP StoreOpen Automation on a Linux/Mac host machine already running HP LTFS (HP SOS) for standalone LTO drives is not supported. Portions of the standalone software will be modified, and may become unusable.

NOTE: Do not install HP Storage TapeAssure LTFS service version 1.0, for SLES and RHEL. This software is for the standalone version of LTFS. The MSL, EML and ESL libraries support HP TapeAssure directly, and do not require this service to collect TapeAssure data.

Configure the open source software dependencies

FUSE

Table 1 FUSE site and filename details

Operating system	Site	Compatible versions
RHEL 6.0 through 6.7 (x86_64)	http://fuse.sourceforge.net/	`fuse-2.8.4`
RHEL 7.0 through 7.1 (x86_64)	http://fuse.sourceforge.net/	`fuse-2.9.2`
Mac OS X 10.7 through 10.10	*Provided with the HP StoreOpen Automation package*	Install OSXFUSE 2.7.3

Instructions, comments:

`untar` the file to a test directory, then follow the instructions.

Before starting to install and use HP StoreOpen Automation, you must ensure that the FUSE kernel module is present and loaded. To check, execute the following command:

```
$ lsmod | grep fuse
```

If the module is not currently loaded, you can load it as follows:

```
$ modprobe fuse
```

libxml2

Table 2 libxml2 site and filename details

Operating system	Site	Compatible versions
RHEL 6.0 through 6.7 (x86_64)	http://xmlsoft.org/downloads.html	`libxml2-2.7`
RHEL 7.0 through 7.1 (x86_64)	http://xmlsoft.org/downloads.html	`libxml2-2.9`
Mac OS X 10.7 through 10.9	*not required*	*not required*

Instructions, comments:

Installs as an `rpm`, but be prepared for installation issues since other software may have dependencies on other versions of this package.

Be prepared for the `rpm` command to appear to hang for a minute or two before reporting successful status.

libicu

Table 3 libicu site and filename details

Operating system	Site	Compatible versions
RHEL 6.0 through 6.7 (x86_64)	http://site.icu-project.org	`ICU 50.1.2`
RHEL 7.0 through 7.1 (x86_64)	http://site.icu-project.org	`ICU 50.1.2`
Mac OS X 10.7 through 10.10	*Provided with the HP StoreOpen Automation package*	`ICU 50.1.2`

Instructions, comments:

Find the `readme` file in the download and follow the process as closely as you can.

libuuid

Table 4 libuuid site and filename details

Operating system	Site	Compatible versions
RHEL 6.0 through 6.7 (x86_64)	http://e2fsprogs.sourceforge.net	`e2fsprogs 1.4.1`
RHEL 7.0 through 7.1 (x86_64)	http://e2fsprogs.sourceforge.net	`e2fsprogs 1.42`
Mac OS X 10.7 through 10.10	*not required*	*not required*

Instructions, comments:

Find the `readme` file in the download and follow the process as closely as you can.

Xcode

Table 5 Xcode site and filename details

Operating system	Site	Compatible versions
RHEL 6.0 through 6.7 (x86_64)	*not required*	*not required*
RHEL 7.0 through 7.1 (x86_64)	*not required*	*not required*
Mac OS X 10.7 through 10.10	*Provided with the OS X DVD*	Xcode package from the OS X DVD

Instructions, comments:

Find the `readme` file in the download and follow the process as closely as you can.

Installing HP StoreOpen Automation

Download the installation package for your OS and save it in a temporary directory on the system.

To install HP StoreOpen Automation on a RHEL system

To install HP StoreOpen Automation on Linux, follow these steps:

1. Download the installer package appropriate for your OS.
2. Unzip the zip file.

   ```
   gunzip HP_STOREOPEN_AUTOMATION_3.0.0_RHEL_x64_PKG.tar.gz
   ```
3. Untar the package.

   ```
   tar -xvf HP_STOREOPEN_AUTOMATION_3.0.0_RHEL_x64_PKG.tar
   ```

   This will extract the contents of the package to the current directory.

4. Install the rpm package by running this command:

   ```
   rpm –ivh hp-soa-x.x.x-xx.x86_64.rpm
   ```

NOTE: HP StoreOpen Automation requires the open source software mentioned in this guide (see “Configure the open source software dependencies” (page 9)). The rpm installer expects these dependencies to be installed from their rpm package.

If any of those dependencies are installed by compiling the source, installation of the rpm package will fail because it will not detect that dependency in the RPM database. In that case, the user would need to run the rpm installer with the `--nodeps` switch:

Sample command:

```
#rpm –ivh hp-soa-x.x.x-xx.x86_64.rpm --nodeps
```

To install HP StoreOpen Automation on a MacOS X system

Install the HP StoreOpen Automation package by double-clicking on the `.dmg` file.

Uninstalling HP StoreOpen Automation

To remove HP StoreOpen Automation from an RHEL

To un-install HP StoreOpen Automation, issue the following command.

```
# rpm –e hp-soa
```

To remove HP StoreOpen Automation from a MacOS X system

Delete `/usr/local/bin/*ltfs*` and then delete the tree under `/Library/Frameworks/LTFS.framework`.

You can uninstall the GUI management application and the GUI utilities by dragging them to the Trash. To delete the ICU package, delete the tree at `/Library/Frameworks/ICU.framework`.

3 Installation and configuration (Windows)

When using HP StoreOpen Automation with HP LTO tape libraries, you need the following components:

- An HP tape library with supported tape drives, connected via a supported SAS or FC HBA
- The Library or partition must not contain more than 4 drives and 48 slots.
- A drive firmware revision that supports dual partitioning. HP L&TT should be used if a firmware update is required.
- The latest drivers for libraries and tape drive (hplto.sys) installed. Drivers for HP Tape Libraries and drives can be downloaded from http://www.hp.com/go/support.
- Tapes used with HP StoreOpen Automation must have barcodes to be recognized by the software and those barcodes must be unique. Those barcodes currently must consist of 8 characters, and the last two characters must indicate the media generation (L5, L6, or L7).
- HP StoreOpen Automation installer executable. This can be found at: http://www.hp.com/go/storeopen.

NOTE: You can download HP L&TT from http://www.hp.com/support/tapetools.

Downloading and installing HP StoreOpen Automation

To use the precompiled binaries:

1. Download the installer appropriate to your operating system.
2. When the download has completed, launch the installer by double clicking the installer executable. (Note that administrator privileges may be required depending on your system configuration.)
3. Follow the installer steps until the installation is complete.

The executables will be installed into a new menu group under **Hewlett-Packard\HP StoreOpen Automation** in the Start Menu programs.

Uninstalling HP StoreOpen Automation

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

1. Unmount any LTFS file system you currently have mounted
2. Close all LTFS program windows.
3. Open the Windows Control Panel and select **Uninstall a program**.
4. From the list of installed software, select **HP StoreOpen Automation** and then click **Uninstall**.

4 Using HP StoreOpen Automation (Linux)

Starting HP StoreOpen Automation (Linux)

1. Ensure that `/usr/local/bin/` is in your command search path. For example:

   ```
   $ export PATH="$PATH:/usr/local/bin"
   ```

2. **Linux:** Find the library device file. One way to do this is to `grep` the `dmesg` log for `sg` devices with device type 8. In this example, assume the library's device file is `/dev/sg5`
3. Create a mount directory for the library device. This only needs to be done one time. For example:

   ```
   mkdir /mnt/hp_msl
   ```

4. Mount the tape library device, using the `ltfs` tool provided with the product:

   - **Linux:** `ltfs /mnt/hp_msl -o devname=/dev/sg5`

   NOTE: To find the device file associated with the tape library, run the following command:

   ```
   dmesg | grep sg
   ```

   From the output, search for the device with device type 8. That will be the library device.

   The library will start to identify each piece of media in the library, or partition, by moving it to a drive, and caching the LTFS index, if the tape is formatted for LTFS.

   This process may take several minutes, potentially an hour or more.

5. After all the media has been identified, you can begin using any LTFS formatted cartridge as a file system.

Formatting cartridges with HP StoreOpen Automation

LTO-5, LTO-6, and LTO-7 tape cartridges must be LTFS-formatted before they can be used as a file system. There are two ways to format an LTO tape for use with HP StoreOpen Automation. Both methods use the `mkltfs` utility, from the command line. In the following examples, the library device file is `dev/sg4`, and the barcode of the media to be formatted is `KR1234L5`. You may specify an individual tape's barcode, using `-s`. Alternatively, you may omit the `-s` parameter, and select the cartridge from a list.

Formatting an LTO tape:

```
mkltfs --device=/dev/sg4-s KR1234L5
```

Common usage examples

Copy data from disk to tape

In this example, the library is mounted as `/mnt/hp_msl`. It contains an LTFS-formatted tape with barcode `KR1234L5`.

The directory to be written to tape is located on the host machine, at `/opt/photos` and that directory may contain a number of files, for example files from a digital camera.

To copy all of those files to tape, use the following command

```
cp /opt/photos /mnt/hp_msl/KR1234L5 -r
```

Copy data from tape to disk

To move the data from the previous example from tape to disk, at a location called `/opt/incoming_photos`, use the following command:

```
cp /mnt/hp_msl/KR1234L5/photos /opt/incoming_photos -r
```

Copy data from tape to tape

If the library or partition contains two tape drives, data may be copied from tape to tape.

Assume the library mounted at `/mnt/hp_msl` contains two tape drives, and two LTFS-formatted cartridges, `KR1234L5` and `KR2468L5`.

Use the following command to copy the 'photos' directory from `KR1234L5` to the other tape.

```
cp /mnt/hp_msl/KR1234L4/photos /mnt/hp_msl/KR2468L5 -r
```

Unmounting and shutdown

The `umount` (or `fusermount`) command can be used to terminate the HP StoreOpen Automation software, and unmount the library device. For example:

```
umount /mnt/hp_msl
```

or

```
umount /dev/sg5
```

NOTE: `fusermount` is only available on Linux.

IMPORTANT: The `umount` command will return immediately. However, cached data will continue to be written to tape for a few minutes. If there are two tape drives, the cached writes may take up to 5 minutes total. Do not power off or reset the tape library for at least 5 minutes after the `umount` command has been issued. Otherwise, the tapes may become inconsistent and potential data loss may occur.

For similar reasons, wait at least 5 minutes after `umount` has returned before re-mounting the library.

Command line utilities

ltfs

Mounts the library device as a file system.

- Usage: `ltfs mountpoint [options]`
- Example: `ltfs /mnt/library -o devname=/dev/sg1`

LTFS options

`-o devname=<dev>`	Tape device (default: `/dev/changer`)
`-o work_directory=<dir>`	LTFS work directory (default: `/tmp/ltfs`)
`-o trace`	Enable diagnostic output (same as verbose=3)
`-o sync_type=<type>`	Specify sync type (default:time@5) <type> should be specified as follows: time@min: LTFS attempts to write an index each ‘min’ minutes
`-o force_mount_no_eod`	Skip EOD existence check when mounting (read-only mount). Only use for a CM corrupted medium.
`-o release device`	Clear device reservation (should be specified with `-o devname`)
`-o non_ltfs_media`	Attempt to format tapes in the library/partition which are not LTFS format
`-a`	Advanced help, including standard FUSE options

`-V, --version`	Output version information and exit
`-h, --help`	Display this help and exit

FUSE options

`-o umask=M`	Set file permissions (octal)
`-o uid=N`	Set file owner
`-o gid=N`	Set file group

Comments:

Use the operating system's `umount` command to unmount.

mkltfs

Formats LTO-5, LTO-6, or LTO-7 media for use with LTFS solutions

Configures LTFS options

- Usage: `mkltfs [device file] [options]`
- Usage example 1: re-format an LTFS tape when the barcode is known

  ```
  mkltfs -s DG6359L5 -f --device=/dev/sg7
  ```

- Usage example 2: re-format an LTFS tape. The user wishes to select the media to be formatted from a list.

  ```
  mkltfs --device=/dev/sg7
  ```

- Usage example 3: configure LTFS for files 100K bytes or smaller to be directed to the index partition

  ```
  mkltfs --device=/dev/sg7 -s DG6359L5 --rules="size=100K"
  ```

Available options are:

`-d, --device=<name>`	Changer device (required)
`-f, --force`	Force to format medium
`-s, --barcode=<id>`	Tape barcode (8 alphanumeric ASCII characters)
`-n, --volume-name=<name>`	Tape volume name (`LTFS VOLUME` by default)

`-r, --rules=<rules>`	Rules for choosing files to write to the index partition.
	The syntax of the rule argument is:
	`size=1M`
	`size=1M/name=pattern`
	`size=1M/name=pattern1:pattern2:pattern3`
	A file is written to the index partition if it is no larger than the given size AND matches at least one of the name patterns (if specified). The size argument accepts K, M and G suffixes. Name patterns may contain the special characters '?' (match any single character) and '*' (match zero or more characters)

`--no-override`	Disallow mount-time data placement policy changes
`-w, --wipe`	Restore the LTFS medium to an unpartitioned medium (format to a legacy scratch medium)
`--long-wipe`	Unformat the medium and erase any data on the tape by overwriting special data pattern. This operation takes over 3 hours. Once you start it, you cannot interrupt it.
`-q, --quiet`	Suppress progress information and general messages
`-t, --trace`	Enable function call tracing

`--syslogtrace`	Enable diagnostic output to `stderr` and `syslog`
`-V, --version`	Version information
`-h, --help`	This help
`-p, --advanced-help`	Full help, including advanced options
`-z, --prompt options`	Select options for each tape: • `Volume Name` • `blocksize` • `no-compression` • `rules` The options are not enabled by default
`-j, --interactive`	Interactive mode

ltfsck

Repairs an inconsistent volume, if possible

Rollback to a previous instance of the tape index

- Usage: `ltfsck [options] [device file]`
- Usage example 1: perform a full recovery of an LTFS tape when the barcode is known
  `ltfsck -b DG6359L5 -f /dev/sg7`
- Usage example 2: list available tapes in a library, so one can be selected for checking
  `ltfsck /dev/sg7`
- Usage example 3: list roll-back points in a tape
  `ltfsck -l -b DG6359L5 /dev/sg7`

Available options are:

`-b, --barcode=<tape_bc>`	Specify the barcode of the tape to be checked
`-g, --generation=<generation>`	Specify the generation to roll back
`-r, --rollback`	Roll back to the point specified by `-g`
`-n, --no-rollback`	Do not roll back. Verify the point specified by `-g` (default)
`-f, --full-recovery`	Recover extra data blocks into `directory_ltfs_lostandfound`
`-z, --deep-recovery`	Recover EOD missing cartridge. Some blocks might be erased, but recover to final unmount point with an index version of at least 2.0.0 or earlier. (Must be used for a cartridge that cannot be recovered by a normal option.)
`-l, --list-rollback-points`	List rollback points
`-m, --full-index-info`	Display full index information (effective only for `-l` option)
`-v, --traverse=<strategy>`	Set traverse mode for listing rollback points. Strategy should be forward or backward (default=backward)
`-j, --erase-history`	Erase history at rollback
`-k, --keep-history`	Keep history at rollback (default)

`-q, --quiet`	Suppress informational messages
`-t, --trace`	Enable diagnostic output
`--syslogtrace`	Enable diagnostic output to `stderr` and `syslog`
`-V, --version`	Version information
`-h, --help`	This help
`-p, --advanced-help`	Full help, including advanced options

NOTE: The `-z` option should only be necessary when a mount operation has failed and `ltfs` has advised that deep recovery is required.

Note also that the "erase history" operation cannot be undone, so this option should be used only when you are sure that you need it.

ltfscap

Report capacity on tape media

- Usage: `ltfscap <options>`
- Usage example 1: report capacity on a tape with a known barcode

  ```
  ltfscap -m DG6359L5 --device=/dev/sg7
  ```

- Usage example 2: report capacity of a tape selected from a list

  ```
  ltfscap --device=/dev/sg7
  ```

- Usage example 3: report capacity of a tape with a known barcode, when the library is mounted

  ```
  ltfscap -m DG6359L5
  ```

Available options are:

`-d, --device=<name>`	Tape device (required when library is not yet mounted)
`-m, --media=<barcode>`	Barcode of the media for which capacity data is needed
`-h, --help`	This help

ltfsieutil

Import and export media from the library.

NOTE: This utility requires that the library already be mounted.

- Usage: `ltfsieutil <options>`
- Usage example 1: Import a tape to the library.

  First open the library's import/export ports, and insert media to be imported.

  ```
  ltfsieutil --device=/dev/sg5
  ```

  From the menu, select **1** to import.

- Usage example 2: Export one or more tapes from the library.

  ```
  ltfsieutil --device=/dev/sg5
  ```

  From the menu, select **2** to export media

  From the menu, select a tape to export. This media will be moved to the import/export slots.

  Exit the export menu.

  Open the library's import/export slots and remove the exported media.

unltfs

Removes the LTFS format from a tape cartridge, so the cartridge can be used with other applications.

△ **CAUTION:** This will IRRETRIEVABLY DESTROY all contents of the cartridge, so use it only when you are sure that you wish to erase the LTFS volume.

- Usage: `unltfs <options>`
- Usage example 1: un-format an LTFS cartridge with barcode KR1234L5

  ```
  unltfs --device=/dev/sg3 –m KR1234L5
  ```

Available options are:

`-d, --device=<name>`	Specifies the tape drive to use
`-m, --media=<name>`	Specifies the tape to use
`-y, --justdoit`	Omits normal verification steps, reformats without further prompting
`-e, --eject`	Eject tape after operation completes successfully
`-q, -—quiet`	Suppresses all progress output
`-t, -—trace`	Displays detailed progress
`-h, -—help`	Shows this help
`-i, --config=<file>`	Overrides the default configuration file
`-b, --backend`	Specifies a different tape backend subsystem
`-x, --fulltrace`	Displays debug information (verbose)

Other usage information

File names

To maintain compatibility when copying files between multiple platforms, it is strongly recommended that the following characters should not be used in HP StoreOpen Automation for file names, directory names, or extended attributes: `* ? < > : " | / \`

File permissions

HP StoreOpen Automation 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. Files or directories that are write-protected will have permission bits set to `555`; write-enabled files and directories have permission set to `777`. By default the user and group information is set to that of the current user; this can be overridden by use of the `-o uid` and `-o gid` options to HP StoreOpen Automation.

File types

HP StoreOpen Automation also does not support creation of special files and will report "`Function not implemented`".

Determining available capacity

To support the `df` command, HP StoreOpen Automation reports the aggregated capacity of all tape cartridges through `df`. However, the reported capacity is generally not available as a continuous data space. Please note the following behaviors:

- Data can only be written to cartridge directories. that is those directories identified by cartridge barcodes. Data cannot be written to the volume root (mount point) which contains those cartridge directories.
- When a tape is full, further write operations to that cartridge directory will fail.
- Use operating system commands, such as `du`, to determine available capacity of individual cartridge directories. The `ltfscap` utility can also be used to report capacity of the tape cartridges.
- Deleting files from an LTFS file system removes the file from the directory, but does not free tape capacity. This is normal. To free tape capacity it is generally necessary to reformat the tape. It is also possible to rollback to an earlier version, erasing history, using `ltfsck`.
- You can also use the below Virtual Extended Attributes (VEA) for knowing the usage information for the individual cartridges:
    - Shows the total capacity of the Data Partition:
      `ltfs.mediaDataPartitionTotalCapacity`
    - Shows the total capacity of the Index Partition:
      `ltfs.mediaIndexPartitionTotalCapacity`
    - Shows the free space in the Data Partition:
      `ltfs.mediaDataPartitionAvailableSpace`
    - Shows the free space in the Index Partition:
      `ltfs.mediaIndexPartitionAvailableSpace`

  Use the `attr` command in Linux or the `xattr` command in Mac OS X to retrieve the values for the above mentioned attributes. Refer to the `attr/xattr` documentation for the command reference.

User permissions

Note that on some systems, the logged-in user may not have access rights to the tape device (e.g. `/dev/st0`). This may be addressed by (a) having a super user change permissions on the tape device file; or (b) executing the `ltfs` command with the `sudo` command (e.g. `sudo ltfs /mnt/lto5`). The second approach is recommended since this preserves the integrity of the system.

Checking the status of the Library

HP SOA 3.0.0 and above versions support a Virtual Extended Attribute (VEA) to retrieve the status of the Library. The attribute *ltfs.vendor.HP.libraryStatus* holds a value that indicates the current status of the library which is mounted at the given mount point. This attribute is read-only.

This attribute returns one of the following strings indicating the current status of the library:

- Not mounted
- Mounting
- Mounted
- Unmounting
- Moving media

The **Not mounted** and **Unmounting** status are available only for a fraction of second. The **Mounting** status is displayed after initiating a mount and after the library identifies each media in the library. The **Moving media** status is displayed whenever the library moves media. The **Mounted** status is displayed when LTFS completes processing all tapes in the library and the file system is ready. The ltfs.vendor.HP.libraryStatus attribute has 7 bytes value for the path, **Mounted**.

Example (Command line):

```
ltfsxattr -g –n ltfs.vendor.HP.libraryStatus –p E:\
```

Status of cartridges in the library

HP SOA 2.0.0 onwards supports a Virtual Extended Attribute (VEA) to retrieve the status of cartridges in the library. The attribute is `ltfs.vendor.HP.cartridgeList`. When this attribute is accessed, it returns a string containing details of all cartridges in the partition. The layout of the string will be as given below.

```
Barcode:State:Location[;Barcode:State:Location[;Barcode… ]]
```

Example on Linux:

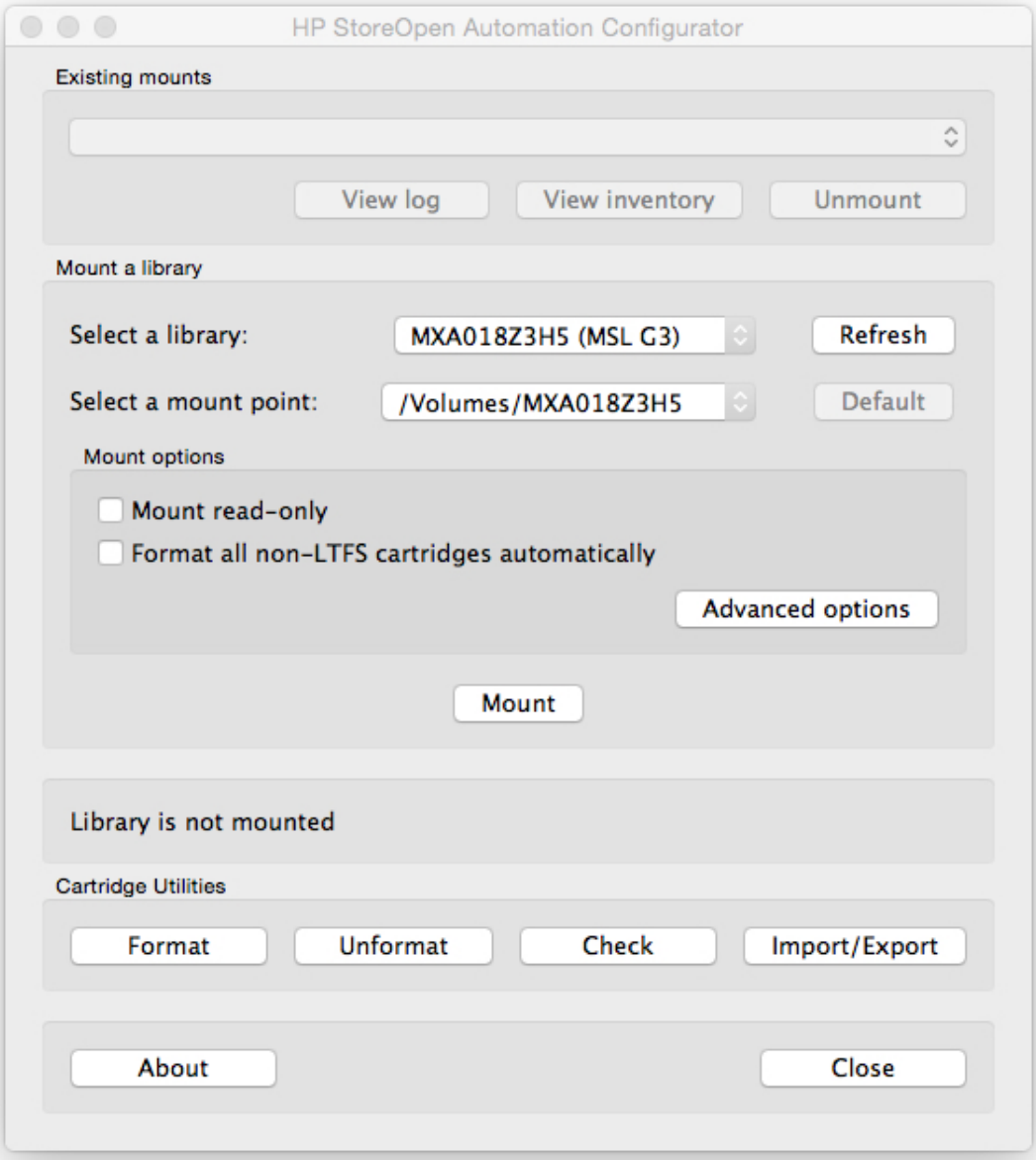
```
attr -g ltfs.vendor.HP.cartridgeList /mnt/library
Attribute "ltfs.vendor.HP.cartridgeList" had a 49 byte value for /mnt/library:
000370L5:N:D257;DG6347L5:F:D256;CGV952L5:N:S4097;
```

Where `State` is a single letter, one of: `F` (formatted), `C` (corrupt/inconsistent), `N` (not formatted for LTFS), `U` (unknown at this time); `Location` is one of: `Snnnn` (in storage slot nnnn), `Dnnn` (in drive nnn), or `Mnnn` (in mailslot nnn).

5 Using HP StoreOpen Automation (Mac OS X)

Mounting the Library using the GUI tools

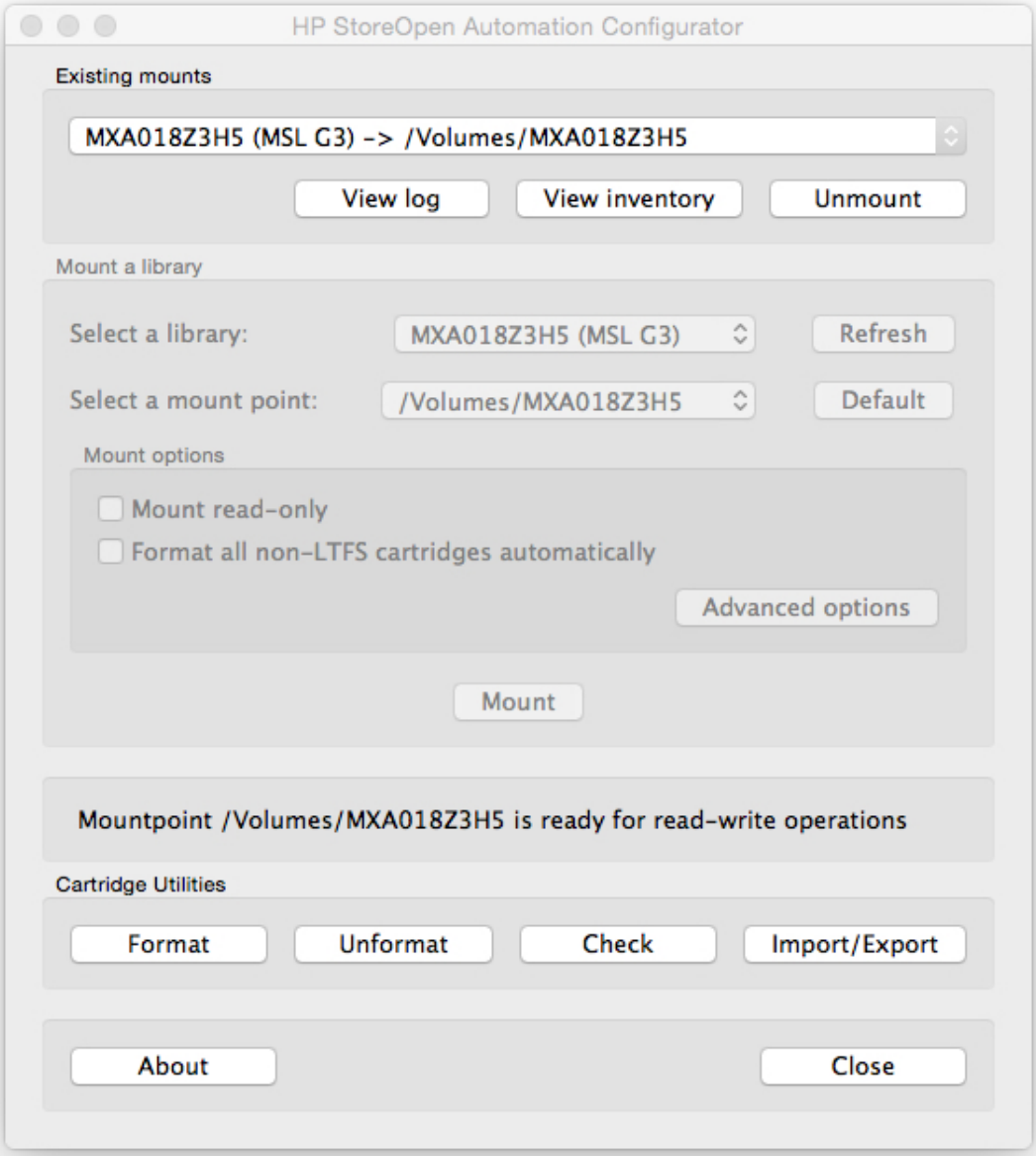
1. Double-click **HP StoreOpen Automation Configurator**.
   The **HP StoreOpen Automation Configurator** window appears.



   By default, the first usable tape library or partition is selected.
2. Select the required settings.

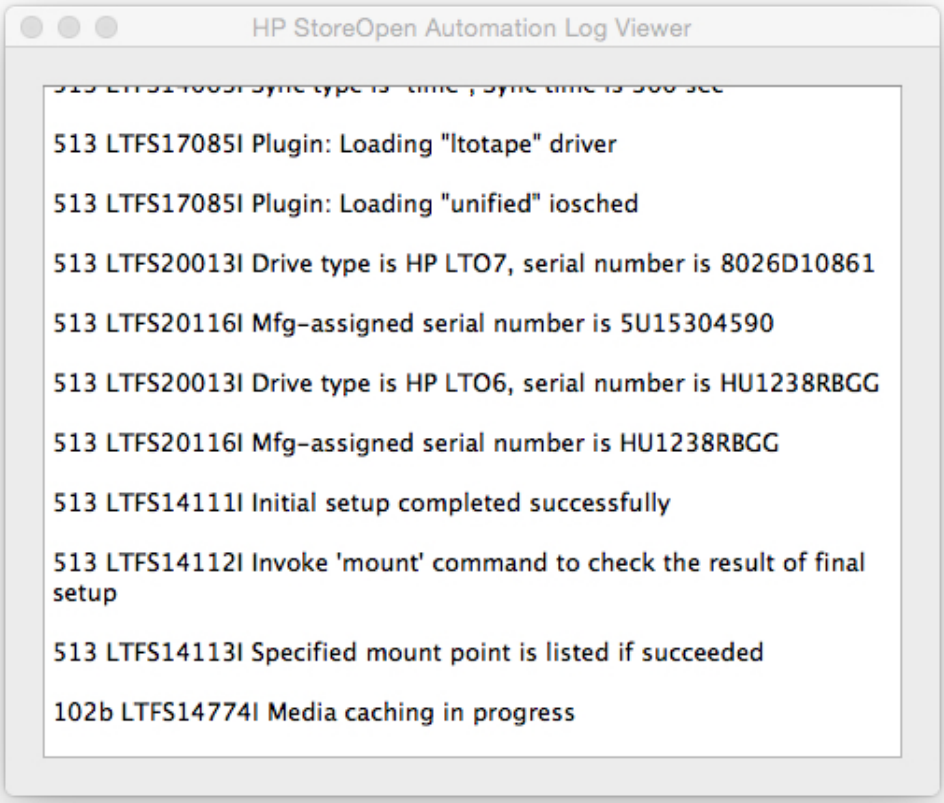
3. Click **Mount**.
   - The configuration tool checks whether the tape library or partition is accessible and usable.
   - The tool checks for available tape cartridges in the library. For each cartridge in the library, the tool checks whether the library is formatted as an LTFS volume.
   - The file system is started and the window is updated to reflect the new configuration.

   After mounting, the following window appears:



   A link to launch the mount point where the library is mounted is created on the desktop.
4. To view the live logs from the LTFS process, click **View Log**.

   The **HP StoreOpen Automation Log Viewer** window appears.



5. To get the details about the tapes that are currently loaded in the mounted tape library, click **View Inventory**.

   A new window with the details is displayed.

Mount options

HP recommends the default settings. However, you can use the following options to change the settings:

- Mount read-only—The cartridge contents are readable, and you cannot modify the content. This option enables write-protect mechanism for the software. You can also implement the same by using the write-protect tab for hardware on the tape cartridge.
- Format all Non-LTFS tapes automatically—If the library has non-LTFS cartridges, you can use this option to format these cartridges during the mount. If LTFS finds a non-LTFS tape during the mount, LTFS formats and mounts that tape.

Advanced mount options

You can use the Advanced Options on the SOA Configurator to configure the following settings:

- **Save support ticket to**—Provides the location where the system stores the drive logs. These logs are generated on each unmount and whenever an error is detected. The application stores the last ten logs and automatically deletes older logs.
- **Enable extended verbose logging**—Provides more detail about the log file entries. HP does not recommend this setting as this option reduces the performance. You must use this option only when HP support personnel asks.

- **Index updates**—Sets how frequently indexes are written to tape.
- **Index capture**—Keeps a copy of the latest index from all the LTFS cartridges in the library on the local disk. You can enable this option and enter the path to the folder where you want to keep the index file after unmounting the library.
- **Index partition usage**—Provides an option to write data files in the index partition. This setting might improve access times for frequently-used files. However, HP recommends the default setting.

NOTE: HP recommends not to change the default settings as some of these options might have an impact on performance.

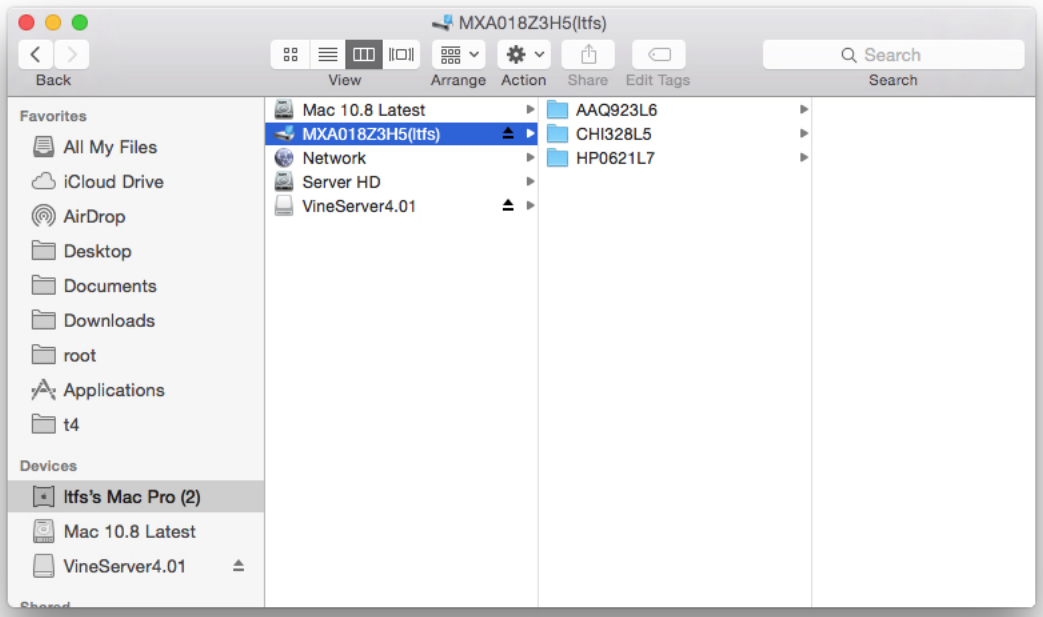
Index updates

Accessing data stored on tape depends on the availability of an up-to-date index. By default, a copy of the index is written to the tape every five minutes. However, you can change this time interval. This index update method reduces the loss of data due to power-loss events as the index on tape are less than five minutes old with the default setting. HP StoreOpen Automation writes the index to tape when a volume is removed. If you remove the power from the drive before unmounting the volume becomes inconsistent, and you cannot access the files added after the last dismount operation, for example, through an unplanned power outage or accidental unplugging. You can use the HPStoreOpenCheckUtility to recover the file data, however you cannot restore the metadata, such as filename and access dates.

Reducing the sync time adds overhead in terms of the tape capacity used for each index and performance because the writing of the index reduces the bandwidth for writing data. These overhead effects increase with smaller file sizes. HP recommends the default settings, however you can use this option to modify the settings for a particular scenario.

Accessing the tape contents

After mounting the library, you can access the contents of the LTFS cartridges using a command prompt or a finder. You can use the shortcut on the desktop to get the mount path for the library. The following figure displays the LTFS cartridges of a library in a finder window:



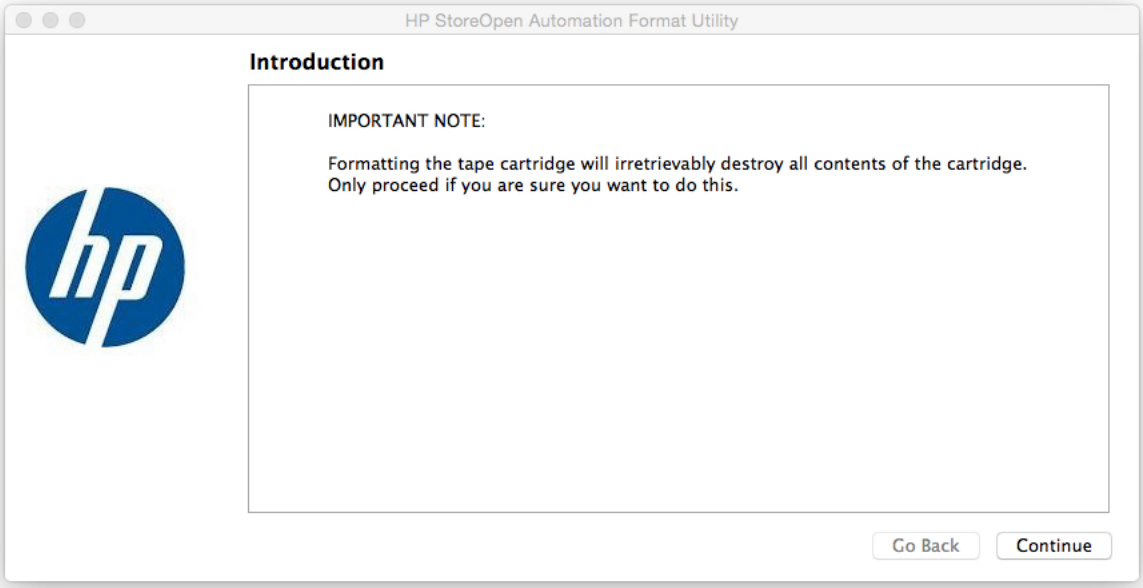
Using the HP StoreOpen Format Utility

Before using an LTO cartridge with LTFS, you must format the cartridge according to the LTFS specification. With the *HP StoreOpen Format Utility* application, you can select appropriate options and settings to format the tape. *HP StoreOpen Format Utility* application available in the HP StoreOpen Automation program group.

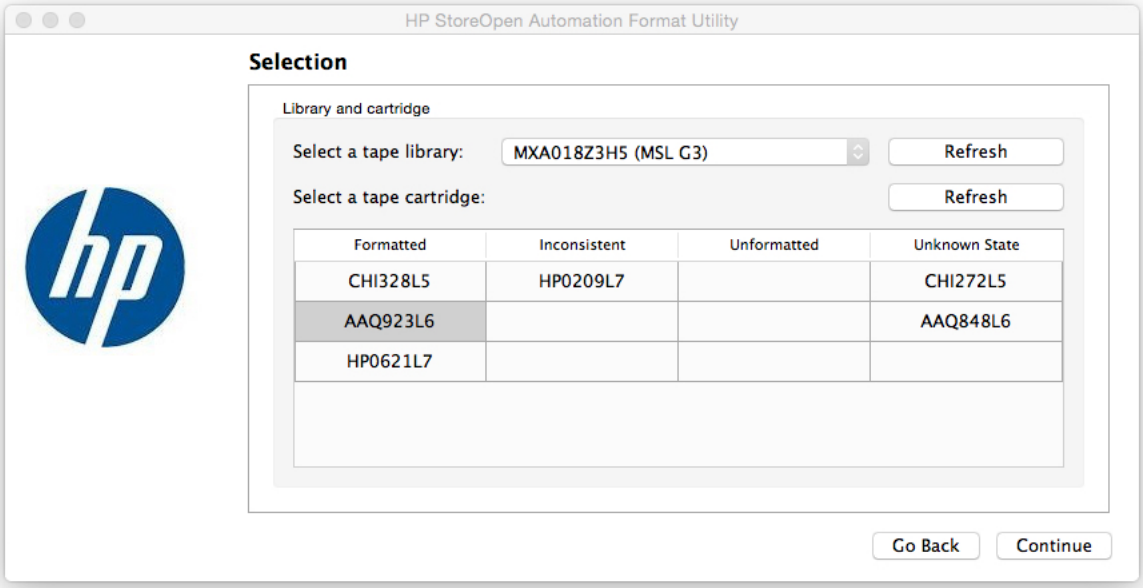
NOTE: The contents of the LTFS cartridge is displayed despite formatting as the finder does not refresh the window automatically. This scenario is because the finder does not refresh the window automatically. The finder window gets updated if you access, close, or open the cartridge contents in the finder again.

CAUTION: Read all the text on the wizard dialog windows carefully. Completing this utility destroys the tape contents irretrievably.

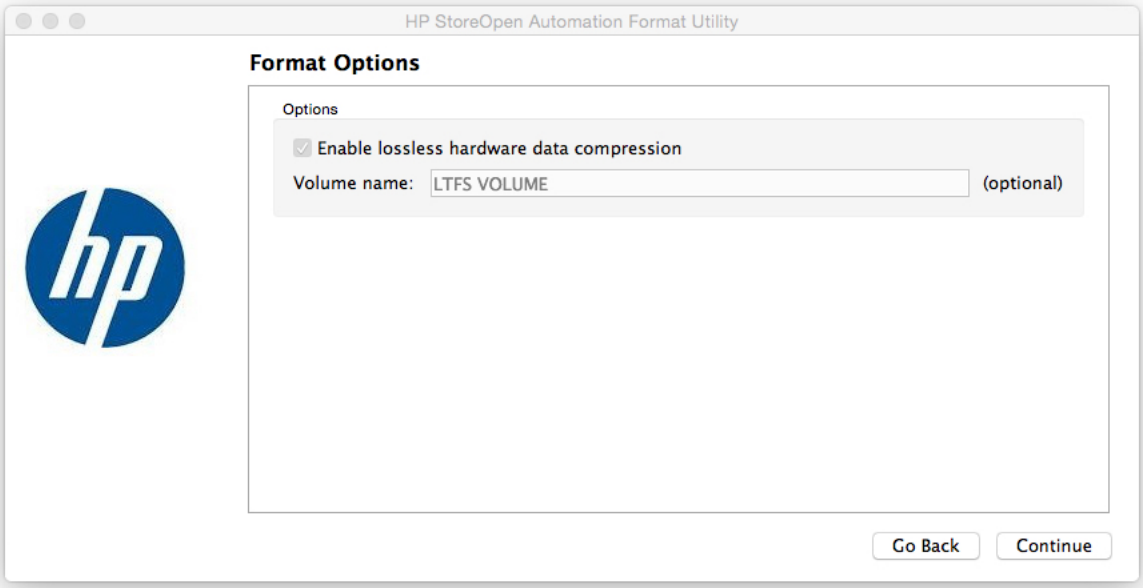
1. On the **HP StoreOpen Automation Format Utility** page, click **Next**.



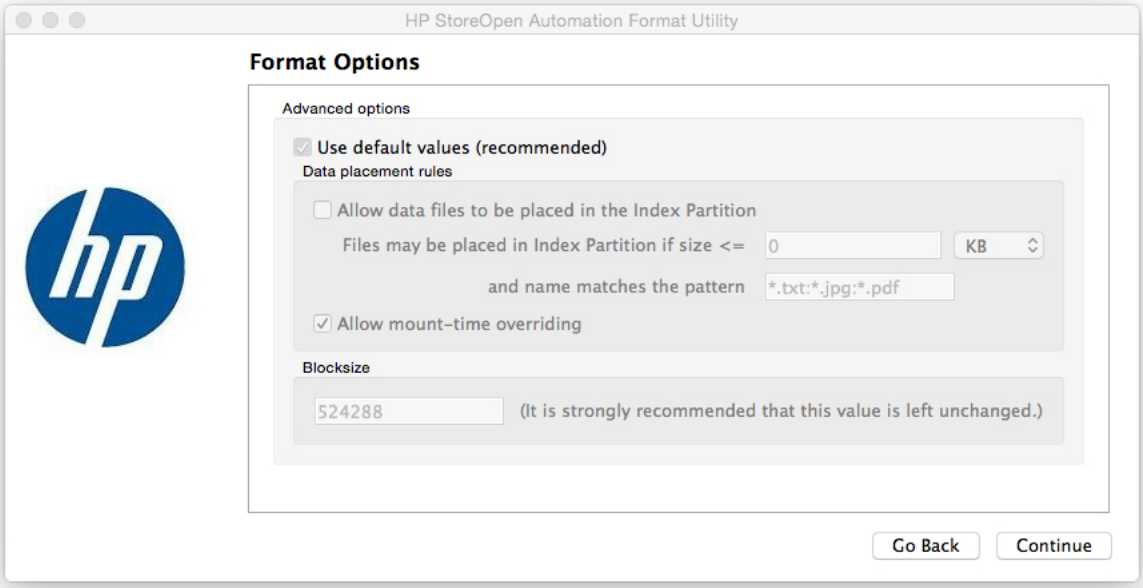
2. Select a tape library, cartridge, and click **Next**.



3. In the **Format Options** section, select the required format options.



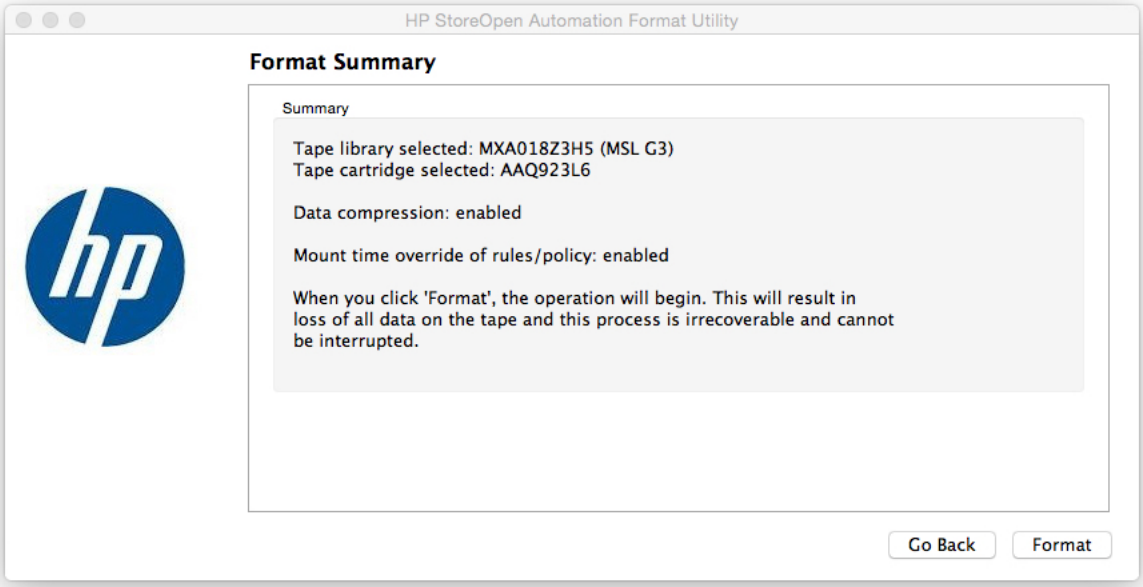
4. Click **Next**.
5. In the **Advanced Options** section, select the required settings.



HP recommends the default settings, changing the setting might impact the performance.

6. Click **Next**.

   The **Format Summary** page displays the details about the selected format option.



7. Click **Format**.

   The following actions take place:

   - The format operation starts.
   - The contents on the selected tape are removed and a fresh index is written to the cartridge.

8. In the progress dialog box, click one of the following options:
   - **Format another**—To format another cartridge.
   - **Close**–To exit the window.

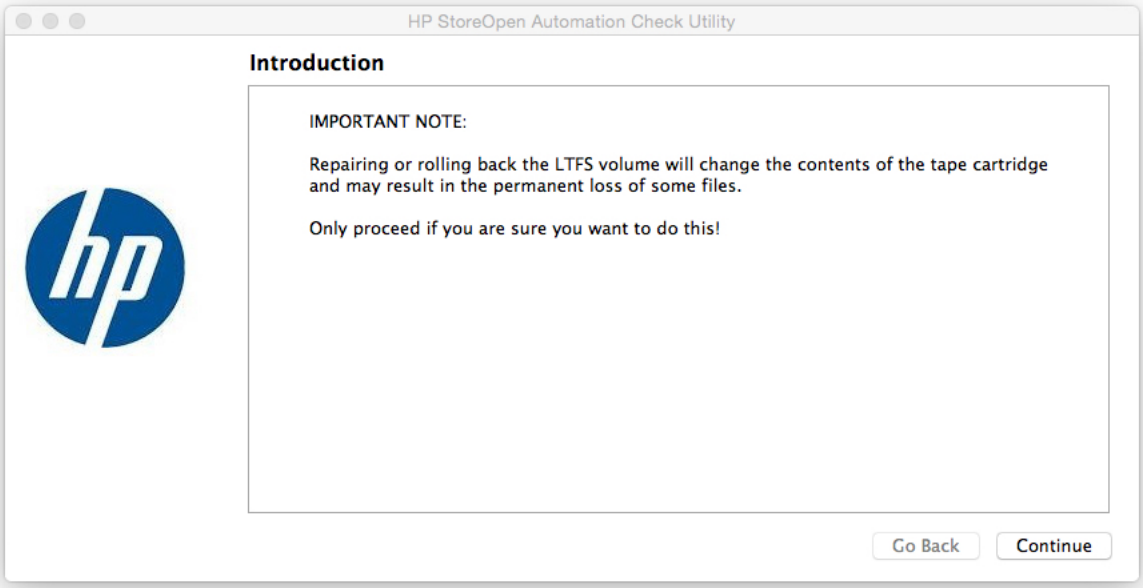
Using the HP StoreOpen Check Utility

The purposes of the *HP StoreOpen Check Utility* are:

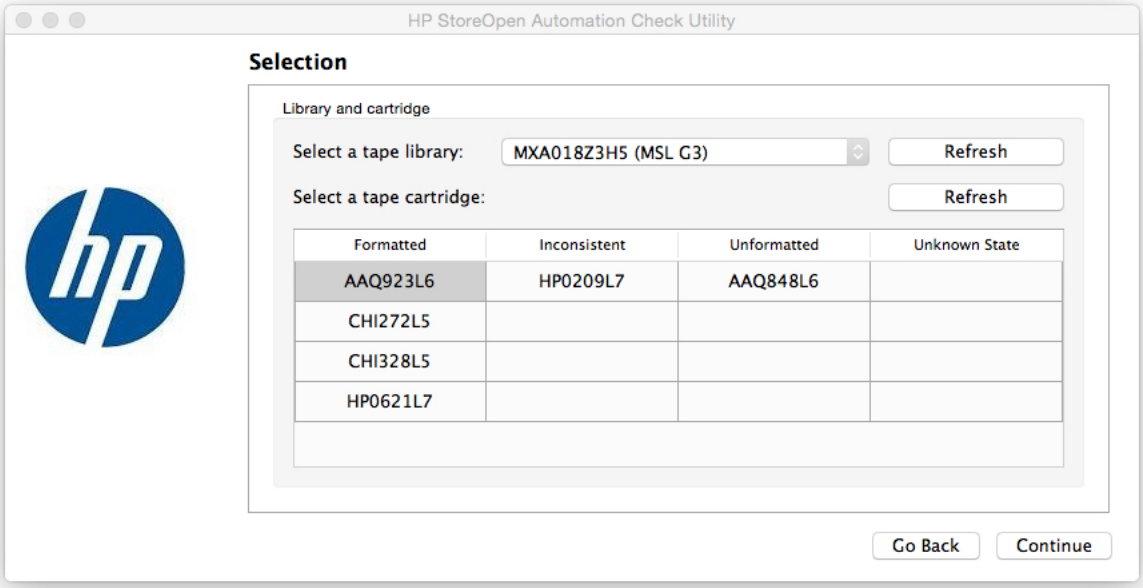
- To check for format issues while writing an index on the cartridge. This action is not necessary, but might be required in some scenarios, such as you switch off the drive without completely unmounting the volume.
- To facilitate the roll back of the cartridge contents to an earlier state.

CAUTION: Read all the text on the wizard dialog windows carefully. Completing this utility destroys the tape contents irretrievably.

1. On the **HP StoreOpen Automation Check Utility** page, click **Next**.

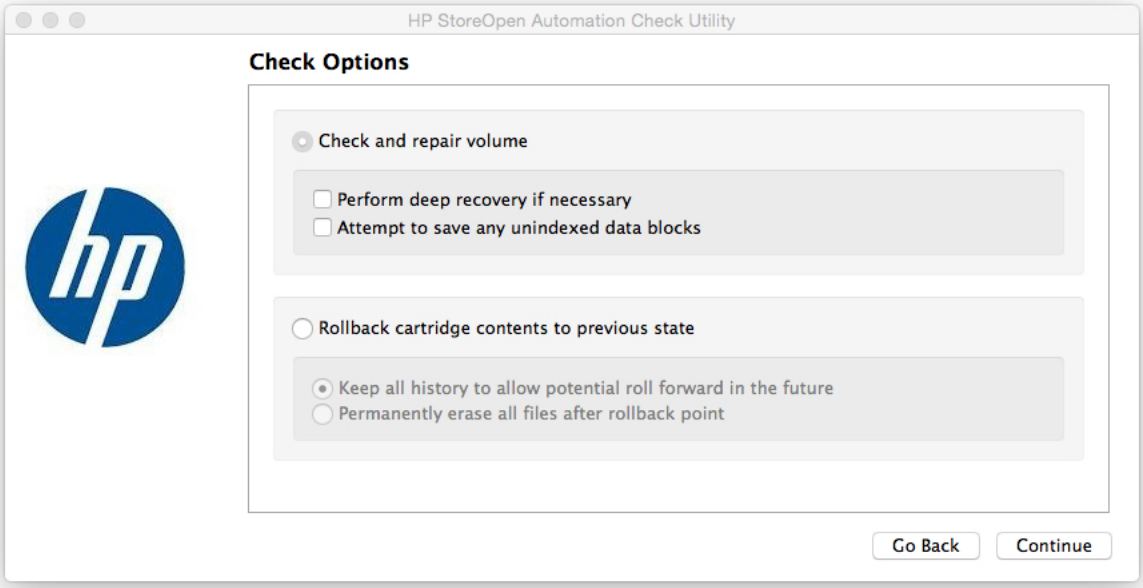


2. Select a tape library, cartridge, and click **Next**.



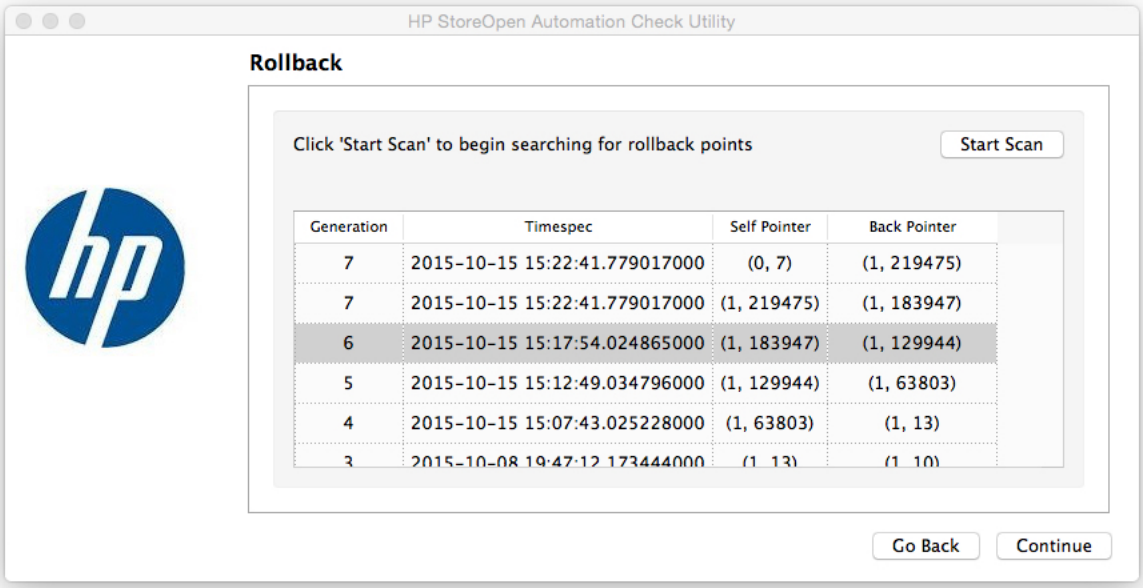
3. In the **Check Options** page, select one of the following:
   - **Check and repair volume**–Checks the volume for consistency. The options are:
     - **Perform deep recovery if necessary**—Verifies and recovers from a missing End Of Data (EOD) marker in case of a update failure due to a power outage. This action might take a long time and result in the loss of unindexed data blocks written after the last good index.
     - **Attempt to save any unindexed data blocks**–Recovers the unindexed data blocks. The utility saves the blocks to a new folder *_ltfs_lostandfound*.

     You must identify and manipulate any recovered blocks manually as the blocks are not indexed and the identifying details are unavailable.
   - **Rollback cartridge contents to previous state**—Changes the view of the cartridge contents to a previous version. The options are:
     - **Keep all history to allow potential roll forward in the future**—The default settings is to roll back the contents as viewed in the index, but not to erase any data. The view of the contents change, but the actual contents do not change. You can also use this option to roll forward the contents again by recovering changes that occurred after the rollback point. This operation does not provide any free storage space.
     - **Permanently erase all files after rollback point**—Rolls back and erases the history. Any changes after the rollback point is lost irreversibly. This option provides free storage space.



When you select the **Rollback cartridge contents to previous state**, the **Rollback** screen appears.

4. In the **Rollback** screen, select a rollback point on the cartridge and click **Start Scan** to initiate a scan of the entire volume.

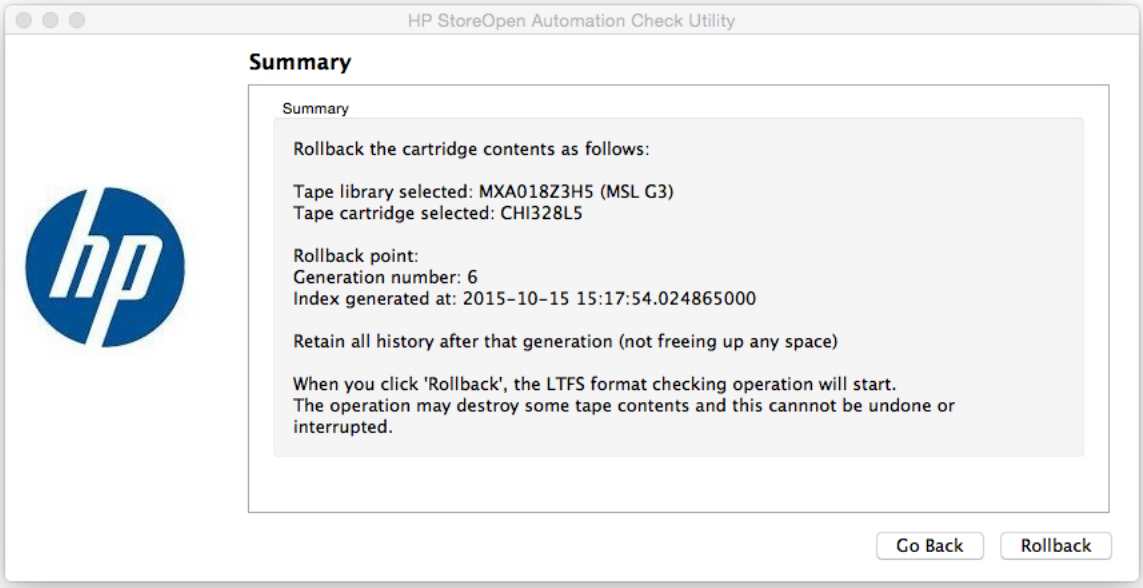


This operation might take several minutes to hours. When the scanning completes, the window is refreshed to display the available rollback points.

5. Select a rollback point and click **Next**.

   The **Summary** screen displays a summary of the operation to be carried out.

6. Click **Rollback**.



The following actions take place:

- The check or rollback operation starts.
- The **Progress** dialog box is updated as the operation completes.

7. In the progress dialog box, click one of the following options:
   - **Check another**—To check another cartridge.
   - **Close**—To exit the window.

HP StoreOpen Unformat Utility

△ **CAUTION:** This operation permanently removes all data present on the cartridge.

The *Unformat Utility* removes the LTFS format from a cartridge and changes to a single partition, so that you can use the cartridge with a different application.

Using the HP StoreOpen IE Utility

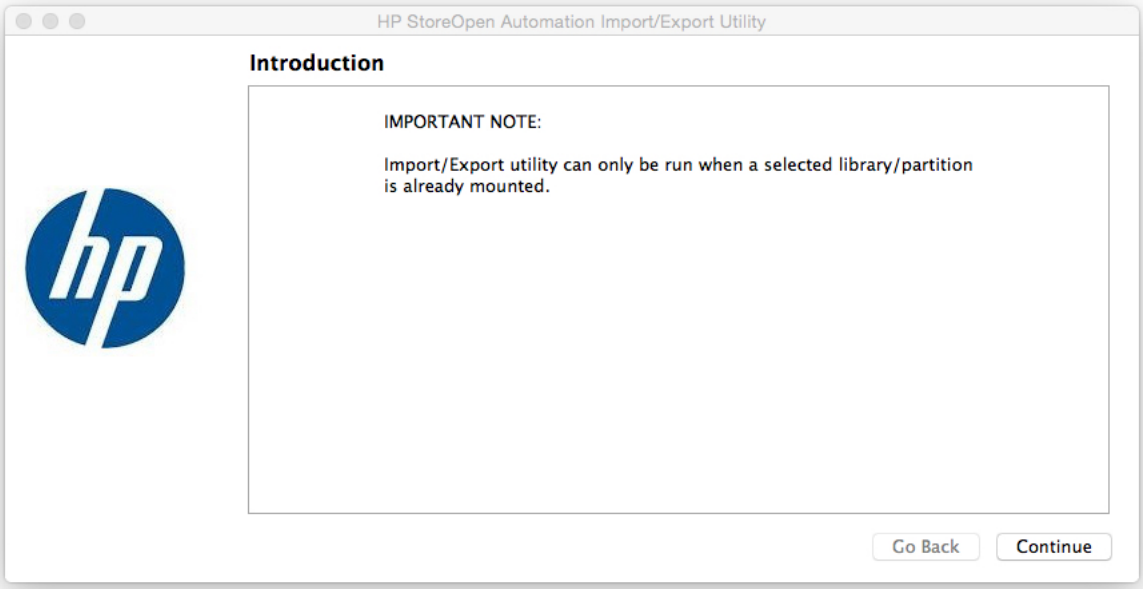
NOTE: You must mount the library before using this utility.

You can use the *Import Export Utility* to import and export media from the library to the mail slots of the library. If mail slots are configured and empty slots are available in the library, the utility exports the selected tape to one of the mail slots. When the utility exports a tape cartridge:

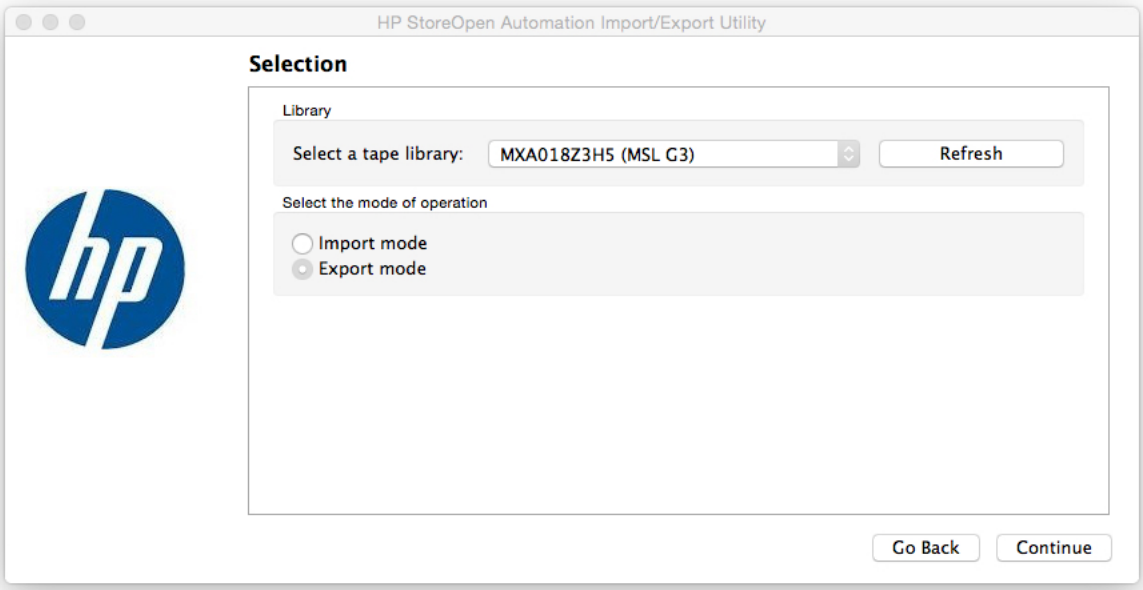
1. The index on the tape is updated.
2. The tape is unmounted.
3. The tape is exported to one of the empty mail slots.

To use the HP StoreOpen IE Utility:

1. Launch **HP StoreOpen IE Utility**.
   The following screen appears:



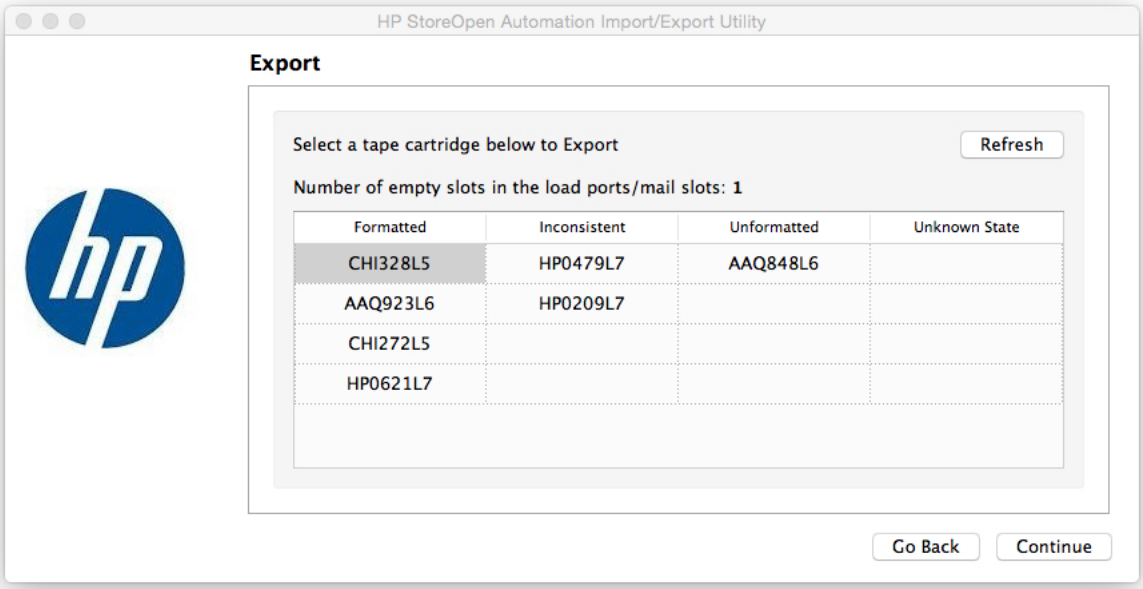
2. Click **Continue**.
3. Select the following:
   - Tape library and cartridge
   - The mode of operation



4. Click **Continue**.

NOTE: If a tape library is not displayed, click Refresh. The system updates the list.

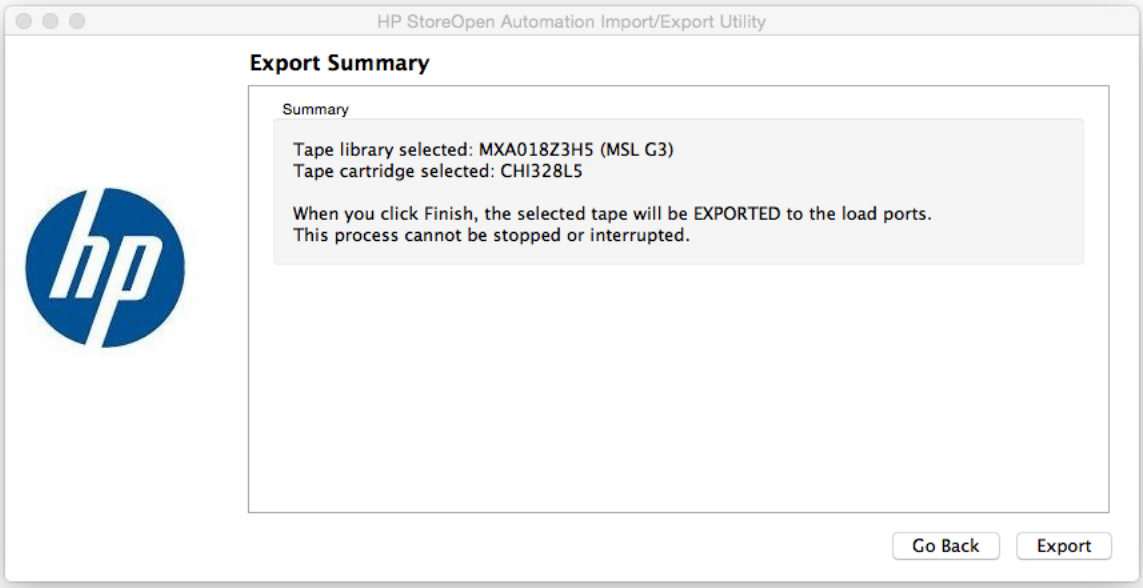
5. Select a tape cartridge to import or export.



NOTE: Only one tape cartridge can be imported or exported at a time.

6. Click **Continue**.

   The following screen with the Import/Export operation appears:

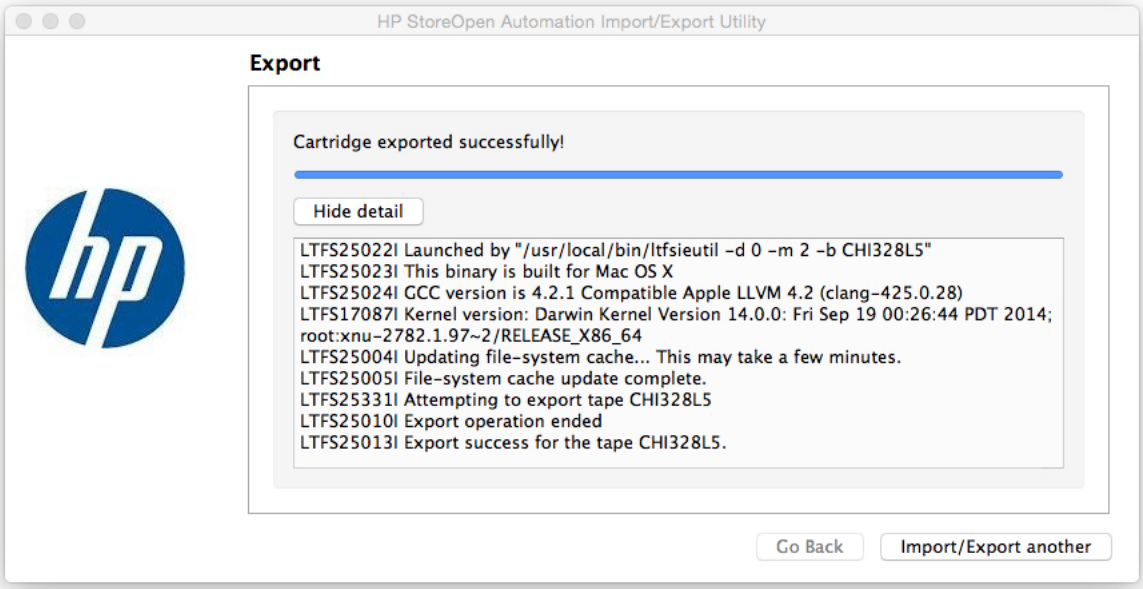


7. Click **Finish**.

   The following operations take place:

   1. If the cartridge is currently mounted, the system unmounts the cartridge.
   2. The import or export operation starts and a **Progress** dialog box is displayed with the progress and result of the operations.

8. To import or export another cartridge, click **Import/Export another** and repeat this procedure.



9. To exit the tool, click **Close**.

Mounting the Library from a command terminal

Ensure that `/usr/local/bin/` is added in the command search path. For example,

```
$ export PATH="$PATH:/usr/local/bin
```

1. To get the robotic device instance number of the library, run the `system profiler` command.

   NOTE: In this procedure, the device instance number of the library is 0.

2. Create a mount directory for the library device.

   For example, `mkdir /mnt/hp_msl`.

   NOTE: You need to create this directory only one time.

3. Mount the tape library device, using the *ltfs* tool.

   For example, `ltfs /mnt/hp_msl -o devname=0`.

   NOTE: If the tape is formatted for LTFS, the library identifies the media in the library or partition by moving it to a drive and identifying the LTFS index. This process might take more than an hour. After identifying all media, you can use any LTFS formatted cartridge as a file system.

Formatting cartridges from the command terminal

The tape cartridges must be LTFS-formatted before using the cartridges as a file system. You can use two methods to format a supported cartridge. These methods use the `mkltfs` command from the command line.

In the following examples, the library device number is 0 and the barcode of the media to be formatted is KR1234L5:

- **Formatting an LTO tape**

  ```
  mkltfs --device=0 -s KR1234L5
  ```

- **Unmounting and shutdown**

  The `unmount` command can be used to terminate the HP StoreOpen Automation software, and unmount the library device. For example, `unmount /mnt/hp_msl`.

  You can specify barcode of a tape using `-s` parameter or select the cartridge from a menu.

IMPORTANT: The system writes cached data to tape for a few minutes. For two tape drives, the cached writes might take up to five minutes. You must not turn off the power or reset the tape library for at least five minutes after executing the `unmount` command. The tapes might become inconsistent and potential data loss might occur. Before remounting the library, you must wait at least five minutes after executing the `unmount` command.

Status of cartridges in the Library

HP SOA 2.0.0 and above support a Virtual Extended Attribute (VEA) to retrieve the status of cartridges in the library. The attribute is `ltfs.vendor.HP.cartridgeList`. This attribute returns a string that contains the details of all cartridges available in the partition.

The string format is:

```
Barcode:State:Location[;Barcode:State:Location[;Barcode… ]]
```

Example (command line):

```
xattr -p ltfs.vendor.HP.cartridgeList /Volumes/MXA324J8H5 Attribute
"ltfs.vendor.HP.cartridgeList" had a 49 byte value for E:\
000370L5:N:D257;DG6347L5:F:D256;CGV952L5:N:S4097;
```

You can use a state and location

Different states are:

- F (formatted)
- C (corrupt/inconsistent)
- N (not formatted for LTFS)
- U (unknown at this time)

Different locations are:

- Snnnn (in storage slot nnnn)
- Dnnn (in drive nnn)
- Mnnn (in mail slot nnn)

Checking the status of the Library

HP SOA 3.0.0 and above support a Virtual Extended Attribute (VEA) to retrieve the status of the library. The attribute *ltfs.vendor.HP.libraryStatus* indicates the current status of the library which is mounted at the given mount point. This attribute is read-only.

This attribute returns one of the following strings indicating the current status of the library:

- Not mounted
- Mounting
- Mounted

- Unmounting
- Moving media

The **Not mounted** and **Unmounting** status are available only for a fraction of second. The **Mounting** status is displayed after initiating a mount and after the library identifies each media in the library. The **Moving media** status is displayed whenever the library moves media. The **Mounted** status is displayed when LTFS completes processing all tapes in the library and the file system is ready.

Example for checking the status of a Library(Command line):

```
xattr -p ltfs.vendor.HP.libraryStatus /Volumes/MXA324J8H5 Attribute
"ltfs.vendor.HP.libraryStatus" had a 7 byte value for path: mounted
```

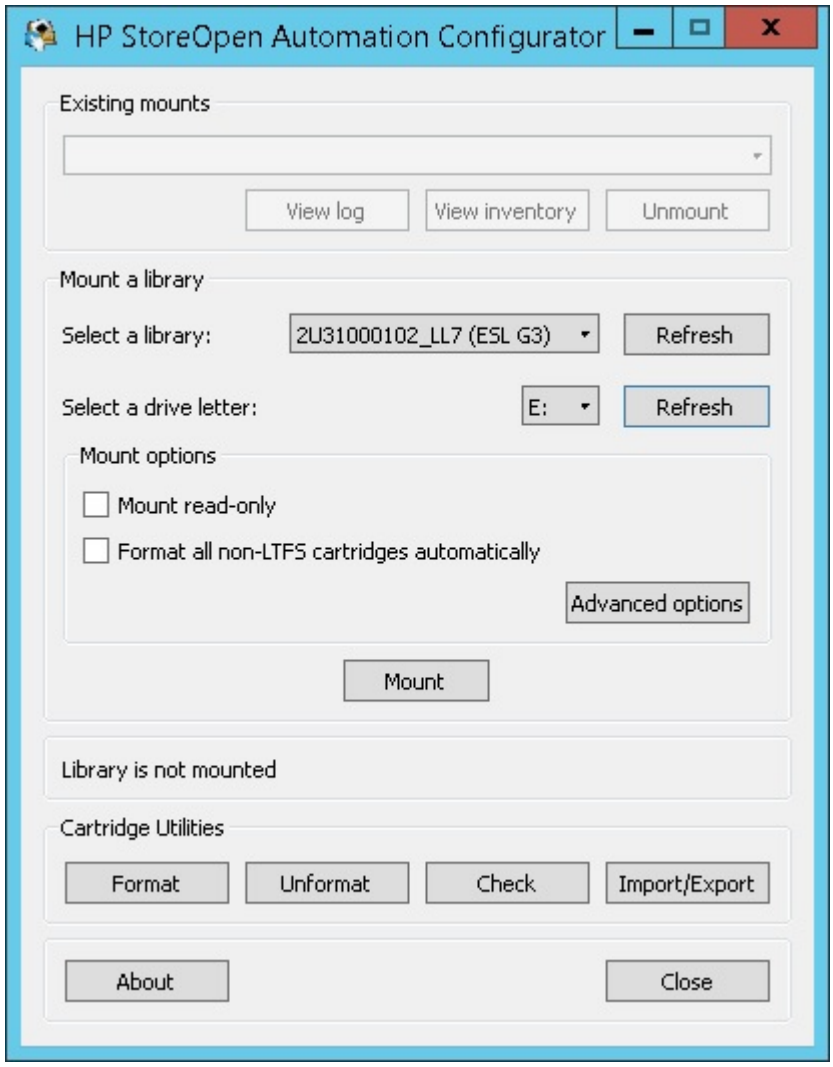
6 Using HP StoreOpen Automation (Windows)

Mapping a tape library or partition to a drive letter

Before you can access the tape cartridge as a volume, you must first establish a mapping between the tape library and a Windows drive letter. To do this, run the **HP SOA Configurator** tool from the desktop shortcut or from the HP StoreOpen Automation program group.

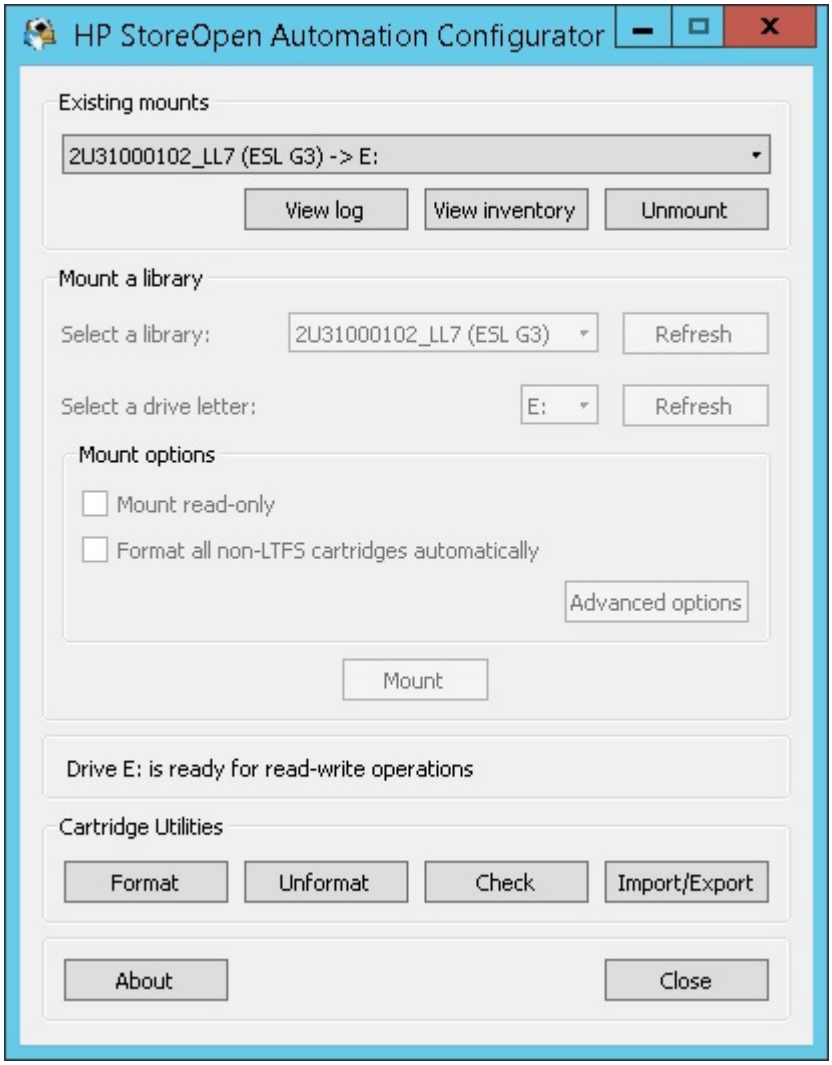
NOTE: The tool may request administrative privileges, depending on your system security policies.

The configuration window will appear on your system.

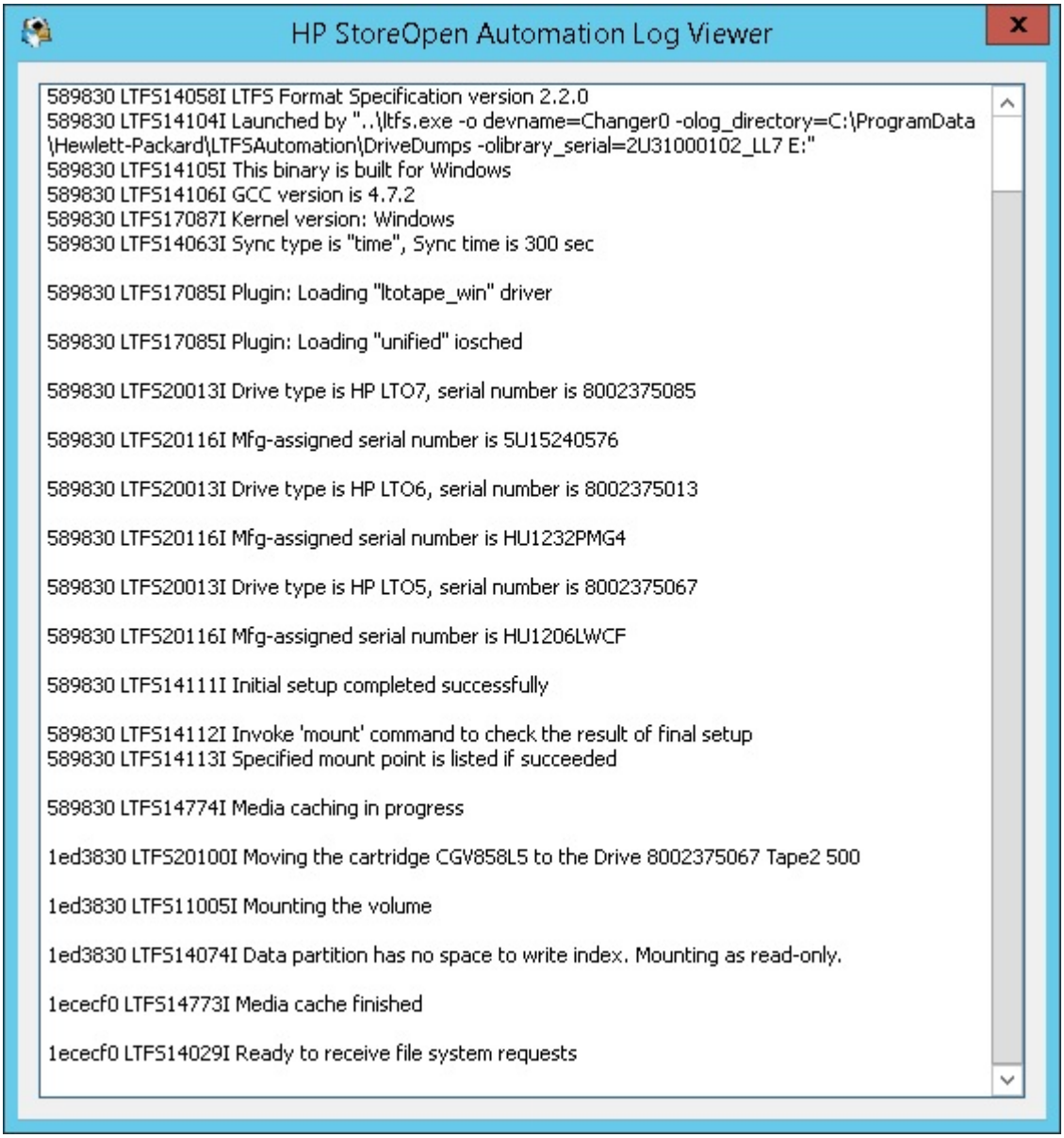


By default the first usable tape library or partition found on your system is selected, along with the first unused drive letter. Change the selections as desired, then to mount with all the default options, click **Mount**. This results in the following actions:

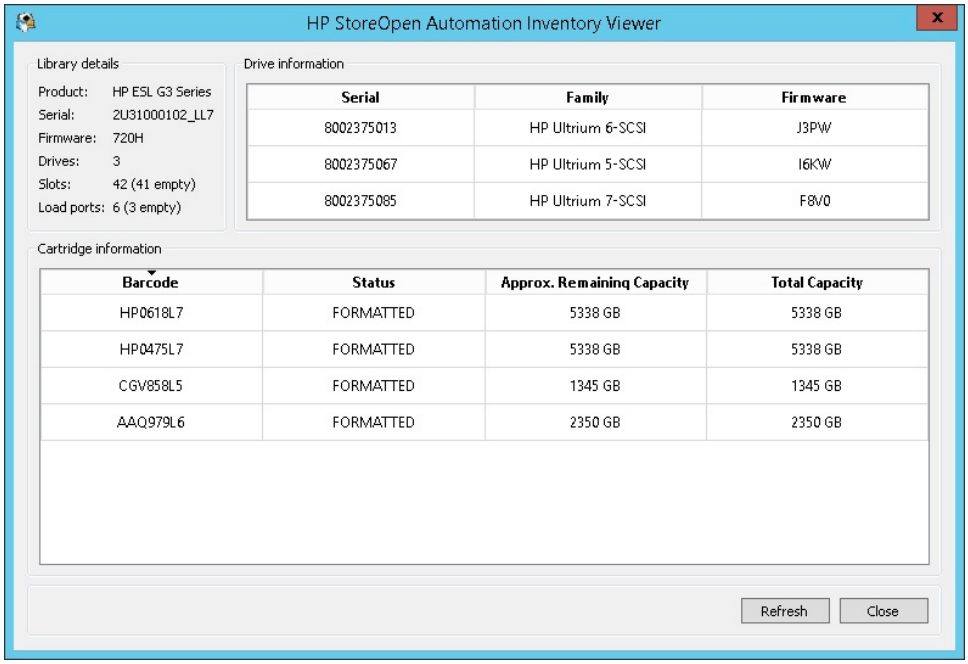
1. The configuration tool checks that the tape library or partition is accessible and usable.
2. The tool looks for available tape cartridges in the library. For each cartridge in the library the tool checks to see if it is formatted as an LTFS volume.
3. The file system service is started and the window is updated to reflect the new configuration. The following screen illustrates a typical view after a mapping has been established.



4. Once the file system is mounted, you can close or minimize the configuration tool. A Windows Explorer window will now include all the LTFS formatted tapes as separate folders under the drive letter.
5. Clicking on the ‘View Log’ button will show the live logs from the LTFS process as shown in the below picture.


HP StoreOpen Automation Log Viewer
589830 LTFS14058I LTFS Format Specification version 2.2.0
589830 LTFS14104I Launched by "..\ltfs.exe -o devname=Changer0 -olog_directory=C:\ProgramData
\Hewlett-Packard\LTFSAutomation\DriveDumps -olibrary_serial=2U31000102_LL7 E:"
589830 LTFS14105I This binary is built for Windows
589830 LTFS14106I GCC version is 4.7.2
589830 LTFS17087I Kernel version: Windows
589830 LTFS14063I Sync type is "time", Sync time is 300 sec
589830 LTFS17085I Plugin: Loading "ltotape_win" driver
589830 LTFS17085I Plugin: Loading "unified" iosched
589830 LTFS20013I Drive type is HP LTO7, serial number is 8002375085
589830 LTFS20116I Mfg-assigned serial number is 5U15240576
589830 LTFS20013I Drive type is HP LTO6, serial number is 8002375013
589830 LTFS20116I Mfg-assigned serial number is HU1232PMG4
589830 LTFS20013I Drive type is HP LTO5, serial number is 8002375067
589830 LTFS20116I Mfg-assigned serial number is HU1206LWCF
589830 LTFS14111I Initial setup completed successfully
589830 LTFS14112I Invoke 'mount' command to check the result of final setup
589830 LTFS14113I Specified mount point is listed if succeeded
589830 LTFS14774I Media caching in progress
1ed3830 LTFS20100I Moving the cartridge CGV858L5 to the Drive 8002375067 Tape2 500
1ed3830 LTFS11005I Mounting the volume
1ed3830 LTFS14074I Data partition has no space to write index. Mounting as read-only.
1ececf0 LTFS14773I Media cache finished
1ececf0 LTFS14029I Ready to receive file system requests

6. Click the **View Inventory** button to open another window where you can get the details about the tapes currently loaded in the tape library which is mounted.



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.
- Format all Non-LTFS tapes automatically— If the library have non-LTFS tapes and if you would like to format those tapes during the mount itself you can enable this option. If LTFS encounters a non-LTFS tape during mount it will format that tape and mount it.

Advanced mount options

If you click on the **Advanced Options** button on the **SOA Configurator** window it 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.

- **Save support ticket to**: 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 HP support personnel but otherwise can be ignored.
- **Enable extended verbose logging**: This is not required in normal operation and you should only use it when requested by HP support personnel, as it will have an adverse effect on performance. This adds a further level of detail to log file entries.
- **Index updates**: This allows you to control how frequently indexes are written to tape.

- **Index capture**: This option allows you to keep a copy of the latest index from all the LTFS cartridges in the library 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 library is unmounted.
- **Index partition usage**: The LTFS 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.

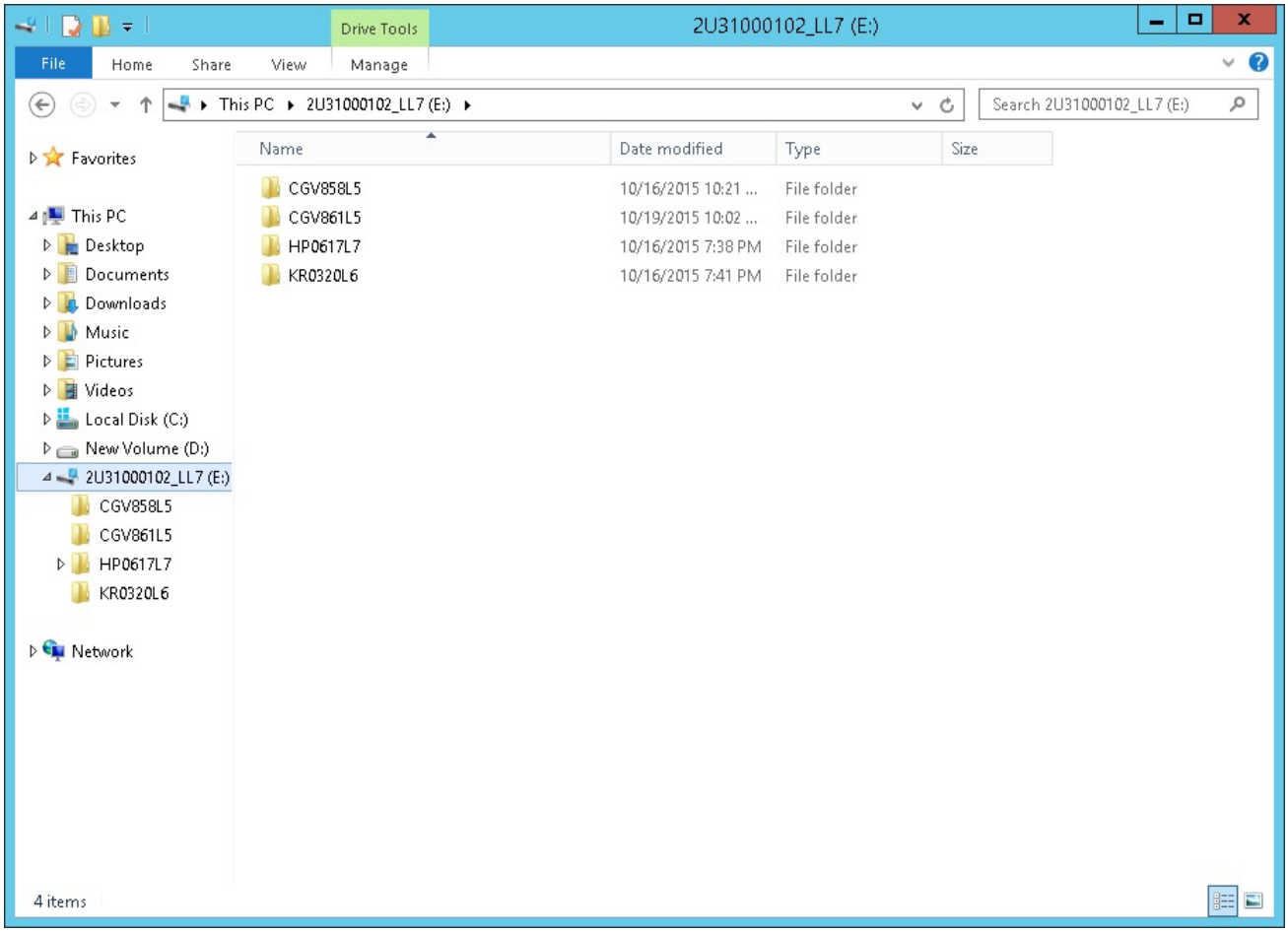
Index updates

Accessing data stored on tape relies on an up-to-date index being available. The default setting is to write a copy of the index to tape 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). HP StoreOpen Automation will write the index to tape when a volume is removed. In normal operation this is sufficient, since the LTFS 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 but the metadata (filename, access dates, and so on) will be lost. You can even choose to write the index every 1 minute. 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.

Working with Windows Explorer

Once the library is mounted you can access the contents of the LTFS cartridges either at a command prompt or through Windows Explorer. The following screen shows the LTFS cartridges of a library viewed in an Explorer window.



The **Total size** and **Space free** figures appear slightly lower than expected; this is due to the way that Windows calculates and reports capacities in binary GB (230 bytes) and TB (240 bytes) instead of decimal GB (109 bytes) and TB (1012) 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.

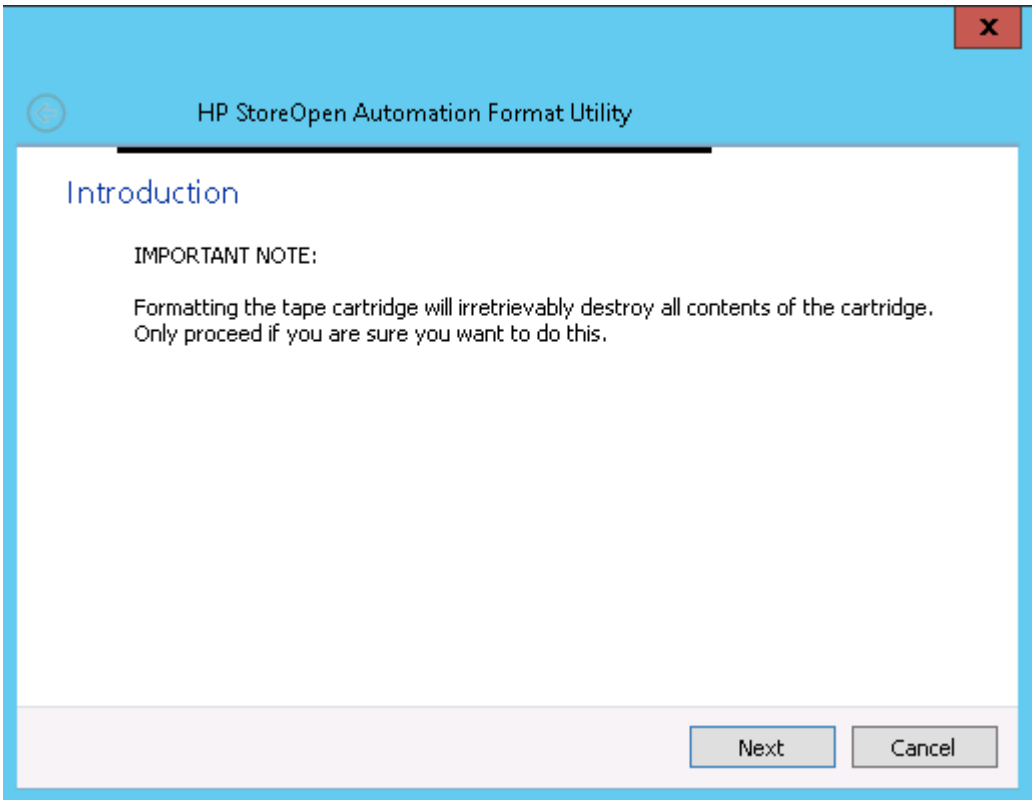
Using the SOA Format Utility

Before you can use an LTO-5, LTO-6, or LTO-7cartridge with LTFS, it must be prepared by formatting according to the LTFS specification. The SOA Format Utility application helps to select appropriate options and settings and then formats the tape. You can run it from the HP StoreOpen Automation program group.

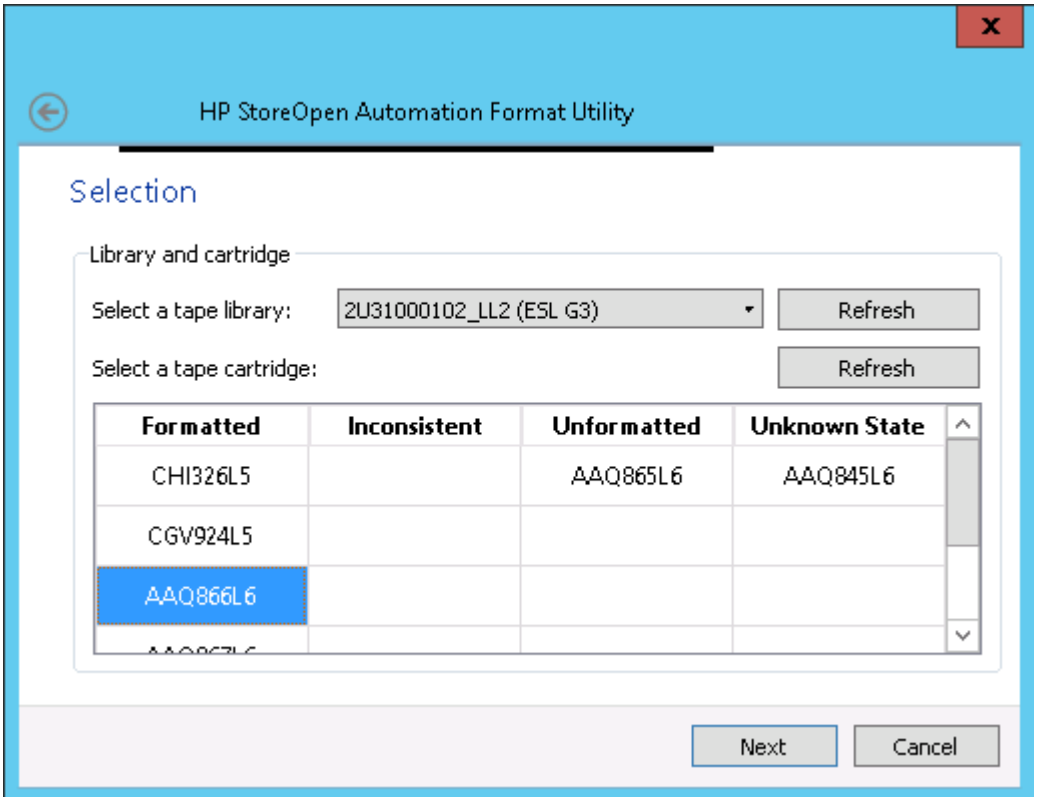
△ **CAUTION:** Read all the text on the wizard dialog windows carefully. Completing this wizard will irretrievably destroy all tape contents.

To use the SOA Format Utility:

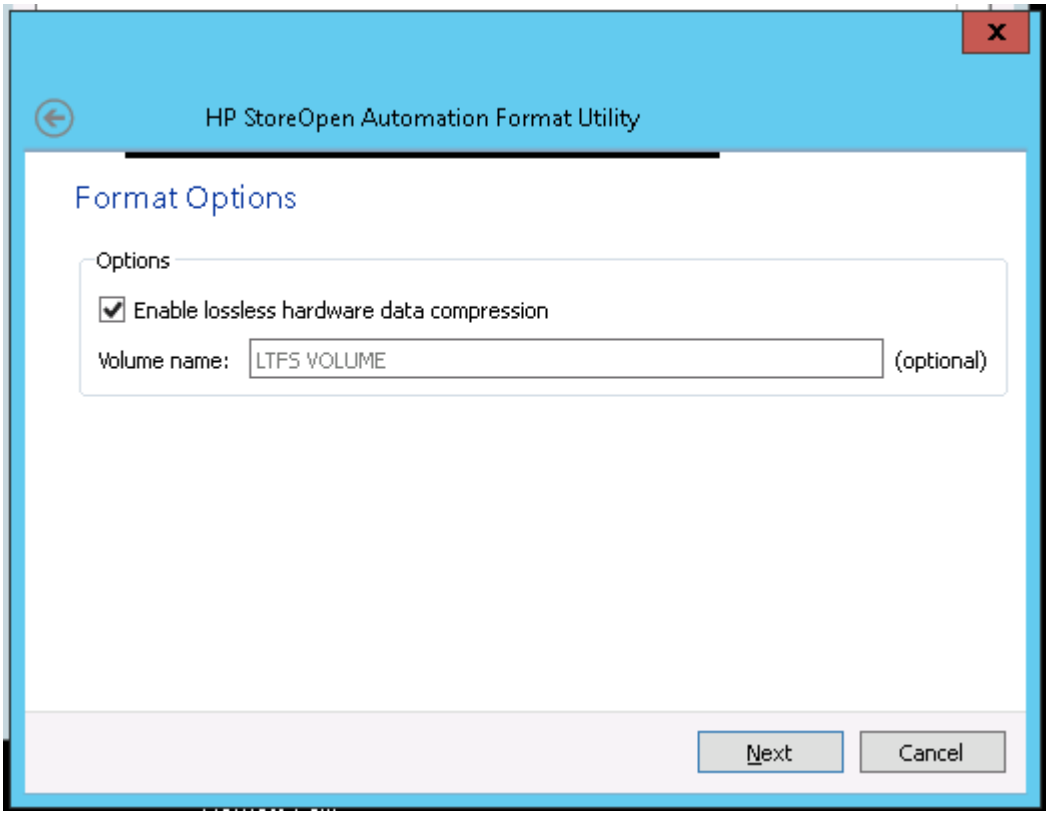
1. The initial screen presents information about the operation that has been started. Click **Next**.



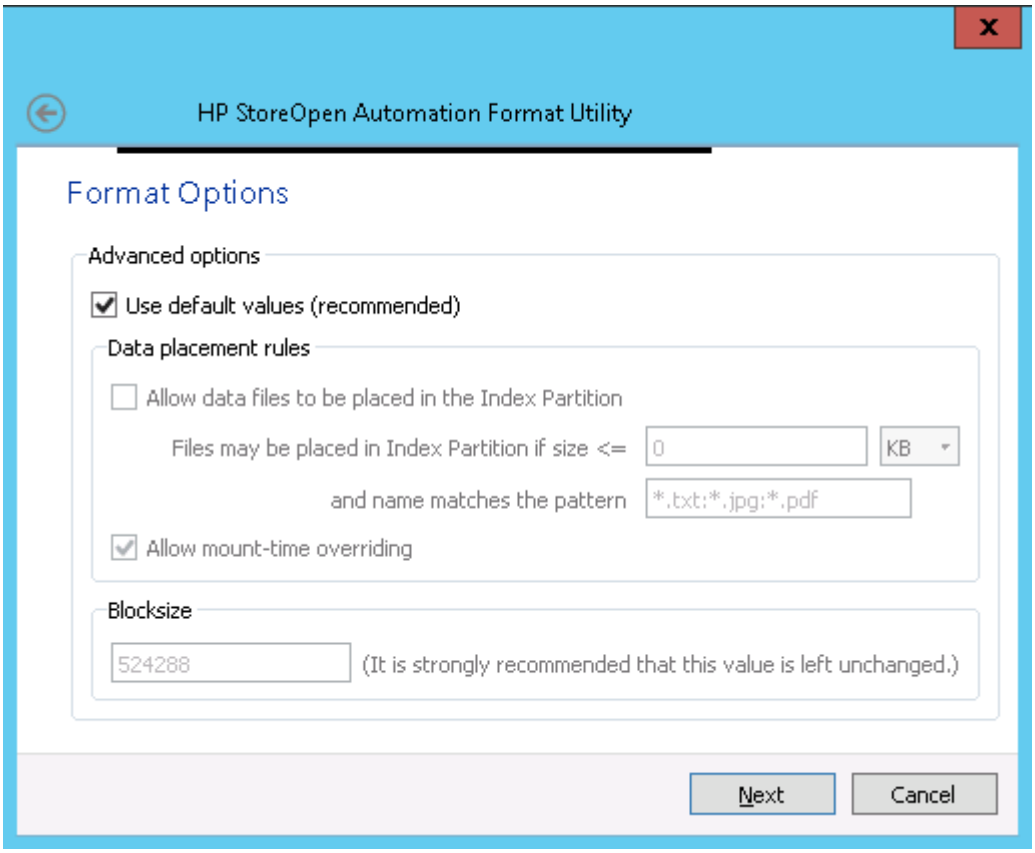
2. The next screen allows you to select a tape library and cartridge. When you have completed your changes, click **Next**.



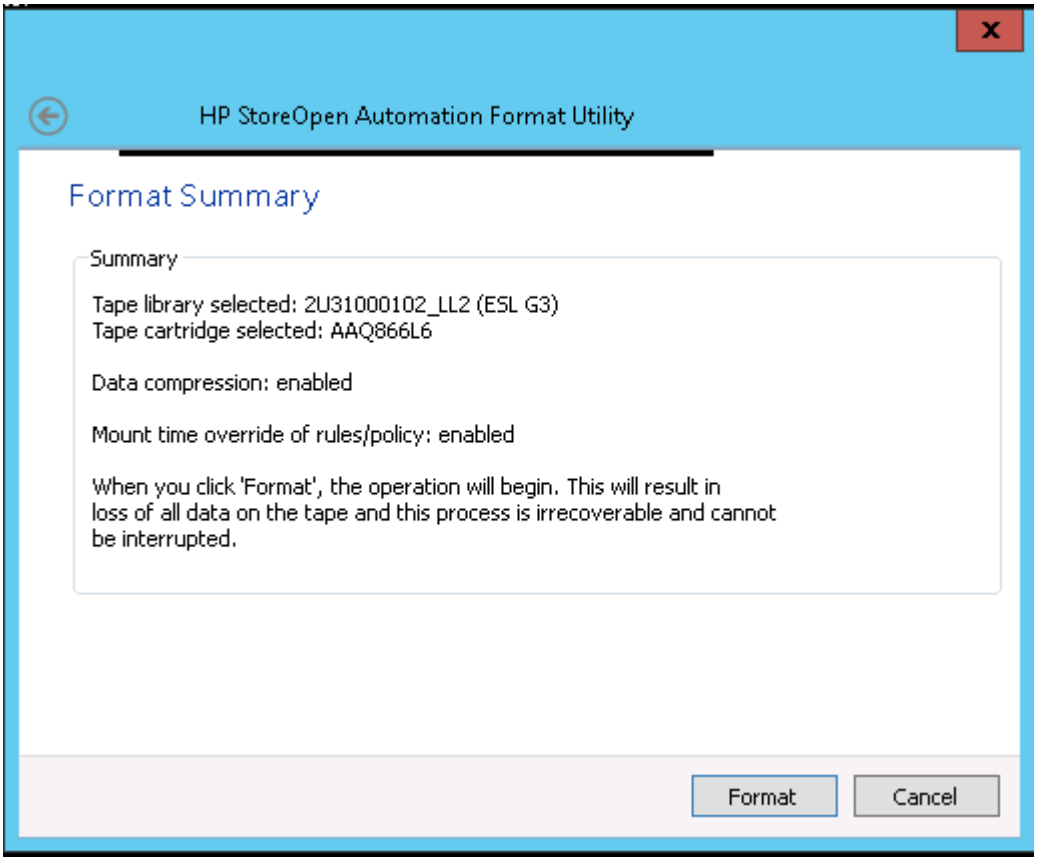
3. On the next screen you can enable or disable data compression and also give a volume name to the cartridge. When you have completed your updates, click **Next**.



4. The next screen provides advanced options for the format operation. However, it is recommended that you leave these at their default settings for all normal usage. When you have completed making changes, or have chosen not to, click **Next**.



5. The next screen summarizes the format operation that you have defined using the wizard. Click **Format**.



When you click **Format**, the following operations take place:

1. The format operation starts.
2. All contents on the selected tape are removed and a fresh index is written to the cartridge.
3. When the progress dialog shows that the format is complete, you can close the window or click Format another to format another cartridge.

Using the SOA Check Utility

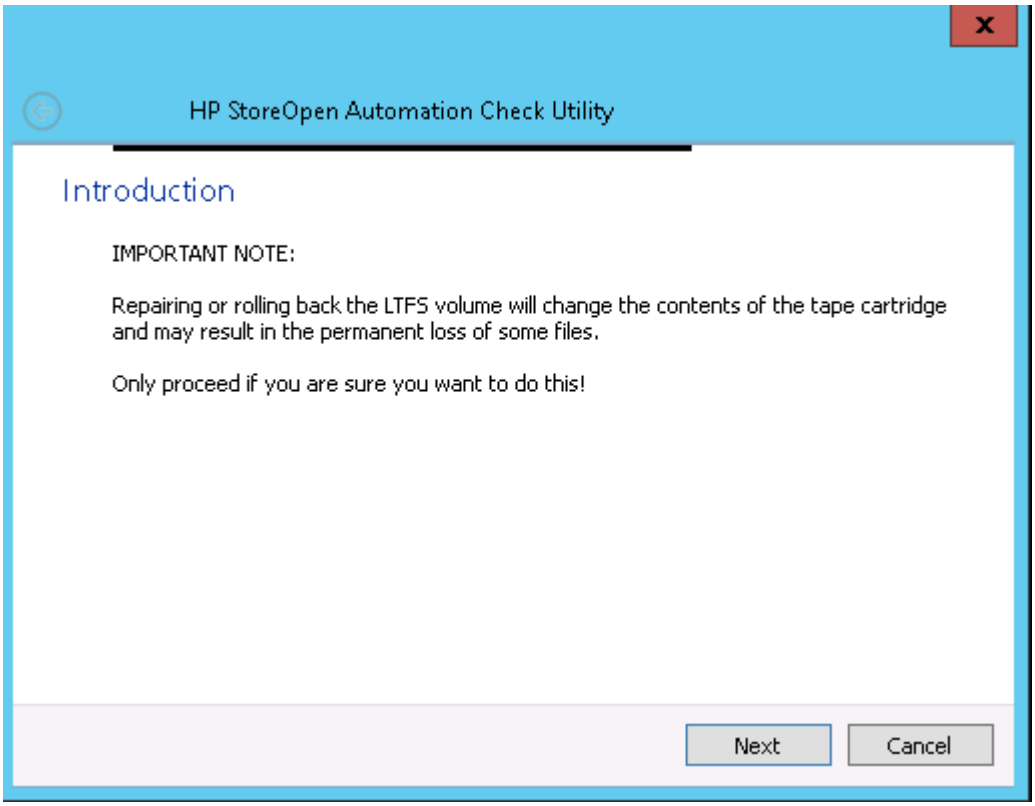
The SOA Check Utility has two purposes:

- 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.

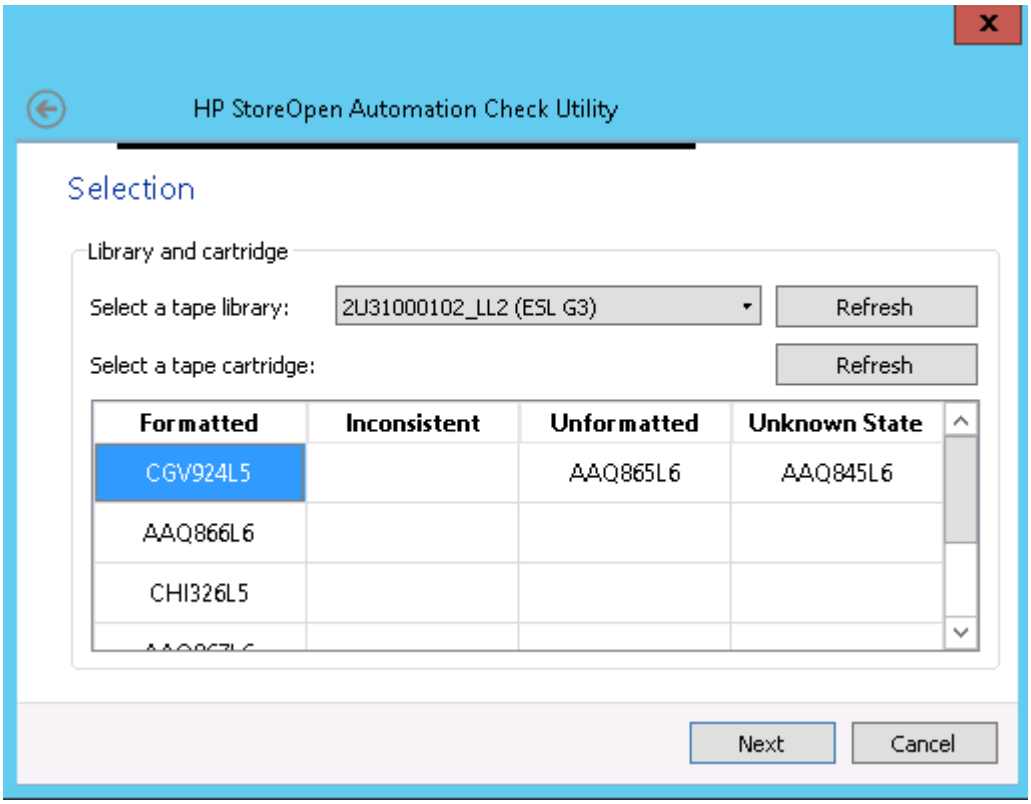
△ **CAUTION:** Read all the text on the wizard dialog windows carefully. Completing this wizard may irretrievably modify the tape contents.

To use the SOA Check Utility:

1. The initial screen presents information about the operation that has been started. Click **Next**.



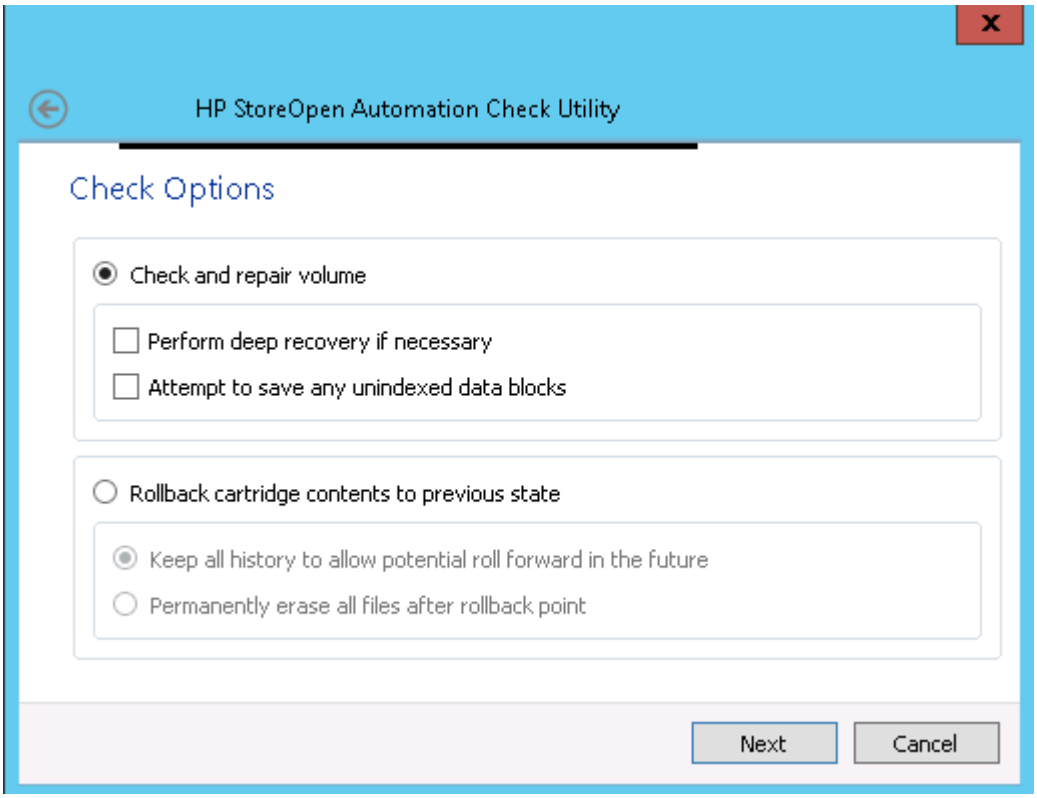
2. Select a tape library and cartridge. When you have completed your updates, click **Next**.



3. Select the desired mode of operation by selecting one of the following:
   - **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 **Perform deep recovery if necessary**, 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 **Attempt to save any unindexed data blocks**. The utility will try to save the blocks to a new folder `_ltfs_lostandfound`.

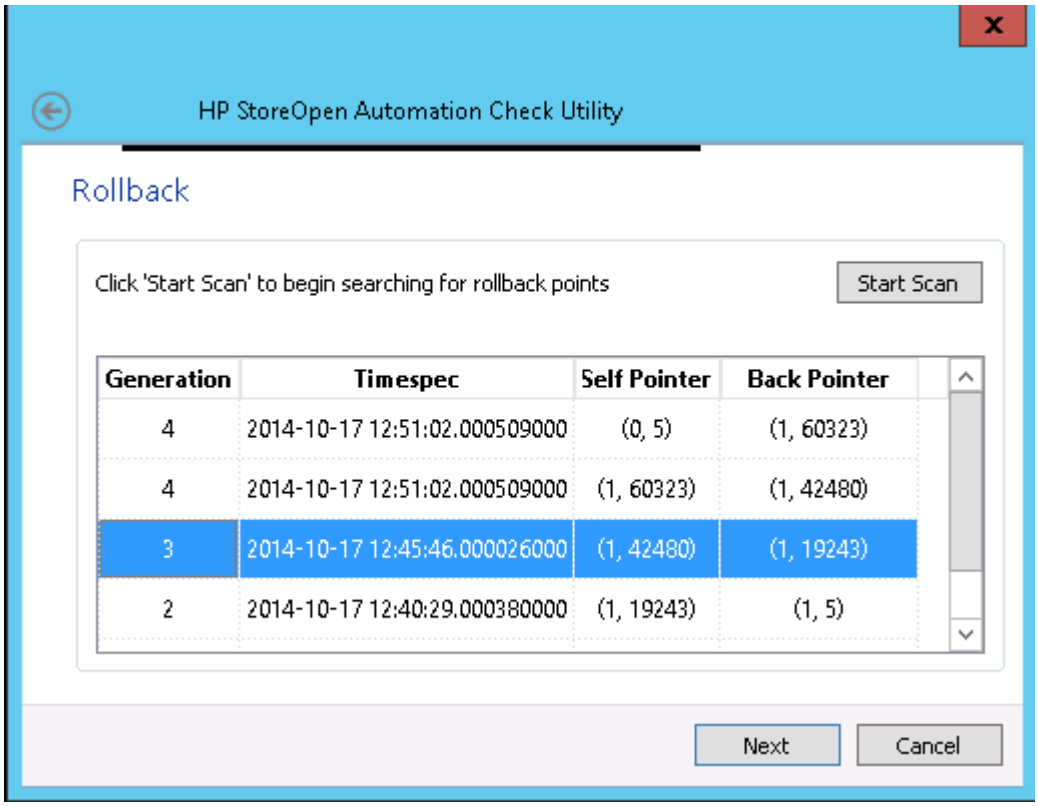
       NOTE: You need to identify and manipulate any recovered blocks manually, since there will be no identifying details (because they were not in any index).

   - **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 options:
     - 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 —In 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 operation.
     - 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 that data.



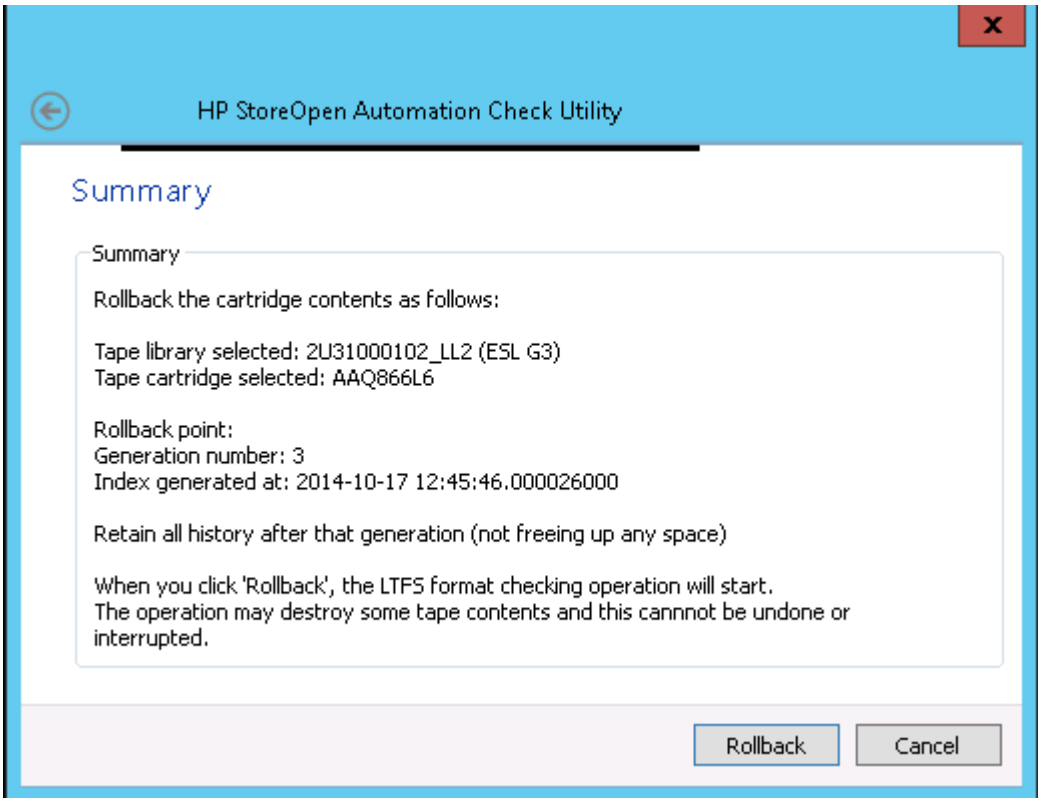
Click **Next**.

4. If you opted to **Rollback cartridge contents to previous state**, 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.



Select a rollback point and click **Next**.

5. In the next window a summary of the operation to be carried out is displayed.



Click **Rollback** or **Check**. The following operations will take place:

1. The check or rollback operation starts.
2. The Progress dialog is updated as the operation proceeds to completion.
3. When the operation is complete, you can close the window or choose to check another cartridge.

Using the SOA Unformat Utility

△ **CAUTION:** This operation will permanently remove all data present on the cartridge, so only use it if this is what you intend.

You do not normally need to use the Unformat Utility. 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 similar to the Format Utility, but is much simpler.

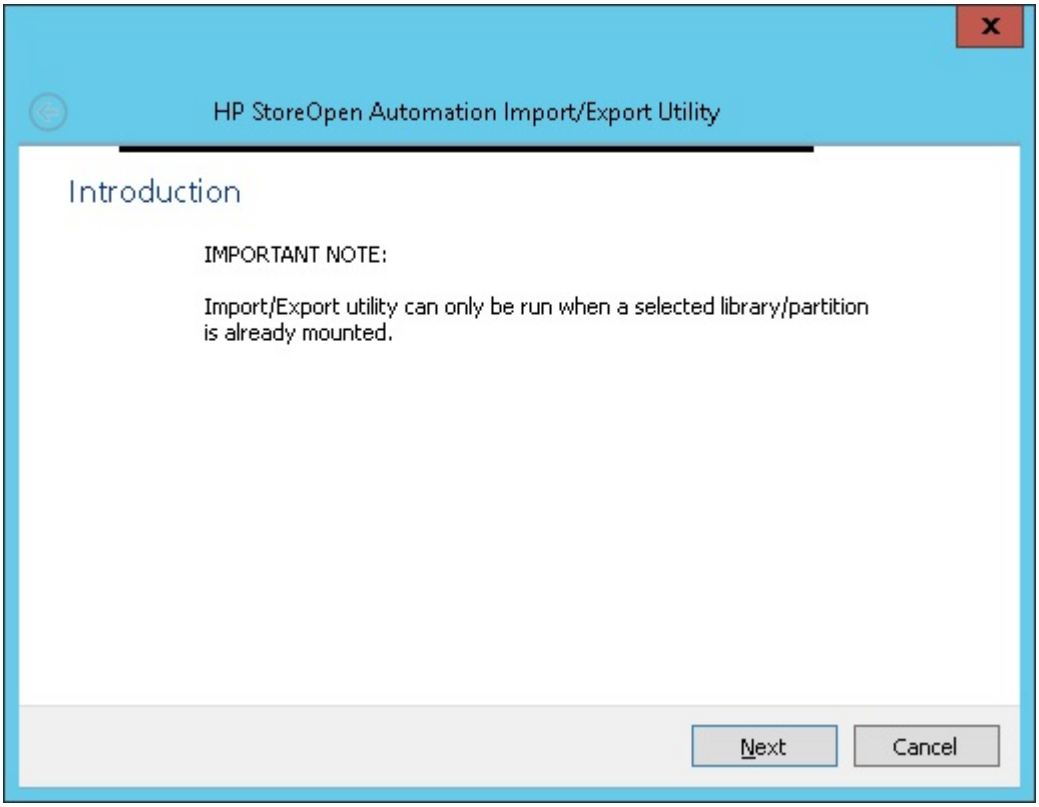
HP StoreOpen Automation Import/Export Utility

NOTE: This utility requires that the library already be mounted.

The Import Export Utility can be used to Import and export media from the library to the mail slots of the library. If there are mail slots configured in the library and there are empty mail slots available the utility will export selected tape to one of the mail slots. When a tape cartridge is exported, the index on the tape is updated and the tape is unmounted and then it will be exported to one of the empty mail slots.

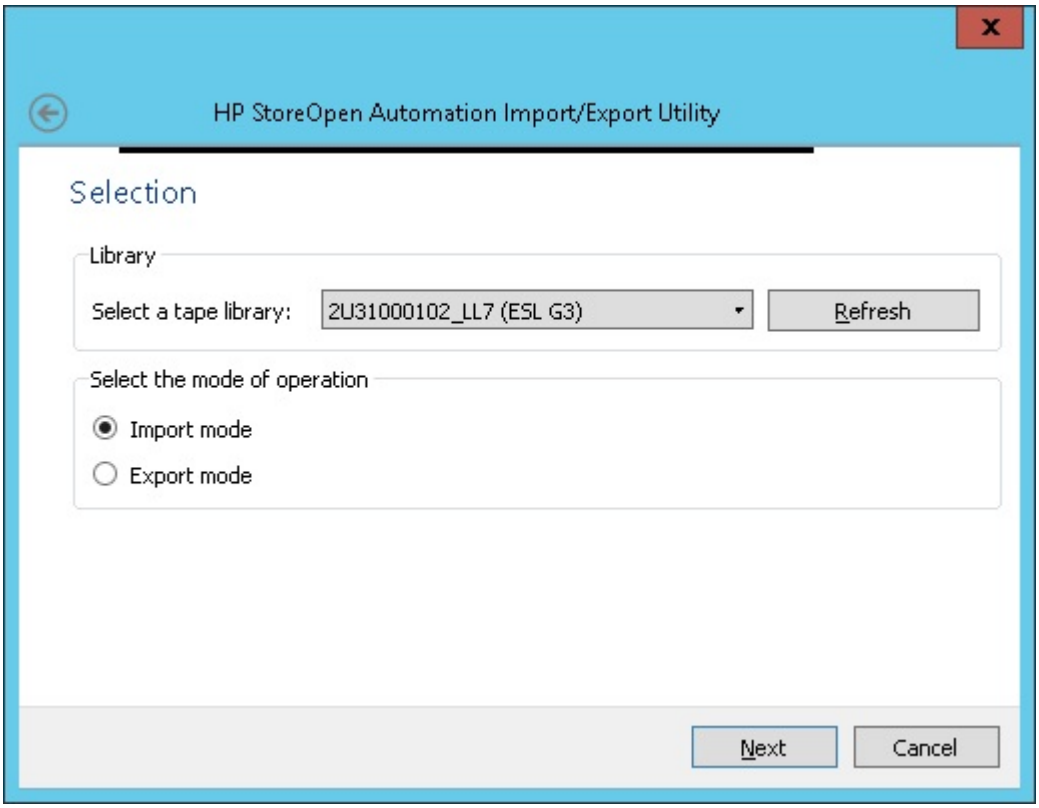
To use the HP StoreOpen Automation Import/Export Utility:

1. Launch the SOA Import Export Utility from the SOA Configurator window or from the Program Menu.
2. The initial screen provides information about the operation that has been started. Click **Next**.

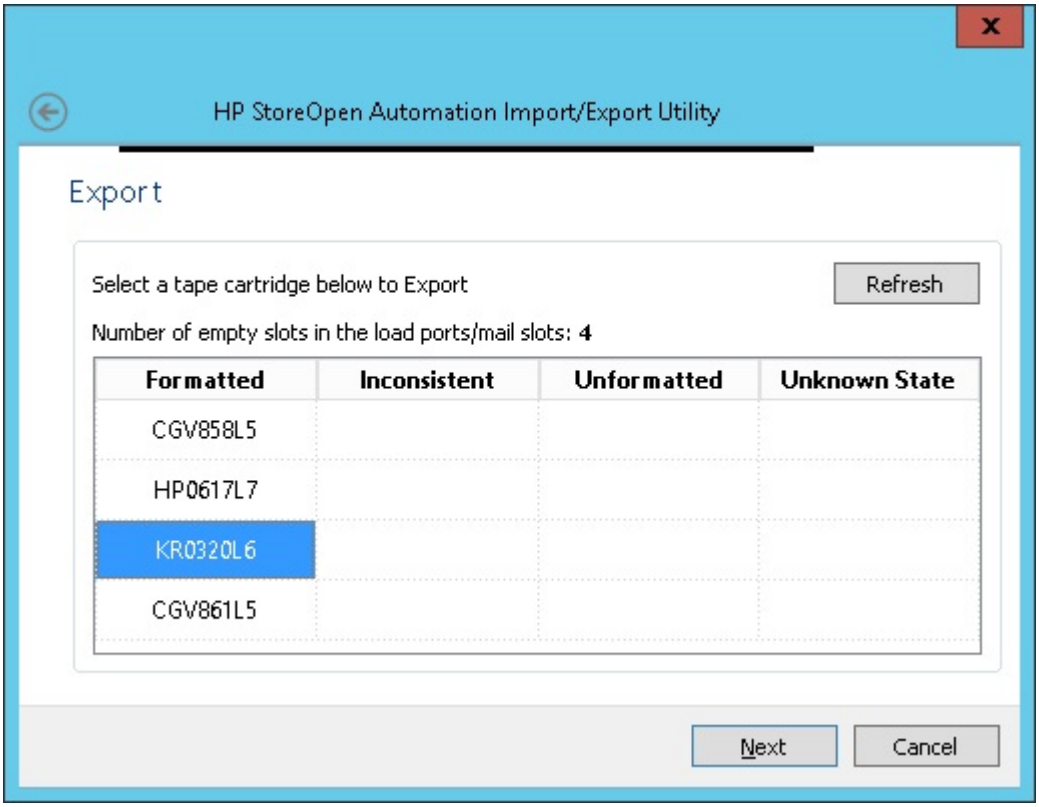


3. On the next screen, select a tape library and the mode of operation. Select the mode of operation, either to import a tape or to export a tape. Click **Next**.

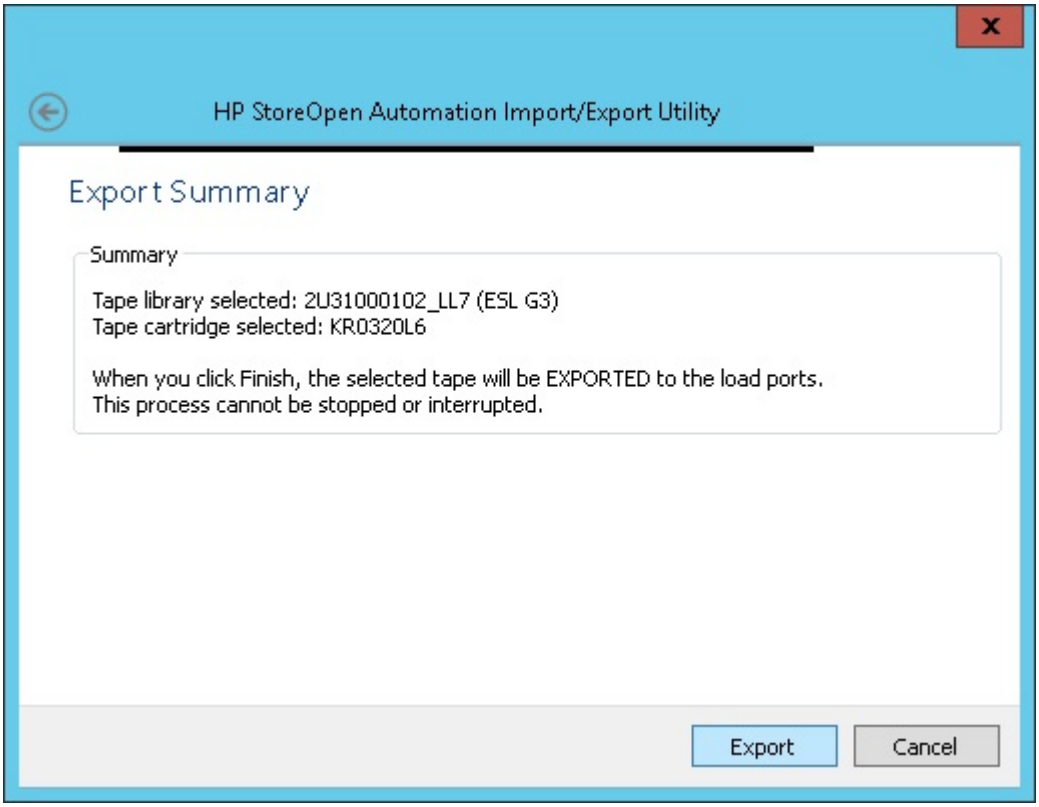
NOTE: If you do not see your desired tape library, click **Refresh** and browse through the list again.



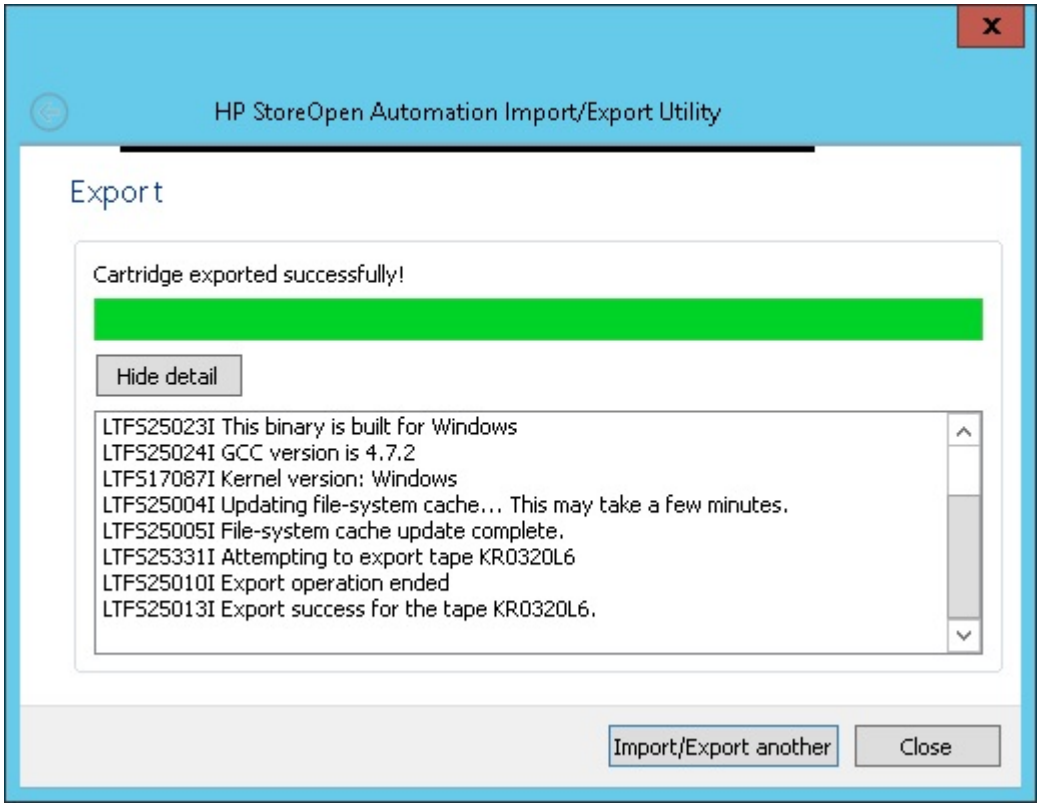
4. Select the tape cartridge you want to import or export. Only one tape cartridge can be imported or exported at a time.



5. The next screen summarizes the Import/Export operation that you have defined using the wizard. Click **Import/Export**.



6. When you click **Finish**, the following operations take place:
    1. If the cartridge is currently mounted, it is unmounted.
    2. The import/export operation starts and a **Progress** dialog box will show the progress and result of the operations.

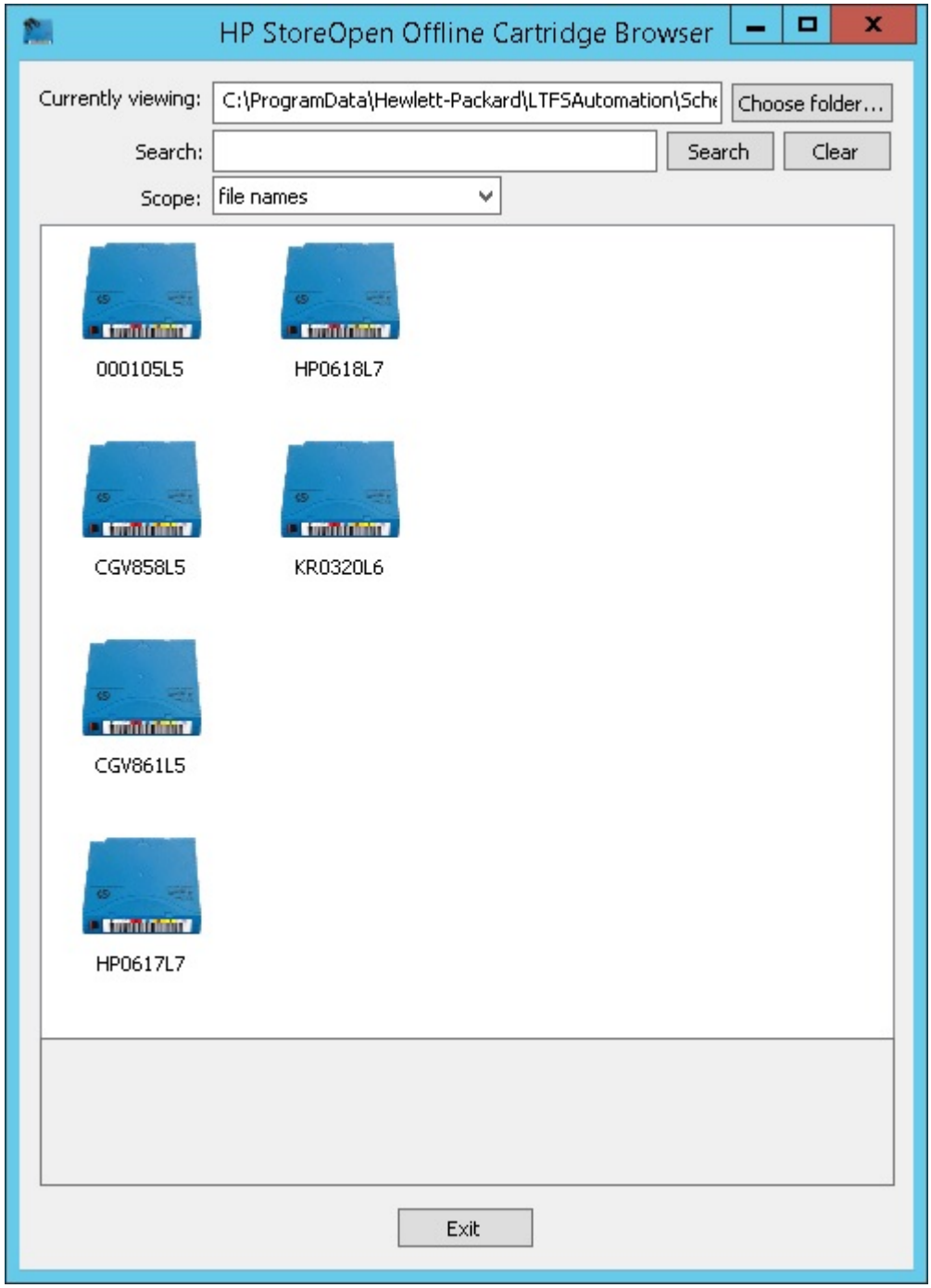


7. If you wish to perform another import or export operation, click **Import/Export another** and repeat this procedure. Otherwise, click **Close**.

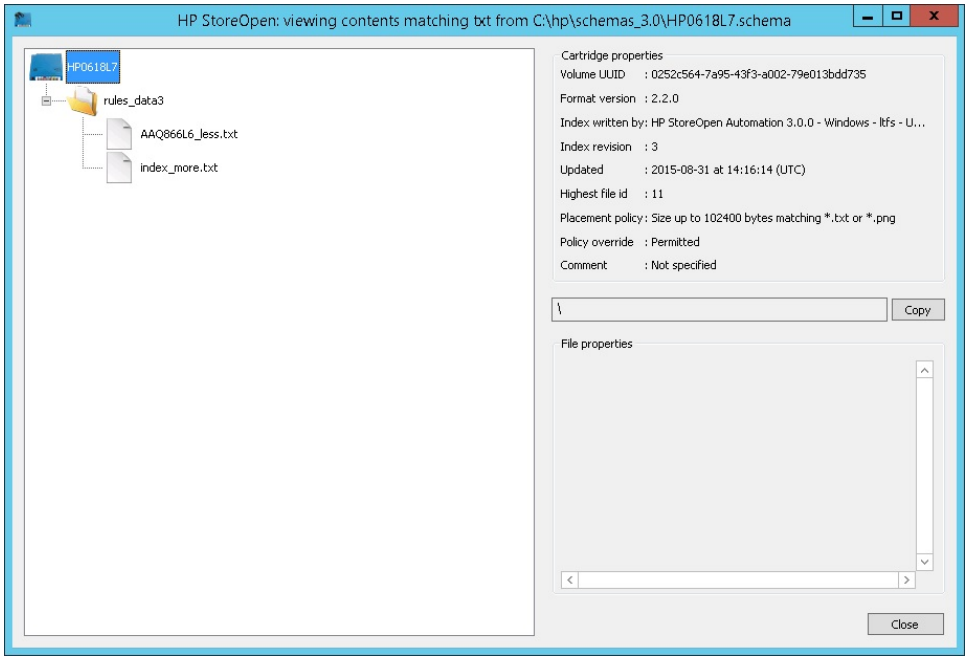
HP StoreOpen Offline Cartridge Browser

HP StoreOpen Automation includes a GUI utility (available only on Windows) 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 StoreOpen 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.



Users can select a folder where the index files are kept (in most setups this will be the directory path selected for the ‘index capture’ setting in the advanced options of the HP LTFS configuration GUI). 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.



User can also search for specific files and find out in which index that file is present. The search feature will be very useful if you have a lot of indexes and want to find out which tape has the particular file. The search box accepts regular expressions as described below.

```
c matches any literal character c
. matches any single character
^ matches the beginning of the input string
$ matches the end of the input string
* matches zero or more occurrences of any character
? Matches with any one character.
```

Using the ltfsxattr utility

HP Store Open Automation on Windows platforms includes the LTFSXATTR 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 `ltfsxattr` utility with no parameters gives the usage information.

Usage:

```
ltfsxattr -h
ltfsxattr -g -n attrname -p path
ltfsxattr -s -n attrname —V attrvalue -p path
ltfsxattr -r -n attrname -p path
ltfsxattr -l -p path
```

ltfsxattr options:

-h	Prints this usage information
-g	Reads and displays the value of attribute for the path specified
-s	Sets value to an attribute for the path specified
-r	Removed an attribute and the associated value
-l	Lists all custom attributes

NOTE: "Path" refers to the fully qualified absolute path of a file or a directory. This utility manipulates extended attributes in conjunction with HP StoreOpen Automation software and should only be used in that context with a mounted tape library.

You can also use the below Virtual Extended Attributes (VEA) for knowing the usage information for the individual cartridges:

- Shows the total capacity of the Data Partition: `ltfs.mediaDataPartitionTotalCapacity`
- Shows the total capacity of the Index Partition: `ltfs.mediaIndexPartitionTotalCapacity`
- Shows the free space in the Data Partition: `ltfs.mediaDataPartitionAvailableSpace`
- Shows the free space in the Index Partition: `ltfs.mediaIndexPartitionAvailableSpace`

Checking the status of the Library

HP SOA 3.0.0 and above versions support a Virtual Extended Attribute (VEA) to retrieve the status of the Library. The attribute *ltfs.vendor.HP.libraryStatus* holds a value that indicates the current status of the library which is mounted at the given mount point. This attribute is read-only.

This attribute returns one of the following strings indicating the current status of the library:

- Not mounted
- Mounting
- Mounted
- Unmounting
- Moving media

The **Not mounted** and **Unmounting** status are available only for a fraction of second. The **Mounting** status is displayed after initiating a mount and after the library identifies each media in the library. The **Moving media** status is displayed whenever the library moves media. The **Mounted** status is displayed when LTFS completes processing all tapes in the library and the file system is ready. The ltfs.vendor.HP.libraryStatus attribute has a 7 byte value for the **Mounted** path.

Example (Command line):

```
ltfsxattr -g –n ltfs.vendor.HP.libraryStatus –p E:\
```

Status of cartridges in the Library

HP SOA 2.0.0 onwards supports a Virtual Extended Attribute (VEA) to retrieve the status of cartridges in the library. The attribute is `ltfs.vendor.HP.cartridgeList`. When accessed this attribute, it returns a string containing details of all cartridges in the partition. The layout of the string will be as given below.

```
Barcode:State:Location[;Barcode:State:Location[;Barcode… ]]
```

Example (command line):

```
ltfsxattr -g –n ltfs.vendor.HP.cartridgeList –p E:\
Attribute "ltfs.vendor.HP.cartridgeList" had a 49 byte value for E:\
000370L5:N:D257;DG6347L5:F:D256;CGV952L5:N:S4097;
```

Where `State` is a single letter, one of: `F` (formatted), `C` (corrupt/inconsistent), `N` (not formatted for LTFS), `U` (unknown at this time); `Location` is one of: `Snnnn` (in storage slot nnnn), `Dnnn` (in drive nnn), or `Mnnn` (in mailslot nnn)

7 LTFS Smart Copy

HP StoreOpen Automation version 2.0.0 onwards includes the LTFS Smart Copy utility for Windows, Linux, and Mac OSX platforms and will be installed by default when you install HP StoreOpen Automation.

The LTFS Smart Copy tool provides the binary `ltfscopy` command that provides the below two 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 sequentially to the location of the file on the tape by winding the tape back and forth many times until it reads all the files that need 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 re-arranging 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 do file verification 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 a

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 listed below.

--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 as well as 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 HP StoreOpen Automation. The executable name is `ltfscopy.exe` and it will be available in the installation folder where you installed the HP StoreOpen Automation software. The default location is `C:\Program Files\Hewlett-Packard\HP StoreOpen Automation\`.

Command examples:

NOTE: These assume that `E:\` is where the tape library is mounted and CVG427L5 is the barcode of the cartridge where the files needs to be copied.

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

```
ltfscopy.exe –s E:\CVG427L5\ -d C:\Photos
```

To copy files and all subfolders and files recursively:

```
ltfscopy.exe –s E:\CVG427L5\ -d C:\Photos --recursive
```

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

```
ltfscopy.exe –s E:\CVG427L5\ -d C:\Photos --copy --verify --recursive
```

To verify previously copied data by comparing it with source:

```
ltfscopy.exe -s E:\CVG427L5\ -d C:\Photos --verify –-recursive
```

Running `ltfscopy` on Linux and Mac OS

The `ltfscopy` tool is installed by default when you install HP StoreOpen Automation. The executable name is `ltfscopy` and will be available at `/usr/local/bin` on Linux platforms.

Command examples:

NOTE: These assume that `/mnt/ltfs` is where the tape library is mounted and CVG427L5 is the barcode of the cartridge where the files are to be copied.

To copy the files from `/tmp/photo` to the cartridge:

```
ltfscopy –s /mnt/ltfs/CVG427L5 –d /tmp/photos
```

To copy files and all subfolders and files recursively:

```
ltfscopy –s /mnt/ltfs/CVG427L5 –d /tmp/photos --recursive
```

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

```
ltfscopy –s /mnt/ltfs/CVG427L5 –d /tmp/photos --copy –verify --recursive
```

To verify previously copied data by comparing it with source:

```
ltfscopy -s /mnt/ltfs/CVG427L5 –d /tmp/photos –verify –-recursive
```

8 Library maintenance and management tips

- **Drive maintenance:** The library should be unmounted before taking drives offline, or replacing them. Remount the library when the maintenance has completed.
- **Partition changes:** The library should be unmounted before modifying or removing a partition used by HP StoreOpen Automation. Any operation which causes the host machine to see a different number of slots or drives will require the library to be unmounted first, then re-mounted after maintenance is complete.
- **Power cycling:** Power cycling or resetting the library will require the library be re-mounted.

  NOTE: To reduce risk of data inconsistency or loss, always wait at least 5 minutes after unmounting the library device before power cycling or resetting the library.

- **Barcodes:** Media in the library must have barcode numbers, and the barcodes must be unique within that library or partition. To avoid risk of inconsistent or lost data, do not use two or more tapes with the same barcode.

  NOTE: If you have media without barcodes, please obtain and apply labels before using them with HP StoreOpen Automation. One way to do this is with the HP LTO-5 Ultrium RW Bar Code Label Pack (Q2011A), or HP LTO-6 Ultrium RW Bar Code Label Pack (Q2013A).

- **Exclusive media access:** To avoid risk of data inconsistency or loss, do not use the library's management interfaces or another application to unload a tape drive while the library device is mounted.
- **Media import/export (MSL):** To import/export media with the MSL library products while the library is mounted, use these steps:
  - Only export media from cartridge slots. Do not use the library’s management tools to unload a tape drive while the library is mounted as a file system. If the media to be exported is in a tape drive, first execute a file system operation with another tape, which will cause the media in the drive to be unloaded.
  - Using the MSL’s management software or front panel, unlock the cartridge slots.
  - Open the cartridge slots, and add new media (import), or remove media (export). Close the cartridge slots.
  - Wait a few minutes for the library to re-inventory the changes.
  - Using the command line, use `ls/dir` to show a directory of the library mount point. This operation will take several minutes, so be patient.
  - The `ls` command will now show any imported media that is LTFS-formatted. Also, any exported media will no longer be shown in the `ls` command output.
- **Media Import/Export (Enterprise libraries):** To import/export media from HP Enterprise libraries, use the library's import/export slots, and the `ltfsieutil` utility.
- **'mv' command between tapes:** HP StoreOpen Automation does not support moving files or directories across tape cartridges using the `mv` command. So commands such as the following will return an error, as unsupported.

  ```
  mv /mnt/hp_msl/KR1234L5/photos /mnt/hp_msl/KR5678L5/photos
  ```

To successfully move a file or directory across tapes, first copy the data from tape to tape, then manually delete the file or directory from the first cartridge.

- **MSL modes of operation:** MSL libraries must be placed in either the automatic or random mode. HP StoreOpen Automation will not work with libraries in sequential mode.

MAC OS X only

- Mac OS X's Spotlight will not display the files on HP StoreOpen Automation as a result of search.

9 Troubleshooting

General

If problems occur during HP StoreOpen Automation operation, entries may be made in the system log (e.g. `/var/log/messages` on RHEL systems). Check for entries made with the service name "`ltfs`".

Both `ltfs` and `mkltfs` have command line options to report further details of the operations undertaken, which may be of assistance when trying to troubleshoot problems.

If there is a problem with drive interaction, HP StoreOpen Automation will attempt to create a snapshot of the drive's internal state at the time of failure. A snapshot may also be taken at unmount time.

- **On Linux systems:** this will be stored in the system log directory (e.g. `/var/log/`) and will take the form `ltfs_datestamp_timestamp_driveSerialNum.ltd`.
- **On Mac OS X systems:** the snapshots are stored in the directory `~/Library/Logs/LTFS/`.
- **On Windows Systems:** The snapshots are stored in the directory `C:\ProgramData\Hewlett-Packard\LTFSAutomation\DriveDumps`. This directory will be created by the windows installer when installing HP Store Open Automation.

These files are not otherwise used by HP StoreOpen Automation and they may safely be removed from the system, if they are not needed for troubleshooting.

Note that logs may not be created, and warning messages issued, in either of the following cases:

- The `ltfs` process does not have write permissions for the log directory

  Resolution: Run `ltfs` as root, or use the *`log_directory`* option to specify a directory for which it does have the required permissions.

- The log directory does not exist

  Resolution: Create the log directory indicated, or use the *`log_directory`* option to specify a directory which already exists.

Linux shared object files

On some systems, trying to execute the `ltfs` command may result in an error message of the form `libltfs.so.0: cannot open shared object file: No such file or directory`.

To resolve this, it is necessary to tell the linker/loader how to locate the required dynamic library files. There are several ways of doing this:

- Add `/usr/local/lib/` to the environment variable `LD_LIBRARY_PATH`

  Or

- (As root) Add `/usr/local/lib/` to the file `/etc/ld.so.conf`, and then execute `/sbin/ldconfig`.

Refer to the man pages for `ld.so` and `ldconfig` for further details.

Library connection

HP StoreOpen Automation requires that the tape library be powered up and all components of the library be connected to the host computer. This can be verified using:

- **Linux:** `cat /proc/scsi/sg/device_strs`
- **Mac OS X:** Use the System Profiler tool (Applications -> Utilities) to check specific devices connected to your HBA.

If the tape library and tape drives are not shown then check cabling, power and so forth. HP StoreOpen Automation will not be able to operate until the library media changer device and all tape drives associated with that library or partition are detected.

10 Error codes

Table 6 LTFS error codes and descriptions

CODE	Error expansion	Description	Corrective action
14001E	Cannot enable FUSE option %s (%d)	The fuse options have not been added to the command structure `fuse_args`.	Check to ensure that the HP-SOA installation has completed successfully.
14002E	Cannot set up permissions	Permissions are not properly set based on the mount options and the current user information.	Check that the user running LTFS has permissions to make changes to the working directory.
14003E	`min_pool_size` (%d) cannot be greater than `max_pool_size` (%d)	The minimum writer cache pool size (cache objects are 1 MB each) is greater than the maximum cache pool size.	Check to ensure that the HP-SOA installation has completed successfully.
14004E	Cannot create work directory (%d)	The directory that stores temporary LTFS files creation failed.	Check that the user running LTFS has the necessary permissions.
14005E	Path ‘%s’ exists but is not a directory.	The directory is not found in the specific path.	Verify the contents of the `/tmp` directory.
14006E	Invalid umask '%s' (must be 3 octal digits, such as 022)	umask is not set properly.	Check the arguments provided to LTFS during mounting.
14007E	Invalid fmask '%s' (must be 3 octal digits, such as 022)	fmask is not set properly.	Check the arguments provided to LTFS during mounting.
14008E	Invalid dmask '%s' (must be 3 octal digits, such as 022)	dmask is not set properly.	Check the arguments provided to LTFS during mounting.
14009E	The backend '%s' does not have a default device. Specify one using the `-o devname=` option.	The device name option was not provided with the command.	Provide the device name while running LTFS using the `-o devname=` option.
14011E	Cannot allocate LTFS volume structure	Allocation of memory for LTFS volume structure (`ltfs_volume`) has failed.	Increase memory or reboot the host.
14012E	Tape backend option parsing failed	The device (drive) backend options are not parsed properly.	Check to ensure that the HP-SOA installation has completed successfully.
14013E	Cannot mount %s%s.	The volume has failed to mount.	Check the tape media for its health, inconsistency, if it is formatted with LTFS, and any other erroneous cases.
14016E	Cannot format data placement rules (%d)	The data placement rules have failed to format.	Check for WORM, bad tapes with no EOD, or tapes not supported by LTFS in the library. If any of these are present, remove them and retry operations.
14017E	Cannot parse data placement rules (%d)	The data placement rules have failed to parse.	Check for WORM, bad tapes with no EOD, or tapes not supported by LTFS in the library. If any of these are present, remove them and retry operations.
14018E	Cannot get read-only status of the medium	The read-only status of the medium cannot be retrieved.	Check the tape media.

Table 6 LTFS error codes and descriptions *(continued)*

CODE	Error expansion	Description	Corrective action
14022E	Cannot flush file data to the medium. Data might be lost (%s).	Data to the medium through ioscheduler failed to flush.	Reboot the host/library and if this failure is still happening, contact the OS vendor.
14023E	Cannot set extended attribute: position option must be zero	The extended attribute cannot be set.	Check for WORM, bad tapes with no EOD, or tapes not supported by LTFS in the library. If any of these are present, remove them and retry operations.
14024E	Cannot set extended attribute: position option must be zero	The extended attribute cannot be set.	Check for WORM, bad tapes with no EOD, or tapes not supported by LTFS in the library. If any of these are present, remove them and retry operations.
14027E	Cannot read directory: convert to system locale failed (%s, %d)	A path name in the system locale failed to convert to the canonical LTFS form IUTF-8, NFC)	Check for WORM, bad tapes with no EOD, or tapes not supported by LTFS in the library. If any of these are present, remove them and retry operations.
14054E	Failed to load tape drive plug-in (%d)	The driver plug-in failed to load.	Check to ensure that the HP-SOA installation has completed successfully.
14055E	Failed to load I/O scheduler plug-in	The ioscheduler plug-in has failed to load.	Check to ensure that the HP-SOA installation has completed successfully.
14056E	No driver plug-in configured and no default found	The library or the path to the library (for example, `ltotape`) cannot be retrieved from the configuration file.	Check to ensure that the HP-SOA installation has completed successfully.
14060E	Failed to convert the sync time (%s)	Sync time has not been converted in the proper format.	Provide the proper format for the sync time value.
14061E	Unknown type of sync (%s)	The specified sync type is unknown.	Check `ltfs --help`.
14062E	Cannot mount the library. Sync time must be a non-zero positive number.	The sync time provided is not a a non-zero positive number.	Specify a non zero positive sync time value when mounting the library/partition.
14065E	Unexpected sync type (%d)	The specified sync type is not valid.	Check `ltfs --help`.
14066E	Sync time should be a positive value	The specified sync time is negative.	Provide the proper value. Check `ltfs --help`.
14067E	Failed to convert the sync time because it is too big or too small	The specified sync time is out of range.	Check `ltfs --help`.
14068E	Specified sync time is too big or too small (%s)	The specified sync time is too big or too small.	Check `ltfs --help`.
14075E	Cannot set up tape drive	The device has failed to set up.	Make sure the drives are properly connected in the library.
14079E	Invalid uid \'%s\' (must be a positive integer or valid user name)	The user id provided is incorrect.	Check `ltfs --help`.

Table 6 LTFS error codes and descriptions *(continued)*

CODE	Error expansion	Description	Corrective action
14080E	Invalid uid \'%s\' (must be a positive integer or valid group name)	The group id provided is incorrect.	Check `ltfs --help`.
14093E	Unknown type of symbolic link (%s)	The symbolic link type created is not a live link or a posix link.	Only live link and posix links are supported. Make sure the links are one of these types.
14094E	Cannot get mount point (%d)	The mount point has been incorrectly provided (for example, the path is incorrect or points to a non-empty directory).	Provide the correct mount path.
14109E	Minimum pool size must be a positive number	A positive integer number was not provided while setting the minimum pool size.	Provide a positive integer number while setting pool size during mounting.
14110E	Maximum pool size must be a positive number	A positive integer number was not provided while setting the maximum pool size.	Provide a positive integer number while setting pool size during mounting.
14114E	Cannot initialize the open file table	The file table lock failed to initialize.	Reboot the host and try the operation again.
14164E	EOD missing, cannot mount the volume (%s)	An EOD for a particular tape is missing and therefore, that tape will not mount.	Try to run `ltfsck` deep-recovery and full-recovery for that tape.
14200E	Missing mountpoint parameter	The mount point was not provided in the command.	Check `ltfs --help`.
14201E	Mountpoint ‘%s’ specified but not accessible	The mount point provided in the command is not accessible.	Make sure the mount point is created with proper permissions.
14750E	Device (%s) already mounted, cannot proceed	The device has already been used for a StoreOpen Automation instance; the user is trying to mount another instances with the same device name	Make sure to unmount the device before proceeding with the new mount.
14751E	Mount path (%s) in use, cannot proceed	The mount path provided is in use by another application.	Make sure the mount path provided is empty and not used by any application, and proper permissions are set.
14752E	An instance of HP SOA is already running, cannot have second instance	An instance of HP SOA is already running and the user has attempted to run another instance of HP SOA	Unmount the first instance of SOA before mounting another instance of SOA.
14755E	Unclean instances of HP SOA are present, cannot proceed with mount	The previous SOA mount instance is present (for example, HP SOA crashed while mounted or was not unmounted properly)	Reboot the host/library and if this error continues to happen, contact the OS vendor.
14756E	Invalid mount point, cannot proceed with mount	The mount point provided is not present in the host system.	Provide the correct mount path.
14762E	%s thread creation failed = %d	The creation of the thread failed.	Reboot the host/ Increase the RAM and if it still happening contact the OS vendor.
14763E	%s lock creation failed = %d	The creation of the lock failed.	Reboot the host/ Increase the RAM and if it still happening contact the OS vendor.

Table 6 LTFS error codes and descriptions *(continued)*

CODE	Error expansion	Description	Corrective action
14764E	% condition variable creation failed = %d	The creation of the condition variable failed.	Reboot the host/ Increase the RAM and if it still happening contact the OS vendor.
14771E	Failed to remove file or directory	User has failed to remove a directory or file.	Check if the tape is read-only and check the file/directory permissions.
14775E	Tape drives are busy, try later	All the available tape drives are busy performing one operation (for example, parsing the tapes/copying some data) and another operation has been initiated by the user.	Wait for the operation to finish before initiating a new operation.

Table 7 `mkltfs` error codes and descriptions

CODE	Error expansion	Description	Corrective action
15001E	Cannot allocate LTFS volume structure	Allocation of memory for LTFS volume structure (`ltfs_volume`) has failed.	Increase memory/reboot the host.
15002E	Option validation failed	The options available with the mkltfs command have been incorrectly provided.	Check `mkltfs --help`.
15008E	Cannot open backend '%s'	The shared library for the driver in not available in the path `/usr/local/lib/ltfs/libdriver-lsotape.so`, or the path has not been properly provided.	Check to ensure that the HP-SOA installation has completed successfully.
15009E	Cannot open device \'%s\'(%d)	The device file failed to open.	Check the device file name presented in the command.
15012E	Failed to format the medium	The tape formatting has failed (partitions have not been created; labels and indices have not been written to the tape).	Insert the correct LTO5/LTO6 tape cartridge and make sure the library is configured properly with the current ltfs version.
15014E	Cannot set policy override flag in the index (%d)	The policy override flag used in the mount time has failed to set.	Set the proper options using command prompt (for no override, set `mkltfs - --no-override`).
15015E	Cannot parse data placement rules (%d)	The string containing the index rules failed to parse (these are the rules for files that should go to the index partition).	Set the proper options using the command prompt (`mkltfs --fules=<rules>`).
15026E	Device name must use the \'%s\' option	The library is not mounted but the device name has been provided.	Check `mkltfs --help`.
15028E	Block size must be at least %d	The minimum blocksize is less then 4096 bytes.	Format the tape using the `mkltfs` utility.
15029E	Tape serial must be 6 characters	The tape serial number is less than 6 characters.	Provide the serial number in the proper format.
15030E	Tape serial must contain only ASII digits and capital letters	The tape serial number does not consist of ASCII digits and capital numbers.	Provide the serial number in the proper format.

Table 7 `mkltfs` **error codes and descriptions** *(continued)*

CODE	Error expansion	Description	Corrective action
15031E	Volume name must conform to the file name rules	The human readable volume name has failed to convert to LTFS canonical form (UTF-8 NFC).	This is a system behavior and does not depend on the `ltfs` application.
15032E	Data placement rules contain invalid characters	The data placement rules contain characters that are not supported by the format utility.	Check `mkltfs --help`.
15036E	Cannot specify name rules with a zero file size	The `indexpartitioncriteria` element shall contain a single size element and zero or more name elements. The value of the size element defines the maximum size of files that may be stored on the Index Partition. Each name element shall specify a file name pattern. If these are not present, this error will be displayed.	Refer to `mkltfs --help`.
15038E	Failed to unformat the medium	The application has failed to unformat the medium.	Find out if the tape write protected latch is set.
15044E	Cannot set up the tape device	While formatting the tape, the device failed to set up.	Make sure the drives are properly connected in the library.
15045E	Formatting was canceled by the user	Formatting was cancelled by the user.	Once the formatting starts, the process cannot be stopped by user intervention so make sure before starting this operation that you are ready to format.
15046E	Unformatting was canceled by the user	Unformatting was canceled by the user.	Make sure not to cancel unformatting while in progress. Once the unformatting operation starts it cannot be interrupted or undone.
15047E	Medium is already formatted	The medium is already formatted and the user is attempting to format again.	Use `--force` option to format forcefully if required.
15054E	Unknown option '%s%s'	The error found is unknown.	Check to ensure that the HP-SOA installation has completed successfully.
15055E	Tape backend option parsing failed	The tape backend has failed parsing.	Check to ensure that the HP-SOA installation has completed successfully.
15061E	Failed to format the medium due to WORM error	The utility has failed to format a WORM cartridge.	HP StoreOpen products do not support WORM cartridges.
15062E	Failed to unformat the medium due to WORM error	The utility has failed to unformat a WORM cartridge.	HP StoreOpen products do not support WORM cartridges.
15490E	Tape already contains an LTFS volume. Need `-f` option to force reformat.	The tape that is being formatted already contains an LTFS volume.	Need `-f` option for force reformat.
15496E	Tape/drive error. Could not proceed with formatting the tape	There is an issue with the tape/drive during formatting.	Check for WORM, ,bad tapes with no EOD, or tapes not supported by LTFS in the library. If any of these are present then remove them and try to do the operations.

Table 7 `mkltfs` **error codes and descriptions** *(continued)*

CODE	Error expansion	Description	Corrective action
15497E	Re-initialization of tape failed	Initialization of the tape has failed.	Check for WORM, ,bad tapes with no EOD, or tapes not supported by LTFS in the library. If any of these are present then remove them and try to do the operations.
15498E	Requested tape is busy, try later.	The tape selected for an operation is already engaged in another operation.	Wait for the tape to become idle or move out to the slot.
15499E	Tape drives are busy, try later.	An operation has been requested and all tape drives are busy.	Wait for some of the drives to become idle.
15500E	Tape with given barcode does not exist	The barcode supplied is not present in the library.	Check the barcode name.
15501E	Could not allocate memory	Memory allocation has failed.	Reboot the system.
15502E	Could not move the cartridge	The cartridge failed to move.	Reboot the system/library.
15504E	Unformat unsuccessful, tape already unformatted	The tape is already unformatted with LTFS and another unformat has been attempted.	Provide `-y` option to format again.
15508E	Eject and write-enable the cartridge then try again	The cartridge is not write-enabled.	Check the cartridge used.
15509E	Unable to open device. Check the name and ensure it is not in use	The device has failed to open.	Reboot the system/library.
15510E	Operation failed. Volume may be in a confused state	An operation has failed.	Reboot the system/library/format the volume if required.
15511E	Operation cancelled	The operation was cancelled.	Repeat the operation.
15512E	Must provide a media barcode using the \'%s\' option	The barcode was not provided.	Provide the media barcode.
15517E	Supply the `--barcode/-s` with the option	The barcode was not supplied with the required options.	Provide the media barcode with the required options.
15529E	Cannot unformat: The medium is write-protected	The write protected latch is set on a medium to be unformatted or the library/partition to be unformatted is mounted read-only.	Remove the write protected latch if set, or try to unformat when the library/partition is not mounted.
15818E	HP-SOA instance information could not be obtained	The utility applications failed to attach to the shared memory between the ltfs process and the utils.	Reboot the machine and re-run the application.
15825E	HP-SOA supports only 8 character barcodes. Input a correct barcode.	The barcode supplied is not 8 characters in length.	Provide an 8 character barcode and make sure that it is available in the library/partition.
15907E	Cannot unformat: The library is mounted as read-only	The library is mounted as read-only and the unformat operation has been attempted for any of the cartridges present in the mounted library/partition.	**1.** Do not mount the library/partition as read-only if you wish to run the unformat operation on mounted library. Unmount and mount the library/partition again without specifying read-only, and then run the operation. **2.** Run the unformat operation when the library is not mounted.

Table 7 `mkltfs` error codes and descriptions *(continued)*

CODE	Error expansion	Description	Corrective action
15908E	Cannot format: The library is mounted as read-only	The library is mounted as read-only and a format operation has been attempted for any of the cartridges present in the mounted library/partition.	1. Do not mount the library/partition as read-only if you wish to run the format operation on mounted library. Unmount and mount the library/partition again without specifying read-only, and then run the operation. 2. Run the format operation when the library is not mounted.
15909E	Failed to format the cartridge. The contents are being assessed.	The format operation has been run on a cartridge volume which is currently being accessed.	Make sure not to access the cartridge volume (barcode directory of that particular cartridge) while running format operation in online mode.
15910E	Failed to unformat the cartridge. The contents are being assessed.	The unformat operation has been run on a cartridge volume which is currently being accessed.	Make sure not to access the cartridge volume (barcode directory of that particular cartridge) while running unformat operation in online mode.

Table 8 `ltfscap` error codes and descriptions

CODE	Error expansion	Description	Correction action
23005E	Must provide a device name using the '%s' option	The device file (changer) is not mentioned with the command for getting the capacity data of the cartridges.	Check `ltfs --help` and the user guide for more information.
23006E	Option validation failed	When the library is not mounted ,if the device file(changer) is not mentioned with the command for getting the capacity data of the cartridges, then this error message will be displayed.	Check `ltfs --help` and the user guide for more information.
23007E	Cannot allocate LTFS volume structure	Allocation of memory for LTFS volume structure (`ltfs_volume`) has failed.	Reboot the host and try again.
23008E	Cannot open backend '%s'	The shared library for the driver is not available in the path `/usr/local/lib/ltfs/libdriver-ltotape.so` or the path is not provided properly.	Check to ensure that the HP-SOA installation has completed successfully.
23022E	ltfs capacity utility failed	The ltfscap utility has failed.	Check to ensure that the HP-SOA installation has completed successfully.
23023E	No tape with given barcode is present	The tape barcode supplied is incorrect.	Provide the proper 8 digit barcode.
23024E	Must provide a media barcode using the \'%s\' option	The tape barcode was not supplied.	Provide the barcode.
23027E	Tape backend option parsing failed	The tape backend failed to parse.	Check to ensure that the HP-SOA installation has completed successfully.

Table 8 `ltfscap` error codes and descriptions *(continued)*

CODE	Error expansion	Description	Correction action
23030E	Unknown option '%s%s'	An unknown error was found.	Check to ensure that the HP-SOA installation has completed successfully.
23035E	Tape cartridge is not formatted, capacity not available	The capacity requested for an unformatted tape is not available.	Format the tape.
23036E	Tape cartridge is not consistent, capacity not available	The capacity requested for an inconsistent tape is not available.	Run ltfsck to make the tape consistent and then request the capacity.
23037E	Tape cartridge is either inconsistent or not formatted, capacity not available	The capacity requested for an unformatted or inconsistent tape is not available.	Format the tape if it is unformatted, or if the tape is inconsistent, run ltfsck to get the capacity.
23330E	HP-SOA supports only 8 character barcodes. Please input a correct barcode.	The barcode supplied while requesting capacity is not an 8 character barcode.	Supply an 8–character barcode.

Table 9 `ltfsck` error codes and descriptions

CODE	Error expansion	Description	Corrective action
16001E	Cannot allocate LTFS volume structure	Allocation of memory for LTFS volume structure (`ltfs_volume`) has failed.	Increase memory/reboot the host.
16002E	Option validation failed	The proper options were not provided with the `ltfsck` command.	Provide the proper options with the `ltfsck` command. Run `ltfsck --help` for more information.
16003E	Must provide criteria using `-g`	The `[-g --generation=<generation>]` criteria was not provided at the command line at the same time for rollback.	Provide values for `-g /--generation` from the command line at the same time. Run `ltfsck --help` for more information.
16004E	Unexpected condition. `str_gen` is not specified.	The `[-g --generation=<generation>]` criteria was not provided at the command line for rollback.	Provide values for `-g /--generation` from the command line. Run `ltfsck --help` for more information.
16005E	Invalid generation number %s	The `[-g --generation=<generation>]` criteria was not provided at the command line for rollback.	Provide values for `-g /--generation` from the command line. Run `ltfsck --help` for more information.
16009E	Must provide device name	`/dev/changer` was not provided with the command.	Provide `/dev/changer` with the command. Run `ltfsck --help` for more information.
16010E	Cannot load backend '%s' (%d)	The shared library for the driver is not available in the path `/usr/local/lib/ltfs/libdriver-ltotape.so` or the path is not provided properly.	Check to ensure that the HP-SOA installation has completed successfully.
16011E	Cannot open device \'%s\'	The device file failed to open.	Check the device file name sent in the command.
16016E	Invalid search mode	The search mode associated with `-g /--generation` is incorrect.	Provide proper values for the search modes. Run `ltfsck --help` for more information.

Table 9 `ltfsck` error codes and descriptions *(continued)*

CODE	Error expansion	Description	Corrective action
16019E	Invalid operation mode	The operation mode is incorrect.	Provide proper options -g, -t, -r, -n, and -l with the command. Run `ltfsck --help` for more information.
16021E	Volume is inconsistent and was not corrected	The tape media is not consistent.	Try runing ltfsck with the `--deep-recovery` optin. If this error still appears, try listing the indices and rolling back to a previous index/generation number. Contact HP Customer Support if this does not resolve the issue.
16051E	Cannot erase history: Failed to space forward one file mark (%d)	History failed to erase by moving one file mark forward.	Use `ltfsck --help` to obtain the proper options to use when removing index data in a consistent tape partition.
16053E	Cannot erase history: Failed to space back one file mark (%d)	History failed to erase by moving one file mark backward.	Use `ltfsck --help` to obtain the proper options to use when removing index data in a consistent tape partition.
16054E	Cannot erase history: Failed to write a file mark (%d)	File marks failed to write in the tape.	Make sure the tape is formatting properly and the tape index data is consistent.
16055E	Cannot roll back the data partition: Failed to erase history (%d)	An attempt to erase history in the tape in order to roll back to some specific point has failed.	Use `ltfsck --help` to obtain the proper options for getting back to a particular rollback point. Also check to make sure that the tape is consistent.
16056E	Cannot roll back the data partition: Failed to write an index (%d)	An index file failed to write in the data partition.	Make sure the tape is properly formatted with LTFS and that data is consistent.
16057E	Cannot roll back: Medium is read-only	During rollback the tape was found to be read-only.	Check if the tape is write-protected and if the tape is full.
16059E	Cannot roll back the index partition: Failed to erase history	An attempt to erase history in the tape in order to roll back to some specific point has failed.	Use `ltfsck --help` to obtain the proper options for getting back to a particular rollback point. Also check to make sure that the tape is consistent.
16060E	Cannot roll back the index partition: Failed to write an index (%d)	An index file failed to write in the data partition.	Make sure the tape is properly formatted with LTFS and that data is consistent.
16061E	Cannot roll back: Invalid partition ID %c	The partition ID is wrong for a particular index partition while attempting rollback.	Use `ltfsck` to make the index data consistent.
16068E	Cannot roll back: Found 2 or more target indexes in one partition %d	Two target indexes were found in the same partition instead getting in ip and dp.	Run `ltfsck` to fix the inconsistency.
16070E	Cannot roll back: Failed to load the volume (%d)	The tape failed to load in the drive.	Run `ltfsck` to fix the inconsistency.
16071E	Cannot roll back: Failed to traverse the index partition	The index file from the index partition could not be read.	Run `ltfsck` to fix the inconsistency.
16072E	Cannot roll back: Failed to traverse the data partition	The index file from the data partition could not be read.	Run `ltfsck` to fix the inconsistency.

Table 9 `ltfsck` **error codes and descriptions** *(continued)*

CODE	Error expansion	Description	Corrective action
16073E	Cannot roll back: Failed to find indexes	No indexes were found in the index or the data partition.	Run `ltfsck` to fix the inconsistency.
16074E	Cannot list rollback points: Failed to load the volume (%d)	The tape failed to load in the drive while listing the rollback points.	Run `ltfsck` to fix the inconsistency.
16075E	Cannot list rollback points: Failed to traverse the index partition (%d)	While listing the rollback points, the index file from the index partition could not be read.	Run `ltfsck` to fix the inconsistency.
16076E	Cannot list rollback points: Failed to traverse the data partition (%d)	While listing the rollback points, the index file from the data partition could not be read.	Run `ltfsck` to fix the inconsistency.
16079E	Cannot roll back: Failed to save index partition append position (%d)	The index data block position in the device data structure failed to save.	Run `ltfsck` to fix the inconsistency.
16080E	Cannot check volume (%d)	The tape failed to load while checking tape volume data.	Run `ltfsck` to fix the inconsistency.
16085E	Unexpected traverse strategy	The traverse strategy specified was not TRAVERSE_FORWARD or TRAVERSE_BACKWARD.	Specify correct traverse strategy.
16087E	Volume is inconsistent. Try to recover consistency with ltfsck first.	The volume was found to be inconsistent during rollback.	Run `ltfsck` to fix the inconsistency.
16091E	Cannot recover missing EOD (%d)	The EOD information from the Medium Auxiliary Memory (MAM) could not be found.	Run `ltfsck` to fix the inconsistency.
16092E	Cannot set up tape drive (%d)	Using the command `ltfsck` failed to set up the device for any particular tape volume.	Make sure the drives are properly connected in the library.
16093E	Cannot recover the cartridge with ltfsck	While reading LTFS data structures from a tape, and checking for consistency (and restoring it), EOD information was not found on either partition and was also not found from the MAM.	Try `ltfs /mnt/mount_point -o force_mount_no_eod` to skip the EOD existence check when mounting (read-only mount). Only use this option for a cartridge with corrupted Cartridge Memory(CM).
16094E	CM in the cartridge might be corrupted.	While reading LTFS data structures from a tape, and checking for consistency (and restoring it), EOD information was not found on either partition and was also not found from the MAM.	Try `ltfs /mnt/mount_point -o force_mount_no_eod` to skip the EOD existence check when mounting (read-only mount). Only use this option for a cartridge with corrupted Cartridge Memory(CM).
16097E	Both EODs are missing. Rollback operation not permitted.	EOD information was not found from either partition while doing rollback.	Make sure the tape is well formatted and is consistent.
16098E	Cannot roll back the cartridge: Found unsupported index version	The index search by generation or by time failed.	Run `ltfsck` to fix the inconsistency.
16099E	Use the latest version of LTFS software	The index search by generation failed.	Make sure the tape is well formatted with the latest LTFS software, and is consistent.
16100E	Cannot recover the cartridge: Found unsupported index version	An unsupported index version was found while reading LTFS data structures from a tape,	Make sure the tape is well formatted and is consistent.

Table 9 `ltfsck` error codes and descriptions *(continued)*

CODE	Error expansion	Description	Corrective action
		checking it for consistency, and restoring it.	
16101E	Use the latest version OS LTFS software or `--deep-recovery` option	An unsupported index version was found while reading LTFS data structures from a tape, checking it for consistency, and restoring it.	Make sure the tape is well formatted and is consistent and use the `--deep-recovery` option to get the index from MAM.
16106E	Tape backend parsing failed	The tape backend failed to parse.	Check to ensure that the HP-SOA installation has completed successfully.
16107E	Unknown option '%s%s'	An unknown error was found.	Check to ensure that the HP-SOA installation has completed successfully.
16425E	Tape/drive error: Could not proceed with checking/repairing the tape	While formatting, there is a problem with the tape/drive.	Check for WORM, bad tapes with no EOD, or tapes not supported by ltfs in the library. If any of these are present, remove them, and then retry the operation.
16426E	Re-initialization of tape failed	Initialization of tape failed.	Check for WORM, bad tapes with no EOD, or tapes not supported by ltfs in the library. If any of these are present, remove them, and then retry the operation.
16427E	Requested tape is busy. Try later.	The tape selected for the operation is busy in another drive.	Wait for the tape to become idle or move out to the slot.
16428E	Tape drives are busy. Try later.	An operation was requested when all drives are already busy.	Wait for some of the drives to be idle.
16429E	Tape with given barcode does not exist	The barcode supplied is not present in the library.	Check the barcode name.
16430E	Could not allocate memory	Memory allocation failed.	Reboot the system.
16431E	Could not move cartridge	Cartridge could not be moved.	Reboot the system/library.
16432E	Could not process barcode	The barcode failed to process.	Check the barcode.
16434E	Could not lock the device	The device failed to lock.	Reboot the host/library, and if this error continues, contact the OS vendor.
16435E	Could not unlock the device	The device could not be unlocked.	Reboot the host/library, and if this error continues, contact the OS vendor.
16436E	Must provide a media barcode using the \'%s\' option	The media barcode was not provided.	Provide the media barcode.
16440E	Non LTFS formatted tape, cannot proceed with ltfsck	The check utility was run on a tape that is not ltfs formatted.	Format the tape and run the check utility.
16445E	Cannot run ltfsck: The medium is write-protected	The write-protected latch is set or the library is mounted as read-only.	Make sure the write-protected latch is not set, and check that the library is not mounted as read-only.
16738E	HP SOA instance mounting on %s. Try again later	The user attempted to run the utility while mounting is in progress.	Wait until the media caching finishes.

Table 9 `ltfsck` error codes and descriptions *(continued)*

CODE	Error expansion	Description	Corrective action
16739E	HP SOA instance information could not be obtained.	The utility applications failed to attach to the shared memory between the ltfs process and the utilities.	Reboot the machine and re-run the application.
16746E	HP SOA supports only 8 character barcodes	The barcode supplied is not 8 characters in length.	Provide an 8 character barcode and make sure that it is available in the library/partition.
16747E	Unable to get tape format information. Cannot proceed running ltfsck on the tape.	The check utility was run on an unformatted tape.	Format the tape and run the check utility.
16748E	Cannot run ltfsck: The library is mounted as read-only	The library is mounted as read-only and ltfsck was run on any of the cartridges present in the mounted library/partition.	1. Do not mount the library/partition as read-only if you wish to run ltfcsk on mounted library. Unmount and mount the library/partition again without specifying read-only and run ltfsck. 2. Run ltfsck when the library is not mounted.
16749E	Failed to check cartridge: Its contents are being accessed	ltfsck has been run on a cartridge volume which is currently being accessed.	Make sure not to access the cartridge volume (barcode directory of that particular cartridge) while running ltfsck in online mode.
16750E	Failed to check the medium due to WORM error	A WORM cartridge was inserted in the library/partition and ltfsck was run on this cartridge.	HP-SOA products do not support WORM cartridges.

Table 10 `ltfsieutil` error codes and descriptions

CODE	Error expansion	Description	Corrective action
25001E	Unable to receive data from ltfs service	The socket server failed to receive data from the ltfs service.	Reboot the host. If this error continues to happen, contact the OS vendor.
25002E	Unable to update the file-system cache. Fatal error. Utility will exit.	The file system cache failed to update.	Check for WORM, bad tapes with no EOD, or tapes not supported by ltfs in the library. If any of these are present, remove them, and then retry the operation.
25014E	Export failed for the tape %s	The export operation failed.	The loadports are full.
25015E	Invalid input. Try again.	Input is invalid.	Check input and provide proper input.
25018E	The tape is in use for an operation	ltfsieutil was issued while the tape is in use for another operation.	Wait for the tape cartridge for finish the operation in progress.
25322E	Must provide a device name using the \'%s\' option	The device name was not provided with the command.	Provide the device name with the command.
25323E	HP SOA instance not mounted on %s	The device name with the command was incorrectly specified.	Provide the correct device name with the command.
25324E	HP SOA instance mounting on %s. Try again later.	A command was run while mounting was in progress.	Run the command after the media caching finishes.

Table 10 `ltfsieutil` **error codes and descriptions** *(continued)*

CODE	Error expansion	Description	Corrective action
25325E	HP SOA instance information could not be obtained	The utility applications failed to attach to the shared memory between the ltfs process and the utilities.	Reboot the machine and re-run the application.
25332E	Invalid mode value provided.	A mode value other than 1 or 2 has been provided.	Provide proper mode value. For import, provide 1, for export, provide 2.
25333E	Only tape barcode provided.	Mode value was not provided with the barcode specified for the operation.	Provide the mode value along with the barcode.
25335E	Memory allocation failed	Memory allocation failed for the cartridge volume to be imported.	Check the cartridge that is being imported. Increase memory/reboot the host.
25336E	Only LTO5 drives are configured in the library/partition. LTO6 cartridges cannot be imported.	Only LTO5 drives are configured in the library/partition and an attempt to import and LTO6 drive was made.	Configure LTO6 drive in the library/partition to import the LTO6 tapes from the loadports/mailslots.
25337E	Tape drives are busy. Try again later.	A cartridge import was attempted while all suitable tape drives configured in the library/partition are busy.	Wait for any of the suitable tape drives to finish its current operation and then try to import.
25338E	Tape drives are not ready. Try again later.	A cartridge import was attempted while all suitable tape drives configured in the library/partition are not ready.	Wait for any of the suitable tape drives to be ready and then try to import.
25339E	Cartridge movement failed. Check the cartridge selected for importing.	The cartridge being imported failed to move in a suitable drive.	**1.** Check that the cartridge which is being imported is supported. **2.** Check the drive that failed to move the cartridge in. **3.** Check the library/partition.
25340E	Failed to set up the tape drive	The suitable tape drive selected for the import operation has failed to set itself up.	**1.** Wait for few minutes and try to do the operation again. **2.** Check the selected tape drive for the operation in the library/partition.
25346E	Failed to export the cartridge	An export operation was run on a cartridge volume that is currently being accessed.	Make sure not to access the cartridge volume (barcode directory of that particular cartridge) while running an export operation.

Table 11 Driver LTOTAPE error codes and descriptions

CODE	Error expansion	Description	Corrective action
20014E	Drive requires firmware update to enable LTFS (current=%s)	The drive requires a firmware update.	Upgrade the firmware.
20019E	Internal program error: Size %d too large in (%s)	The modepage buffer size is greater than 16 bits.	Keep the modepage buffer size less than or equal to 16 bits.
20023E	Backend SCSI subsystem error from %s (0x%0X)	There is a SCSI driver error.	Check the device driver installed.
20027E	Failed to find specific device instance %d	Failure to find a specific device instance.	Check the device id/file provided to ltfs while mounting.

Table 11 Driver LTOTAPE error codes and descriptions *(continued)*

CODE	Error expansion	Description	Corrective action
20029E	Failed to create device interface. Device may be busy.	Failure to create device interface.	Check to see if the device is in use by another instance of ltfs or any other application.
20030E	Failed to get exclusive access. Device may be busy.	Failure to get exclusive access to the device.	Check to see if the device is in use by another instance of ltfs or any other application.
20032E	Error remapping st device %s to sg : %s	Failure to map st device to sg device.	Check the device id/file provided to ltfs while mounting.
20033E	Unable to find matching sg device for %s	Failure to find the matching sg device.	Check the device id/file provided to ltfs while mounting.
20035E	Unable to lock device (%s)	Failure to lock the device.	Check to see if the device is in use by another instance of ltfs or any other application.
20036E	Parsing log page: Buffer too small, copying %zu bytes from %lx	Failure to parse the log page.	Run `ltfsck` on the tape.
20037E	Option parsing for the ltotape backend failed (%d)	Failure to parse the ltotape backend options.	Check to ensure that the HP-SOA installation has completed successfully.
20040E	EBUSY in %s	Failure to read a record from the tape because the tape is busy.	Wait for the tape/drive to be free.
20041E	EFAULT in %s	Failure to read a record from the tape because the tape is faulty.	Check the media/tape.
20042E	EIO in %s	Failure to read a record from the tape because of an I/O error.	Reboot the host/library.
20043E	ENOMEM in %s	Failure to read a record from the tape because there is no virtual memory available in the machine.	Reboot the host or add more memory to the host.
20044E	ENXIO in %s	Failure to read a record from the tape because there is no tape available in the machine.	Reboot the host/library.
20045E	EPERM in %s	Failure to read a record from the tape because the process operation is not permitted.	Reboot the host/library.
20046E	ETIMEDOUT in %s	Failure to read a record from the tape because of a time out.	Wait for the tape/drive to be free.
20047E	EINVAL in %s	Failure to read a record from the tape because the arguments passed are not correct.	Check the arguments provided to ltfs.
20049E	EACCES in %s	Failure to read a record from the tape because the file operation is not permitted.	Reboot the host/library.
20051E	ENOSYS in %s	System call failure.	Reboot the host/library.
20052E	EROFS in %s	System call failure.	Reboot the host/library.
20053E	ENOMEDIUM in %s	System call failure.	Reboot the host/library.
20054E	Unknown error in %s (%d)	Failure to read a record from the tape because of an unknown error.	Reboot the host/library.

Table 11 Driver LTOTAPE error codes and descriptions *(continued)*

CODE	Error expansion	Description	Corrective action
20055E	EAGAIN in %s	Failure to read a record from the tape because there is no data available (socket read failed because of data unavailability).	Wait for the tape/drive to be free.
20062E	Unsupported cartridge type (%s)	Cartridge type is not supported.	Insert supported LTO tape in the library.
20064E	Locate failed (%d)	Locating a particular position of a tape failed.	Make sure the tape is formatted.
20065E	Space: Unrecognized type (%d)	The space type in a type is unrecognizable.	Make sure the tape is formatted.
20066E	Cannot read position (%d)	Failure to read the position from the tape.	Make sure the tape is formatted.
20067E	Invalid format mode (%d)	The number of partitions for a tape is more than two.	Make sure the tape is formatted.
20068E	Format operation failed (%d)	Format operation of the tape failed.	Check for WORM, bad tapes with no EOD, or tapes not supported by ltfs in the library. If any of these are present, remove them, and then retry the operation.
20069E	Cannot get remaining capacity: Get log page 0x%02x failed	Failure to get the remaining capacity data for the tape.	Run `ltfsck` on the tape.
20070E	Cannot get remaining capacity: Failed to parse the log page	Failure to parse the log page of the remaining capacity data.	Run `ltfsck` on the tape.
20071E	Cannot get remaining capacity: Capacity loop index error (%d)	A loop index error occurred while filling the index capacity data.	Run `ltfsck` on the tape.
20072E	Failed to read mode data (%d)	Failure to get the mode data from the tape using a SCSI command.	Reboot the library.
20073E	Failed to set mode data (%d)	Failure to set the mode data in the tape using a SCSI command.	Reboot the library.
20074E	Failed to read attribute 0x%X (%d)	Failure to read attribute from the tape.	Run `ltfsck` on the tape.
20075E	Failed to write attribute (%d)	Failure to write attributes on the tape.	Run `ltfsck` on the tape.
20083E	Cannot open device: Inquiry failed	Device enquiry has failed.	Check the device id/file.
20085E	Unsupported drive ‘%s’	Drive found is not an LTO5/LTO6 drive.	LTO5/LTO6 drives should be connected to this library.
20086E	%s Medium is already mounted or in use	Attempt to access the medium while the medium is already mounted or in use.	Check the device id/file.
20087E	Cannot open device ‘%s’ (%d)	Failure to open the device file.	Check the device id/file.
20093E	Unable to delete file ‘%s’ - %s	Failure to delete drive log snapshot old files.	Make sure the tape is formatted.
20106E	HP SOA supports only HP libraries	The number of drive counts is greater than 2 or 0, or the number of slot counts are greater than 24.	The library should be properly configured with 24 slots and 2 drives.

Table 11 Driver LTOTAPE error codes and descriptions *(continued)*

CODE	Error expansion	Description	Corrective action
20110E	HP SOA will support as many tapes as there are slots	The number of tapes inserted in the library is more than the number of slots in the library.	Do not insert more tapes than the number of slots.
20114E	The library does not have LTO5 or LTO6 drives in the configuration. This library configuration is not supported by HP SOA.	An attempt has been made to mount a library/partition that does not contain LTO5 or LTO6 drives.	The library/partition needs at least one LTO5 or LTO6 drive in the configuration.

Table 12 IOSCHED error codes and descriptions

CODE	Error expansion	Corrective action
13005E	Cannot initialize scheduler: Failed to initialize cache manager.	Check if the wrong path is was given for the iosched implementation. If it is correct, Check to ensure that the HP-SOA installation has completed successfully.
13006E	Cannot initialize scheduler: Failed to initialize mutex %s (%d)	Reboot the host.
13007E	Cannot initialize scheduler: Failed to initialize condition variable %s (%d)	Reboot the host.
13008E	Cannot initialize scheduler: Failed to create thread %s (%d)	Reboot the host.
13009E	Failed to initialize mutex in scheduler private data (%d)	Reboot the host.
13010E	Cannot write: Failed to allocate scheduler private data (%d)	Reboot the host.
13011E	Invalid back pointer to the dentry in the dentry_priv structure	Restart the operation again.
13012E	Invalid request_state received when updating the queue membership (%d)	Restart the operation again.
13017E	Cannot write: Failed to allocate a cache block (%d)	Reboot the host.
13018E	Cannot write: Failed to allocate a write request	Reboot the host.
13019E	Cannot flush: Failed to write to data partition (%d)	Check if the tape is write-protected or read-only.
13020E	Aborting full flush: Flushing dentry ‘%s’ failed (%d)	Check if the tape is write-protected or read-only.

Table 13 LIB LTFS error codes and descriptions

CODE	Error expansion	Description
9001E	Failed to parse command line options	Provide proper command line options with the ltfs command. Check `ltfs –a`.
9002E	Cannot specify `-o quiet` with `-o trace` or `-o fulltrace`	Specify proper command line options with the ltfs command. Check `ltfs –a`.
9006E	Cannot load resource `\”failback_messages\”`	Check to ensure that the HP-SOA installation has completed successfully.
9008E	Cannot open output converter	Check to ensure that the HP-SOA installation has completed successfully.
9010E	Invalid option `‘%s’`	Specify proper command line options with the ltfs command. Check `ltfs –a`.

Table 13 LIB LTFS error codes and descriptions *(continued)*

CODE	Error expansion	Description
9011E	Logging initialization failed	Check to ensure that the HP-SOA installation has completed successfully.
9012E	Cannot specify `--quiet` with `--trace` or `--fulltrace`	Specify proper command line options with the mkltfs command. Check —`mkltfs –a`.
9013E	Cannot specify `--quiet` with `--trace` or `--fulltrace`	Specify proper command line options with the ltfsck command. Check `ltfsck –a`.
9014E	Cannot create work directory `'%s':%s`	Check permissions of the work directory path. The work directory path should be: `Windows- C:/ProgramData/Hewlett-Packard/LTFSAutomation/Schemas ; Linux/Mac-/tmp/ltfs`
10000E	Failed to initialize `libltfs` (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
10001E	Memory allocation failed (`%s`)	Reboot the host/library.
10002E	Cannot initialize `mutex` (`%d`)	Reboot the host.
10003E	Cannot initialize condition variable (`%d`)	Reboot the host.
10004E	Cannot open device `'%s'`	Check the device file/ID.
10005E	Null argument (`%s`) to `%s`	Check the arguments.
10008E	Failed to load the configuration file (`%d`)	The configuration file should be present in the proper path.
10009E	No driver plug-in specified and no default found	Mention driver plugin in the configuration file or provide it from the command line.
10012E	Failed to register messages with `libltfs` (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11000E	Cannot instantiate LTFS volume: Failed to allocate device data	Reboot the host.
11001E	Cannot instantiate LTFS volume: Failed to allocate label data	Reboot the host/library.
11002E	Cannot instantiate LTFS volume: Failed to allocate index data	Reboot the host/library.
11003E	Cannot retrieve device capacity data (`%d`)	Find out if the tape is already formatted. If it is not, format the tape.
11004E	Cannot take the device lock (`%d`)	Reboot the host/library.
11006E	Cannot read volume: Failed to load the tape	Check for physical damage on the tape media.
11009E	Cannot read volume: Failed to read partition labels	Tape should be properly formatted with the ltfs utility.
11010E	Cannot read volume: Failed to set medium compression	Reboot the host/library.
11011E	Cannot read volume: Block size is `%lu`, but the device only supports a block size of `%u`	Reformat the tape with correct block size value.
10012E	Failed to register messages with `libltfs` (`%d`)	Reboot the host.
10013E	Failed to set up signal handler	Reboot the host.
10014E	Failed to clean up signal handler	Reboot the host.

Table 13 LIB LTFS error codes and descriptions *(continued)*

CODE	Error expansion	Description
11020E	Cannot mount volume: Seek to index failed on the data partition	Run `ltfsck`.
11021E	Cannot mount volume: Read index failed on the data partition	Run `ltfsck`.
11023E	Cannot mount volume: Seek to index failed on the data partition	Run `ltfsck`.
11024E	Cannot mount volume: Read index failed on the index partition	Run `ltfsck`.
11027E	Cannot mount volume: Medium consistency check failed	Run `ltfsck`.
11029E	Cannot mount volume: Failed to save the append position for the index partition	Run `ltfsck`.
11030E	Cannot release the device lock	Reboot the host/library.
11033E	Cannot unmount: Failed to write an index	Run `ltfsck`.
11039E	Cannot open file: Failed to format the path (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11040E	Cannot open file: Path lookup failed (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11045E	Cannot set times: Device is not ready	Wait for the device to be free and try again.
11046E	Cannot set readonly flag: Device is not ready	Wait for the device to be free and try again.
11047E	Cannot create: Device is not ready	Wait for the device to be free and try again.
11048E	Cannot create: Failed to format the path (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11049E	Cannot create: Path lookup failed (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11050E	Cannot unlink: Device is not ready	Wait for the device to be free and try again.
11051E	Cannot unlink: Failed to format the path (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11052E	Cannot unlink: Path lookup failed (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11053E	Cannot rename: Device is not ready	Wait for the device to be free and try again.
11054E	Cannot rename: Failed to format the source path (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11055E	Cannot rename: Failed to format the destination path (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11056E	Cannot rename: Path lookup failed for source (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11057E	Cannot rename: Path lookup failed for destination (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11059E	Cannot truncate: Length must not be negative	Restart the HP-SOA application.
11062E	Cannot truncate: Device is not ready	Wait for the device to be free and try again.
11067E	Cannot write blocks: Invalid partition identifier	Restart the HP-SOA application.

Table 13 LIB LTFS error codes and descriptions *(continued)*

CODE	Error expansion	Description
11068E	Cannot write blocks: Multiple repetitions specified with an irregular buffer size	Restart the HP-SOA application.
11069E	Cannot write blocks: Failed to write an Index while switching partitions (`%d`)	Run `ltfsck`.
11070E	Cannot write blocks: Locate append position failed on partition `%c`	Run `ltfsck`.
11071E	Cannot write blocks: Failed to determine medium position (`%d`)	Run `ltfsck`.
11072E	Cannot write blocks: Failed to write to the medium (`%d`)	Run `ltfsck`.
11077E	Cannot write: Failed to write blocks to the medium (`%d`)	Run `ltfsck`.
11078E	Cannot write: Failed to update extent list (`%d`)	Run `ltfsck`.
11080E	Cannot write index: Failed to locate append position on partition `%c` (`%d`)	Run `ltfsck`.
11081E	Cannot write Index: Failed to determine medium position (`%d`)	Run `ltfsck`.
11082E	Cannot write index: Failed to write file mark (%d)	Run `ltfsck`.
11083E	Cannot write Index: Failed to generate and write XML data (%d). The medium may be in an inconsistent state; please unmount and run `ltfsck`.	Run `ltfsck`.
11084E	Cannot write Index: Failed to write a trailing file mark (%d). The medium is in an inconsistent state; please unmount and run `ltfsck`.	Run `ltfsck`.
11085E	Cannot read: Failed to determine medium position (`%d`)	Run `ltfsck`.
11086E	Cannot read: Failed to locate (`%d`) to partition `%c`, record `%llu`	Run `ltfsck`.
11087E	Cannot read: Expected `%u` bytes from cache, but received `%lu` bytes	Run `ltfsck`.
11088E	Cannot read: Failed to get a block from the medium (`%d`)	Run `ltfsck`.
11089E	Cannot read: Expected `%u` bytes from the medium, but received `%zd` bytes	Run `ltfsck`.
11093E	Cannot format: Failed to load the medium (`%d`)	Check for physical damage to the tape media.
11095E	Cannot format: The medium is write protected	Check if the readonly switch is turn on at the tape media.
11096E	Cannot format: Requested block size is `%lu` bytes, but the device only supports `%u`	Reformat the tap with the correct block size value.
11098E	Cannot format: Failed to partition the medium (`%d`)	Check for WORM, bad tapes with no EOD, or tapes not supported by ltfs in the library. If any of these is present, remove and retry the operation.
11099E	Cannot format: Failed to set the medium compression (`%d`)	Reboot the library.

Table 13 LIB LTFS error codes and descriptions *(continued)*

CODE	Error expansion	Description
11101E	Cannot format: Failed to locate (%d) to partition %zu, block 0	Check for WORM, bad tapes with no EOD, or tapes not supported by ltfs in the library. If any of these is present, remove and retry the operation.
11102E	Cannot format: Failed to write ANSI label (%d) on partition %zu	Check for WORM, bad tapes with no EOD, or tapes not supported by ltfs in the library. If any of these is present, remove and retry the operation.
11104E	Cannot format: Failed to write file mark after ANSI label (%d) on partition %zu	Check for WORM, bad tapes with no EOD, or tapes not supported by ltfs in the library. If any of these is present, remove and retry the operation.
11105E	Cannot format: Failed to generate LTFS Label	Check to ensure that the HP-SOA installation has completed successfully.
11106E	Cannot format: Failed to write XML label (%d) on partition %zu"	Check for WORM, bad tapes with no EOD, or tapes not supported by ltfs in the library. If any of these is present, remove and retry the operation.
11108E	Cannot format: Failed to write file mark after XML label (%d) on partition %zu	Check for WORM, bad tapes with no EOD, or tapes not supported by ltfs in the library. If any of these is present, remove and retry the operation.
11110E	Cannot get current time (%d)	Reboot the host.
11111E	Base64 decoder: Empty input	Check to ensure that the HP-SOA installation has completed successfully.
11112E	Base64 decoder: Invalid character in the input	Check to ensure that the HP-SOA installation has completed successfully.
11113E	Base64 decoder: Input length is not a multiple of 4	Check to ensure that the HP-SOA installation has completed successfully.
11114E	Cache manager: Failed to initialize the pool	Reboot the host/add more memory.
11116E	Cache manager: Failed to grow the pool	Reboot the host/add more memory.
11117E	Cannot set extended attribute: Device is not ready	Wait for the device to be free and try again.
11118E	Cannot set extended attribute: Failed to format the path (%d)	Check the argument provided to getaxxr.
11119E	Cannot set extended attribute: Failed to format the name (%d)	Check the argument provided to getaxxr.
11120E	Cannot set extended attribute: Failed to validate the name (%d)	Check the argument provided to getaxxr.
11121E	Cannot set extended attribute: Failed to look up the path (%d)	Check the argument provided to getaxxr.
11122E	Cannot set extended attribute: Failed to look up the xattr (%d)	Check the argument provided to getaxxr.
11123E	Cannot get extended attribute: NULL value with non-zero size	Check the argument provided to getaxxr.
11124E	Cannot get extended attribute: Failed to format the path (%d)	Check the argument provided to getaxxr.
11125E	Cannot get extended attribute: Failed to format the name (%d)	Check the argument provided to getaxxr.
11126E	Cannot get extended attribute: Failed to validate the name (%d)	Check the argument provided to getaxxr.

Table 13 LIB LTFS error codes and descriptions *(continued)*

CODE	Error expansion	Description
11127E	Cannot get extended attribute: Failed to look up the path (`%d`)	Check the argument provided to `getaxxr`.
11128E	Cannot get extended attribute: Failed to look for virtual `xattrs` (`%d`)	Check the argument provided to `getaxxr`.
11129E	Cannot get extended attribute: Failed to look up the `xattr` (`%d`)	Check the argument provided to `getaxxr`.
11130E	Cannot list extended attributes: NULL output buffer with a non-zero size	Run `ltfsck`.
11131E	Cannot list extended attributes: Failed to format the path (`%d`)	Run `ltfsck`.
11132E	Cannot list extended attributes: Failed to look up the path (`%d`)	Check the argument provided to `getaxxr`.
11133E	Cannot list extended attributes: Failed to list real `xattrs` (`%d`)	Run `ltfsck`.
11135E	Cannot remove extended attribute: Device is not ready	Wait for the device to be free and try again.
11136E	Cannot remove extended attribute: Failed to format the path (`%d`)	Check the argument provided to `getaxxr`.
11137E	Cannot remove extended attribute: Failed to format the name (`%d`)	Check the argument provided to `getaxxr`.
11138E	Cannot remove extended attribute: Failed to validate the name (`%d`)	Check the argument provided to `getaxxr`.
11139E	Cannot remove extended attribute: Failed to look up the path (`%d`)	Check the argument provided to `getaxxr`.
11140E	Cannot remove extended attribute: Failed to look up the `xattr` (`%d`)	Check the argument provided to `getaxxr`.
11141E	Cannot list physical xattrs: Failed to generate namespace prefix (`%d`)	Run `ltfsck`.
11142E	Cannot list physical xattrs: Failed to convert key to system locale (`%d`)	Run `ltfsck`.
11145E	Cannot get attribute `%s`: Failed to generate the time string	Check the argument provided to `getaxxr`.
11146E	Invalid index criteria option `'%s'`	Run `ltfsck`/reformat the tape with correct index_criteria.
11147E	Duplicate index criteria option `'%s'`	Run `ltfsck`/reformat the tape with correct index_criteria.
11148E	More than one non-numeric character follows the size criterion	Run `ltfsck`/reformat the tape with correct index_criteria.
11149E	Invalid size criterion multiplier `'%c'`	Run `ltfsck`/reformat the tape with correct index_criteria.
11150E	Size= rule must contain a valid size	Run `ltfsck`/reformat the tape with correct index_criteria.
11151E	Size= rule must contain a digit	Run `ltfsck`/reformat the tape with correct index_criteria.

Table 13 LIB LTFS error codes and descriptions *(continued)*

CODE	Error expansion	Description
11152E	Cannot parse index criteria: Rules are invalid	Run `ltfsck`/reformat the tape with correct index_criteria.
11153E	Cannot parse index criteria: Failed to parse name rule (`%d`)	Run `ltfsck`/reformat the tape with correct index_criteria.
11154E	Cannot parse index criteria: Error while seeking name rule	Run `ltfsck`/reformat the tape with correct index_criteria.
11155E	Cannot parse index criteria: Failed to parse size rule (`%d`)	Run `ltfsck`/reformat the tape with correct index_criteria.
11156E	Cannot parse index criteria: Error while seeking size rule	Run `ltfsck`/reformat the tape with correct index_criteria.
11157E	Cannot specify a name rule without a size rule	Check to ensure that the HP-SOA installation has completed successfully.
11158E	Cannot match name: Failed to initialize glob cache (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11159E	Cannot match name: Failed to prepare for caseless matching(`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11160E	Cannot prepare glob cache: Failed to prepare name for caseless matching (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11161E	Cannot match name: Match function failed (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11162E	Cannot perform matching: Failed to open text boundary iterator for criteria (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11163E	Cannot perform matching: Failed to open text boundary iterator for filename (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11164E	Failed to push file name onto a null stack pointer	Reboot host/Check to ensure that the HP-SOA installation has completed successfully.
11165E	Failed to pop a file name from a null stack pointer	Reboot host/Check to ensure that the HP-SOA installation has completed successfully.
11166E	Cannot allocate index data: Failed to initialize `mutex` (`%d`)	Reboot host/add more memory to host.
11167E	Cannot create file or directory: Failed to allocate `dentry`	Reboot host/add more memory to host.
11168E	Cannot allocate Index data: Failed to allocate root `dentry`	Reboot host/add more memory to host.
11169E	Cannot read labels: Failed to allocate label data (`%d`)	Reboot host/add more memory to host.
11170E	Failed to read label (`%d`) from partition 0	Run `ltfsck`.
11171E	Failed to read label (`%d`) from partition 1	Run `ltfsck`.
11172E	Cannot verify labels: Comparison failed (`%d`)	Run `ltfsck`/reformat the tape.
11173E	Cannot read label (`%d`): Failed to seek to block 0 (partition `%lu`)	Run `ltfsck`.
11174E	Cannot read ANSI label: Read failed (`%d`)	Run `ltfsck`.
11175E	Cannot read ANSI label: Expected 80 bytes, but received `%zd`	Run `ltfsck`.

Table 13 LIB LTFS error codes and descriptions *(continued)*

CODE	Error expansion	Description
11176E	ANSI label indicates this is not an LTFS volume	Run `ltfsck`.
11178E	Cannot read LTFS label: Read failed (`%d`)	Run `ltfsck`.
11179E	Cannot read LTFS label: Parsing failed (`%d`)	Run `ltfsck`.
11180E	Cannot read partition label: Failed to space forward over the trailing file mark (`%d`)	Run `ltfsck`.
11181E	Cannot read partition label: Failed to find the trailing file mark	Run `ltfsck`.
11182E	Comparing labels: Tape bar code number mismatch	Run `ltfsck`.
11183E	Comparing labels: Volume UUID mismatch	Run `ltfsck`.
11184E	Comparing labels: Format time mismatch	Run `ltfsck`.
11185E	Comparing labels: Block size mismatch	Run `ltfsck`.
11186E	Comparing labels: Compression mismatch	Run `ltfsck`.
11187E	Comparing labels: Partition IDs must be lower-case ASCII characters	Run `ltfsck`.
11188E	Comparing labels: Partition IDs must be distinct	Run `ltfsck`.
11189E	Comparing labels: Partition map mismatch	Run `ltfsck`.
11190E	Comparing labels: Unknown partition ID	Run `ltfsck`.
11191E	Comparing labels: Partitions have the same ID `'%c'`	Run `ltfsck`.
11192E	Comparing labels: Invalid bar code number	Run `ltfsck`.
11193E	Cannot read index: Failed to determined medium position (`%d`)	Run `ltfsck`.
11197E	Cannot read index: Back pointer is corrupt	Run `ltfsck`.
11198E	Cannot read index: Failed to space forward 1 file mark (`%d`)	Run `ltfsck`.
11199E	Cannot locate index: Failed to locate to EOD (`%d`)	Run `ltfsck`.
11200E	Cannot locate index: Failed to determined medium position (`%d`)	Run `ltfsck`.
11201E	Cannot locate index: Failed to space back 1 file mark (`%d`)	Run `ltfsck`.
11202E	Cannot locate index: Failed to space forward 1 file mark (`%d`)	Run `ltfsck`.
11203E	Cannot locate index: Failed to space back 2 file marks (`%d`)	Run `ltfsck`.
11205E	Index partition contains a back pointer, but no index found on the data partition	Run `ltfsck`.
11206E	Index partition back pointer is invalid	Run `ltfsck`.
11207E	Missing required index partition back pointer	Run `ltfsck`.
11208E	Back pointer chain is broken	Run `ltfsck`.

Table 13 LIB LTFS error codes and descriptions *(continued)*

CODE	Error expansion	Description
11209E	Cannot create lost and found directory: Failed to allocate directory data	Run `ltfsck`.
11211E	Cannot populate lost and found directory: Failed to allocate file data	Run `ltfsck`.
11212E	Cannot create lost and found directory: Seek failed (`%d`)	Run `ltfsck`.
11213E	Cannot Check medium: Seek index failed on the data partition (`%d`)	Run `ltfsck`.
11214E	Cannot Check medium: Seek index failed on the index partition (`%d`)	Run `ltfsck`.
11215E	Cannot Check medium: Failed to locate to EOD on the data partition (`%d`)	Run `ltfsck`.
11216E	Cannot Check medium: Failed to locate to EOD on the index partition (`%d`)	Run `ltfsck`.
11217E	Cannot Check medium: Failed to write a file mark to the data partition (`%d`)	Run `ltfsck`.
11218E	Cannot Check medium: Failed to write a file mark to the index partition (`%d`)	Run `ltfsck`.
11219E	Cannot Check medium: Pointer verification failed (`%d`)	Run `ltfsck`.
11220E	Medium Check failed: Extra blocks detected. Run `ltfsck`.	Run `ltfsck`.
11221E	Medium Check failed: Detected invalid extents	Run `ltfsck`.
11222E	Cannot Check medium: Failed to save index partition append position (`%d`)	Run `ltfsck`.
11224E	Cannot restore medium consistency: Failed to generate lost and found (`%d`)	Run `ltfsck`.
11225E	Cannot Check medium: Failed to allocate index data (`%d`)	Run `ltfsck`.
11228E	Cannot restore medium consistency: Failed to save data partition append position (`%d`)	Run `ltfsck`.
11229E	Cannot restore medium consistency: Failed to save index partition append position (`%d`)	Run `ltfsck`.
11231E	A simple fix is possible to restore the consistency of the tape.	Run `ltfsck`.
11232E	Rerun the consistency Check with simple fixes enabled.	Run `ltfsck`.
11234E	Cannot validate extended attribute value: Code point iteration failed	Run `ltfsck`.
11235E	Cannot validate name: Failed to iterate code point	Run `ltfsck`.
11236E	Cannot fold string case: Failed to get output buffer size (`%d`)	Run `ltfsck`.
11237E	Cannot fold string case: Failed to fill output buffer (`%d`)	Run `ltfsck`.

Table 13 LIB LTFS error codes and descriptions *(continued)*

CODE	Error expansion	Description
11238E	Cannot apply NFC: Failed to get output buffer size (`%d`)	Run `ltfsck`.
11239E	Cannot apply NFC: Failed to fill output buffer (`%d`)	Run `ltfsck`.
11240E	Cannot apply NFD: Failed to get output buffer size (`%d`)	Run `ltfsck`.
11241E	Cannot apply NFD: Failed to fill output buffer (`%d`)	Run `ltfsck`.
11242E	Cannot convert UTF-8 to UTF-16: Failed to get output buffer size (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11243E	Cannot convert UTF-8 to UTF-16: Failed to fill output buffer (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11244E	Cannot convert UTF-16 to UTF-8: Failed to get output buffer size (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11245E	Cannot convert UTF-16 to UTF-8: Failed to fill output buffer (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11246E	Cannot convert system locale to UTF-16: Failed to open converter (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11247E	Cannot convert system locale to UTF-16: Failed to set up converter (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11248E	Cannot convert system locale to UTF-16: Failed to get output buffer size (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11249E	Cannot convert system locale to UTF-16: Failed to fill output buffer (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11250E	Cannot convert UTF-8 to system locale: Failed to get output buffer size (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11251E	Cannot convert UTF-8 to system locale: Failed to fill output buffer (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11260E	Plugin '%s' was not found in the configuration file	Check to ensure that the HP-SOA installation has completed successfully.
11261E	Cannot load plug-in: `%s`	Check to ensure that the HP-SOA installation has completed successfully.
11262E	Cannot unload plug-in: `%s`	Check to ensure that the HP-SOA installation has completed successfully.
11263E	Cannot resolve plug-in operations interface: `%s`	Check to ensure that the HP-SOA installation has completed successfully.
11264E	Cannot get plug-in operations	Check to ensure that the HP-SOA installation has completed successfully.
11265E	Cannot parse configuration file: 'Default' directive must be followed by a plug-in type and name	Check to ensure that the HP-SOA installation has completed successfully.
11267E	Cannot get library path: Unknown plug-in type `\'%s\'` or plug-in name `\'%s\'`	Check to ensure that the HP-SOA installation has completed successfully.
11268E	Cannot open configuration file `'%s'` (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11269E	Cannot parse configuration file: Line too long	Check to ensure that the HP-SOA installation has completed successfully.

Table 13 LIB LTFS error codes and descriptions *(continued)*

CODE	Error expansion	Description
11270E	Cannot parse configuration file: '-Default' directive must be followed by a plug-in type	Check to ensure that the HP-SOA installation has completed successfully.
11271E	Cannot parse configuration file: Unknown plug-in type `'%s'` in '-default' directive	Check to ensure that the HP-SOA installation has completed successfully.
11272E	Cannot parse configuration file: `\'option\'` directive must be followed by an option type and LTFS mount option	Check to ensure that the HP-SOA installation has completed successfully.
11273E	Cannot parse configuration file: `'%s'` directive must be followed by a valid %s name	Check to ensure that the HP-SOA installation has completed successfully.
11275E	"Cannot parse configuration file: `\'plug-in\'` directive must be followed by a plug-in type, name, and library path	Check to ensure that the HP-SOA installation has completed successfully.
11279E	Cannot write index to partition `%c` (`%d`)	Run `ltfsck`.
11280E	Unknown default `%s '%s'`	Check to ensure that the HP-SOA installation has completed successfully.
11281E	Cannot load messages: Failed to get message table (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11282E	Cannot load messages: Failed to determine first message ID (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11283E	Cannot load messages: Failed to determine first message ID (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11284E	Cannot resolve plug-in message bundle interface: `%s`	Check to ensure that the HP-SOA installation has completed successfully.
11285E	Cannot load %s plug-in `\'%s\'`: Failed to load the message bundle (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11286E	Cannot load messages: Failed to open resource bundle (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11287E	Cannot load messages: Failed to register message data (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11290E	Failed to eject the cartridge `(%s)`	Reboot library/host or use HP LTT to eject and remove tapes from drives.
11293E	Cannot load messages for `libltfs` (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
11295E	Cannot load %s plug-in `\'%s\'`: Failed to load the message bundle (`%d`)	Run `ltfsck`.
11296E	Cannot load messages: Failed to open resource bundle (`%d`)	Run `ltfsck`.
11297E	Cannot load messages: Failed to register message data (`%d`)	Reboot host/add more memory to host.
11298E	Failed to eject the cartridge `(%s)`	Remove the medium and make sure it is an LTO5 or LTO6 medium.
11299E	Cannot load messages for `libltfs` (`%d`)	Check for WORM, bad tapes with no EOD, or tapes not supported by ltfs. Remove any that are present and then retry the operation.
11301E	Unable to read index: Cannot duplicate index partition criteria	Run `ltfsck`.

Table 13 LIB LTFS error codes and descriptions *(continued)*

CODE	Error expansion	Description
11302E	Data placement rule contains invalid character(s): '%s'	Run ltfsck/reformat the tape with the correct index_criteria.
11303E	Data placement rule is too long: '%s'	Run ltfsck/reformat the tape with the correct index_criteria.
11304E	Failed to validate data placement rule (%d)	Run ltfsck/reformat the tape with the correct index_criteria.
11305E	Empty data placement rule in '%s'	Run ltfsck/reformat the tape with the correct index_criteria.
11306E	Cannot get read-only state of partition: Invalid partition identifier	Run ltfsck.
11309E	Cannot parse configuration file: \'-plugin\' directive must be followed by a plug-in type and name	Check to ensure that the HP-SOA installation has completed successfully.
11311E	Cannot format: Failed to reset capacity proportion (%d)	Check for WORM, bad tapes with no EOD, or tapes not supported by ltfs. Remove any that are present and then retry the operation.
11314E	Cannot format: Failed to get data key (%d)	Check for WORM, bad tapes with no EOD, or tapes not supported by ltfs. Remove any that are present and then retry the operation.
11315E	Cannot format: Failed to set data key (%d)	Check for WORM, bad tapes with no EOD, or tapes not supported by ltfs. Remove any that are present and then retry the operation.
11317E	Cannot print help message: Unknown type: '%s'	Reboot host.
11319E	Cannot add the key to hash table at %s (%d)	Reboot host.
11320E	Cannot search the key from hash table at %s (%d)	Reboot host.
11321E	Symbolic link might be replaced by data file. Use ltfsck for recovery	Run ltfsck.
11325E	Cannot set extended attribute: Failed to flush (%d)	Check the medium.
11327E	Failed to seek EOD: Seek invalid partition (%d, %d)	Run ltfsck.
11328E	Failed to seek index: Seek invalid partition (%c, %c)	Run ltfsck.
11329E	"Failed to recover tape: Cannot write the index to an invalid position in the data partition (%lld, %lld, %d)	Run ltfsck.
11999E	Cannot load the medium: Failed to get capacity data (%d)	Check the medium.
12008E	Cannot allocate device data: Failed to initialize mutex (%d)	Reboot the host.
12010E	Failed to grab the device lock (%s)	Reboot the host.
12011E	Failed to release the device lock (%s)	Reboot the host.
12012E	Cannot open device: Failed backend open call	Check the device passed to the command.
12013E	Cannot inquire the tape device: Backend call failed (%d)	Check the device passed to the command.
12016E	No medium present	Reboot the library/partition.

Table 13 LIB LTFS error codes and descriptions *(continued)*

CODE	Error expansion	Description
12017E	Cannot load the medium (`%d`)	Reboot the library/partition.
12018E	Cannot load the medium: Failed to lock the medium in the drive (`%d`)	Reboot the library/partition.
12019E	Cannot load the medium: Failed to determine medium position (`%d`)	Reboot the library/partition.
12020E	Cannot load the medium: Failed to set device defaults (`%d`)	Reboot the library/partition.
12021E	Cannot load the medium: Failed to get device parameters (`%d`)	Reboot the library/partition.
12024E	Cannot reserve device: Backend call failed (`%d`)	Reboot the library/partition.
12027E	Cannot lock medium in the drive: Backend call failed (`%d`)	Reboot the library/partition.
12029E	Device is not ready (`%d`)	Reboot the library/partition.
12030E	Cannot get capacity data: Backend call failed (`%d`)	Check the device.
12031E	Cannot set compression: Backend call failed (`%d`)	Check the device.
12032E	Cannot set append position: Invalid partition `%lu`	Run `ltfsck`.
12034E	Cannot get maximum device blocksize: Backend call failed (`%d`)	Check the drive/run `ltfsck`.
12035E	Cannot rewind medium: Backend call failed (`%d`)	Check the drive/run `ltfsck`.
12036E	Seek failed: Final position is not what was requested	Check the drive/run `ltfsck`.
12037E	Cannot seek: Backend call failed (`%d`)	Check the drive/run `ltfsck`.
12038E	Cannot seek EOD: Invalid partition `%lu`	Check the drive/run `ltfsck`.
12039E	Cannot seek EOD: Backend locate call failed (`%d`)	Check the drive/run `ltfsck`.
12040E	Cannot parse backend options: Backend call failed (`%d`)	Check to ensure that the HP-SOA installation has completed successfully.
12041E	Cannot space file marks: Backend call failed (`%d`)	Check the drive/run `ltfsck`.
12042E	Cannot write block: Must open the device first	Check the device file/ID.
12043E	Cannot write block: Device is read-only	Check the device file/ID.
12044E	Cannot write a %u-byte block: Maximum block size is `%lu`	
12045E	Cannot write block: Backend call failed (%d). Dropping to read-only mode.	Check the drive/run `ltfsck`.
12046E	Cannot write file marks: Must open the device first	Check the device file/ID.
12047E	Cannot write file marks: Backend call failed (`%d`). Dropping to read-only mode.	Check the drive/run `ltfsck`.
12048E	Cannot read: Must open the device first	Check the device file/ID.
12049E	Cannot read: Backend call failed (`%d`)	Check the device file/ID.
12050E	Cannot format medium: Locate to partition 0, block 0 failed (`%d`)	Check for WORM, bad tapes with no EOD, or tapes not supported by ltfs. Remove any that are present and then retry the operation.

Table 13 LIB LTFS error codes and descriptions *(continued)*

CODE	Error expansion	Description
12051E	Cannot format medium: Mode Sense for Medium Partition failed (%d)	Check for WORM, bad tapes with no EOD, or tapes not supported by ltfs. Remove any that are present and then retry the operation.
12053E	Cannot format medium: Backend call failed (%d)	Check for WORM, bad tapes with no EOD, or tapes not supported by ltfs. Remove any that are present and then retry the operation.
12054E	Cannot unformat medium: Locate to partition 0, block 0 failed (%d)	Check for WORM, bad tapes with no EOD, or tapes not supported by ltfs. Remove any that are present and then retry the operation.
12055E	Cannot unformat medium: Backend call failed (%d)	Check for WORM, bad tapes with no EOD, or tapes not supported by ltfs. Remove any that are present and then retry the operation.
12064E	Cannot write block: No space left on device	Use a new tape.
13003E	Scheduler backend does not implement all required methods	Check to ensure that the HP-SOA installation has completed successfully.
13004E	Dentry cache backend does not implement all required methods	Reboot the host.
17000E	XML parser: Not all required tags found in \'%s\'	Check libxml2 installation.
17001E	XML parser: Duplicate required tag '%s'	Check libxml2 installation.
17002E	XML parser: Duplicate optional tag '%s'	Check libxml2 installation.
17003E	XML parser: Cannot determine whether tag is empty	Check libxml2 installation.
17004E	XML parser: Tag '%s' must not be empty	Check libxml2 installation.
17005E	XML parser: Extra content in tag '%s'	Check libxml2 installation.
17007E	Cannot instantiate an LTFS label parser for file \'%s\'	Reboot the host/add more memory.
17008E	Cannot parse XML label from file \'%s\'	Run ltfsck.
17009E	Cannot instantiate an LTFS label parser for a memory buffer	Reboot the host/add more memory.
17010E	Cannot parse XML label from memory	Run ltfsck.
17011E	Cannot instantiate an index parser for file \'%s\'	Reboot the host or add more memory.
17012E	Cannot parse index from file \'%s\'	Reboot the host/run ltfsck.
17013E	Cannot parse index: Failed to determine medium position (%d)	Run ltfsck.
17014E	Cannot parse index: Failed to create XML parser input buffer	Reboot the host/add more memory.
17015E	Cannot parse index: Failed to create XML reader	Reboot the host/add more memory.
17016E	Cannot parse index direct from medium	Run ltfsck.
17017E	XML parser: Unexpected top-level tag '%s'	Check libxml2 installation.
17018E	XML parser: Unsupported encoding '%s'	Check libxml2 installation.

Table 13 LIB LTFS error codes and descriptions *(continued)*

CODE	Error expansion	Description
17019E	XML parser: No schema version found	Check `libxml2` installation.
17020E	XML parser: Invalid schema version `'%s'`	Check `libxml2` installation.
17021E	XML parser: Unsupported `%s` version `%s`	Check `libxml2` installation.
17022E	XML parser: Invalid block size `%s`	Check `libxml2` installation.
17023E	XML parser: Invalid generation number `%s`	Check `libxml2` installation.
17024E	XML parser: Invalid size criterion `%s`	Check `libxml2` installation.
17025E	XML parser: Failed to normalize value (`%d`)	Check `libxml2` installation.
17026E	XML parser: File size is shorter than extent list	Check `libxml2` installation.
17027E	XML parser: Unsupported extended attribute type `'%s'`	Check `libxml2` installation.
17028E	XML parser: Base64 decoding failed	Check `libxml2` installation.
17029E	XML parser: Invalid UUID `%s`	Check `libxml2` installation.
17030E	XML parser: Failed to normalize name `'%s'`	Check `libxml2` installation.
17031E	XML parser: Invalid name `'%s'`	Check `libxml2` installation.
17032E	XML parser: Compression must be 'true' (1) or 'false' (0)	Check `libxml2` installation.
17033E	XML parser: Invalid partition `'%s'`	Check `libxml2` installation.
17034E	XML parser: Invalid time `'%s'`	Check `libxml2` installation.
17035E	XML parser: Expected a text node	Check `libxml2` installation.
17036E	XML parser: Expected a text node (received type `%d`)	Check `libxml2` installation.
17037E	XML parser: Failed to read from XML stream	Check `libxml2` installation.
17038E	XML parser: Unexpected end of XML stream	Check `libxml2` installation.
17039E	XML parser: Failed to read a block from the medium (`%d`)	Run `ltfsck`.
17040E	XML parser: Failed to space back 1 file mark	Run `ltfsck`.
17041E	XML parser: Read failed while looking for a file mark (`%d`)	Run `ltfsck`.
17042E	XML writer: Error creating tag (`%s`)	Run `ltfsck`.
17043E	Cannot instantiate an LTFS label writer to memory	Reboot the host or add more memory.
17044E	Label writer: Failed to start the document (`%d`)	Reboot the host or add more memory.
17045E	Label writer: Failed to format time	Run `ltfsck`.
17046E	Label writer: Failed to close the document (`%d`)	Run `ltfsck`.
17047E	Cannot generate LTFS label: Failed to allocate buffer	Reboot the host or add more memory.
17048E	Cannot generate index data (in memory): Failed to allocate buffer	Reboot the host or add more memory.
17049E	Cannot instantiate an index writer (to memory)	Run `ltfsck`.

Table 13 LIB LTFS error codes and descriptions *(continued)*

CODE	Error expansion	Description
17050E	Cannot generate index data (in memory)	Run `ltfsck`.
17051E	Cannot instantiate an index writer (to file `'%s'`)	Run `ltfsck`.
17052E	Cannot generate index data (%d) in file `'%s'`	Run `ltfsck`.
17053E	Cannot generate index data (direct to tape): Failed to create output buffer	Run `ltfsck`.
17054E	Cannot instantiate an index writer (direct to tape)	Run `ltfsck`.
17055E	Cannot generate index data direct to tape (`%d`)	Run `ltfsck`.
17056E	XML writer: Cannot format time (`gmtime` failed)	Run `ltfsck`.
17057E	Index writer: Failed to start the document (`%d`)	Run `ltfsck`.
17058E	Index writer: Failed to close the document (`%d`)	Run `ltfsck`.
17059E	Index writer: Cannot validate extended attribute value (`%d`)	Run `ltfsck`.
17060E	XML writer: Failed to write a block to the medium (`%d`)	Run `ltfsck`.
17061E	XML writer: Failed to flush cached data to the medium (`%d`)	Run `ltfsck`.
17062E	XML writer: Tried to write a directory as a file	Run `ltfsck`.
17072E	Cannot unformat: Failed to unpartition the medium (`%d`)	Check the medium.
17075E	Traverse(`%c`): Cannot read index from `%d` (`%c`)	Run `ltfsck`.
17076E	Traverse(`%c`): Cannot locate to the next index position (`%c`)	Run `ltfsck`.
17079E	Traverse: Cannot find target generation `%d`	Pass the correct generation umber.
17081E	Traverse(`%c`): Callback function failed `%d` (`%c`)	Run `ltfsck`.
17082E	Traverse(`%c`): Cannot locate to the first index position (`%c`)	Run `ltfsck`.
17083E	Traverse(`%c`): Cannot locate to the last index position (`%c`)	Run `ltfsck`.
17084E	XML parser: Failed to read extent list from file (`%d`)	Run `ltfsck`.
17069E	Failed to sync index	Run `ltfsck`.
17091E	Cannot save tag: `libxml2` could not return text for this node	Check `libxml2` installation.
17092E	Index writer: Failed to write opaque tags (`%s`)	Run `ltfsck`.
17093E	XML parser: Failed to skip tag	Run `ltfsck`.
17094E	XML parser: Comment field is longer than 64 KB	Run `ltfsck`.
17097E	XML parser: Two extents overlap	Run `ltfsck`.
17098E	XML parser: Invalid name pattern `'%s'`	Run `ltfsck`.
17099E	Failed to spawn the periodic sync thread (`%d`)	Reboot the host.
17100E	XML parser: UID on the root directory must be 1	Run `ltfsck`.

Table 13 LIB LTFS error codes and descriptions *(continued)*

CODE	Error expansion	Description
17101E	XML parser: UID 1 is reserved for the root directory	Run `ltfsck`.
17102E	Cannot set PEWS: Mode Sense for Device Configuration Extension failed (`%d`)	Check the library drive and tape.
17103E	Cannot set PEWS: Mode Select for Device Configuration Extension failed (`%d`)	Check the library drive and tape.
17104E	Cannot get PEWS: Mode Sense for Device Configuration Extension failed (`%d`)	Check the library drive and tape.
17106E	XML parser: UID 0 is reserved	Run `ltfsck`.
17107E	Version mismatch of MAM, IP=%d, DP=%d	Run `ltfsck`.
17108E	Cannot find partition id `'%c'(0x%x)`	Run `ltfsck`.
17109E	Failed to detect the final index or the final record	Run `ltfsck`.
17115E	Failed to search the final index in IP	Run `ltfsck`.
17117E	Failed to search the final index in DP	Run `ltfsck`.
17119E	Failed to seek to the final index in `%s` (`%d`)	Run `ltfsck`.
17121E	Failed to read the final index in `%s` (`%d`)	Run `ltfsck`.
17123E	Unexpected generation value (Gen = %d, MAM IP = %d, MAM DP = %d)	Run `ltfsck`.
17125E	Failed to seek to the final record in `%s` (`%d`)	Run `ltfsck`.
17126E	Unexpected EOD status (`%d`, `%d`)	Run `ltfsck`.
17132E	Failed to get current position	Run `ltfsck`.
17133E	Failed to unload the cartridge	Run `ltfsck`.
17134E	Failed to reload the cartridge	Run `ltfsck`.
17135E	Failed to seek to EOD recovery point	Run `ltfsck`.
17136E	Failed to erase at EOD recovery point	Run `ltfsck`.
17137E	Failed to recover EOD status (`%d`)	Run `ltfsck`.
17140E	Tape backend does not support missing EOD detection	Check to ensure that the HP-SOA installation has completed successfully.
17142E	Both EODs are missing.	Run `ltfsck`.
17144E	The MAM of %s is not usable	Run `ltfsck`.
17146E	EOD of %s(%d) is missing. A deep recovery operation is required.	Run `ltfsck`.
17148E	Use ltfsck with the --deep-recovery option	Run `ltfsck`.
17149E	Cannot erase: backend call failed (`%d`)	Check for WORM, bad tapes with no EOD, or tapes not supported by `ltfs`. Remove any that are present and then retry the operation.
17151E	Cannot set WRITE MODE: Failed to unload medium (`%d`)	Check the library drive and tape.
17152E	Cannot set WRITE MODE: Failed to load medium (`%s`, `%d`)	Check the library drive and tape.

Table 13 LIB LTFS error codes and descriptions *(continued)*

CODE	Error expansion	Description
17154E	Cannot set WRITE MODE: Mode Sense for Device Configuration Extension failed (`%d`)	Check the library drive and tape.
17155E	Cannot set WRITE MODE: Mode Select for Device Configuration Extension failed (`%d`)	Check the library drive and tape.
17156E	Cannot get WRITE MODE: Mode Sense for Device Configuration Extension failed (`%d`)	Check the library drive and tape.
17163E	Cannot reset the capacity proportion: Failed to locate partition 0, block 0 (`%d`)	Run `ltfsck`.
17164E	Cannot reset the capacity proportion: Backend call failed (`%d`)	Run `ltfsck`.
17167E	Cannot read volume: Failed to get capacity data (`%d`)	Check the medium to see if it is formatted.
17168E	Cannot read volume: Medium is not partitioned	Check the medium to see if it is formatted.
17180E	File %s has both of symbolic link and extents	Check the file before doing any operation on it.
17181E	Cannot reopen device: Failed backend reopen call	Check the device.
17183E	Error writing XML schema to file `'%s'` on the disk	Check the permissions of the path: `C:\ProgramData\Hewlett-Packard\LTFSAutomation in windows and /tmp/ltfs in linux and mac`
17184E	Error changing index cache file's permission (`%d`)	Check the permissions of the path: `C:\ProgramData\Hewlett-Packard\LTFSAutomation in windows and /tmp/ltfs in linux and mac`
17185E	Cannot read LTFS label: Max transfer length is shorter than max LTFS label length (`%d`)	Run `ltfsck`.
17186E	Called `releaseread_mrsw` with zero or less count	Reboot the host.
17187E	Unexpected not ready state (`%d`)	Reboot the host/library.
17200E	XML parser: Cannot save tag, `libxml2` workaround failed (`%s`)	Check `libxml2` installation.
17201E	Cannot unformat: Failed to delete the partitions	Check the library drive and tape.
17202E	Failed to wipe the medium (`%d`)	Check to see if the medium is write-protected.

11 Frequently asked questions

General

Q: How do I get HP StoreOpen Automation?

A: All application downloads and documentation are available from the website at: www.hp.com/go/storeopen

Q:Is source code available for HP StoreOpen Automation?

A: Yes, source code is released under the terms of the LGPLv2.1 and can be downloaded from www.hp.com/go/ltfs. However, HP is not able to support customers who choose to download and build their own versions of the HP StoreOpen Automation application.

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

A: For most common issues, see “Troubleshooting” (page 61). If this does not address the issue, you can get in touch with the HP StoreOpen Automation Support e-mail at storeopen.cpe@hpe.com.

Q:What information must I provide when contacting HP?

A:Please send the following when contacting HP for problem resolution:

- Product model names and numbers
- Technical support registration number (if applicable)
- Product serial numbers
- Error messages
- Operating system type and revision level
- Steps which led to the error
- Detailed questions

Q: Where can I find the support matrix for HP StoreOpen Automation?

A: Please refer the HP EBS matrix at http://h18000.www1.hp.com/products/storageworks/ebs/index.html.

Q: Does HP StoreOpen Automation replace my existing backup software?

A:In most cases it is recommended that you continue to use your existing backup application. HP StoreOpen Automation provides a good method of storing and transporting large files, but is not generally a direct replacement for a backup application.

Q: How do I get communications on new versions of HP StoreOpen Automation?

A: When you download HP StoreOpen Automation from HP download page, you can opt for option to receive email on new product information.

Q: What are best practices to follow in HP StoreOpen Automation?

A:Please refer to http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=4AA5-1230ENW&cc=us&lc=en.

Q: Where I can find more details on LTFS?

A: You may refer the following links to understand more about LTFS:

- http://www.lto.org/technology/ltfs/
- http://www.snia.org/ltfs

Using HP StoreOpen Automation

Q: What are the minimum system requirements?

A: Any server that fulfills the needs of the supported configurations detailed in Supported configurations (page 7).

Q: Why doesn’t HP StoreOpen Automation work with libraries containing LTO-4 or earlier drives?

A: HP StoreOpen Automation relies on a drive feature called partitioning, which was added to the 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 HP StoreOpen Automation solution?

A: No, LTO-4 media does not support partitioning which is required for LTFS support.

Q: Can I use WORM media with HP StoreOpen Automation?

A: No, WORM media cannot be partitioned and so is not usable with HP StoreOpen Automation.

Q: How can I know which LTFS spec version HP StoreOpen Automation supports?

A: This can be found out from the Release Notes. Or issuing the command `ltfs –V` from a command line terminal on the system will display the SOA version as well as the LTFS spec version.

Q: Does HP Store Open Automation offer a GUI?

A: Currently HP StoreOpen Automation provides graphical user interface only on Windows & Mac.

Q:How many drives and slots supported by SOA?

A: Currently HP SOA supports up to 4 drives and 48 slots.

12 Support and other resources

Contacting HP

For worldwide technical support information, see the HP support website:

http://www.hp.com/support

If you believe that you have encountered a software issue with the HP Store Open Automation product itself, send an e-mail to storeopen.cpe@hpe.com. You can also send comments, feedback, suggestions, and questions to this e-mail address.

NOTE: This address is intended to provide support only for HP Store Open product. Refer to the documentation that comes with your hardware for support options for hardware.

Before contacting HP, collect the following information:

- Product model names and numbers
- Technical support registration number (if applicable)
- Product serial numbers
- Error messages
- Operating system type and revision level
- Detailed questions

Subscription service

HP recommends that you register your product at the Subscriber's Choice for Business website:

http://www.hp.com/go/e-updates

After registering, you will receive e-mail notification of product enhancements, new driver versions, firmware updates, and other product resources.

Related information

For diagnosing Library and Tape drive related issues you can use “HP Library and Tape Tools”. For more information about using L&TT please refer to the L&TT user guide available at http://www.hp.com/support/.

Documentation

The *HP StorageWorks Library and Tape Tools user guide* available from http://www.hp.com/support/.

HP websites

For additional information, see the following HP websites:

- http://www.hp.com/go/LTFS
- http://www.hp.com
- http://www.hp.com/go/storage
- http://www.hp.com/service_locator
- http://www.hp.com/support/manuals
- http://www.hp.com/support/downloads

Typographic conventions

Table 14 Document conventions

Convention	Element
Blue text: Table 14 (page 99)	Cross-reference links and e-mail addresses
Blue, underlined text: http://www.hp.com	Website addresses
Bold text	• Keys that are pressed • Text typed into a GUI element, such as a box • 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
`Monospace, italic` text	• Code variables • Command variables
`Monospace, bold` text	Emphasized monospace text

△ **CAUTION:** Indicates that failure to follow directions could result in damage to equipment or data.

⓪ **IMPORTANT:** Provides clarifying information or specific instructions.

NOTE: Provides additional information.