

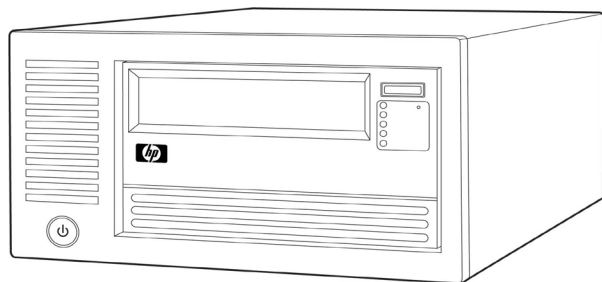
### Overview

The family of HP StorageWorks LTO Ultrium tape drives is HP's premier line of backup devices. Based on the LTO Ultrium format, an open standard with a well-defined six-generation roadmap, HP LTO Ultrium tape drives offer customers the best choice for investment protection. With ultimate reliability and ease of use in mind, even at 100% duty cycles, HP's rugged design builds on superior LTO technology and adds advanced features like hardware data encryption to create a new level of data protection. The tape drives employ dynamic data rate matching to adjust to the speed of the host, reducing wear and tear on both drive and media and increasing performance, even on slower hosts. HP's ultra-durable soft-load feature automatically positions the data cartridge together with the highly reliable HP leader-capture mechanism make your backup and restore operations more reliable. Support for HP One-Button Disaster Recovery provides the easiest way to restore data in the event of a disaster. The StorageWorks family of tape drives also features support for HP TapeAssure which provides a single application for drive management and HP Library and Tape Tools which provides diagnostics, and performance optimization. Included with the HP LTO Ultrium tape drives is Data Protector Express Basic backup and recovery software providing a backup application to protect a single server. If data is critical to your business, protect it with an HP StorageWorks LTO Ultrium tape drive.

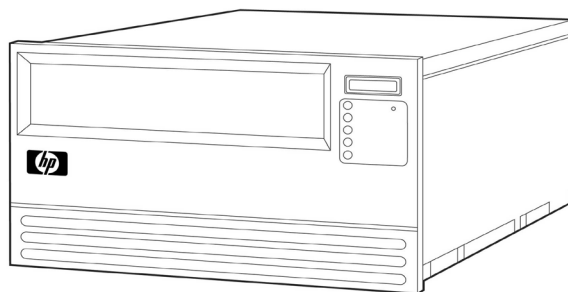
### HP StorageWorks LTO Ultrium Full-Height Tape Drives

#### HP StorageWorks LTO-5 Ultrium 3280 Tape Drive

HP StorageWorks LTO-5 Ultrium 3280 Tape Drive sets new standards for capacity, performance, and manageability. The Ultrium 3280 represents HP's fifth-generation of LTO tape drive technology capable of storing up to 3TB per cartridge while providing enterprise tape drive monitoring and management capabilities with HP TapeAssure and AES 256-bit hardware data encryption, easy-to-enable security to protect the most sensitive data and prevent unauthorized access of tape cartridges. Capable of data transfer rates up to 280MB/sec, HP's exclusive Data Rate Matching feature further optimizes performance by matching speed of host to keep drives streaming and increase the reliability of the drive and media. The Ultrium 3280 provides investment protection with full read and write backward support with LTO-4 media, and the ability to read LTO-3 cartridge. By nearly doubling the capacity of previous generation Ultrium drives, HP customers now require fewer data cartridges to meet their storage needs, significantly reducing their IT costs and increasing their ROI.



Ultrium 3280 External Tape Drive

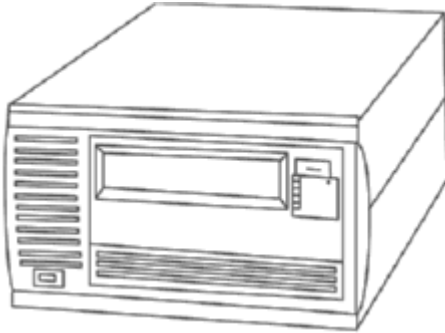


Ultrium 3280 Internal Tape Drive

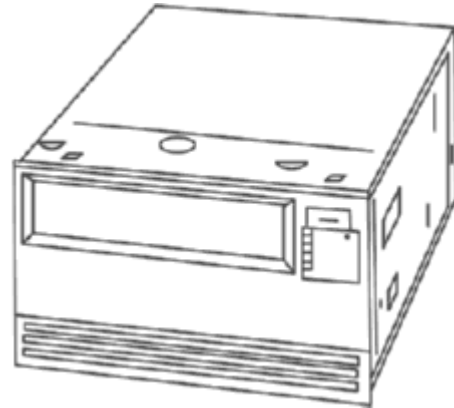
### Overview

#### HP StorageWorks LTO-4 Ultrium 1840 Tape Drive

HP StorageWorks LTO-4 Ultrium 1840 Tape represents HP's fourth-generation of LTO tape drive technology capable of storing up to 1.6TB per cartridge while providing hardware-based data encryption to enable greater levels of security and unprecedented performance. AES 256-bit hardware data encryption provides easy-to-enable security to protect the most sensitive data and prevent unauthorized access of tape cartridges. By using Ultrium 1840 hardware data encryption, not only is data fully capable of being compressed therefore maximizing capacity, encrypted backups are completed without a loss in performance. Capable of data transfer rates up to 240MB/sec, HP's exclusive Data Rate Matching feature further optimizes performance by matching speed of host to keep drives streaming and increase the reliability of the drive and media. The Ultrium 1840 provides investment protection with full read and write support with LTO-3 media, and the ability to read LTO-2 cartridge. By doubling the capacity of previous generation Ultrium drives, HP customers now require fewer data cartridges to meet their storage needs, significantly reducing their IT costs and increasing their ROI.



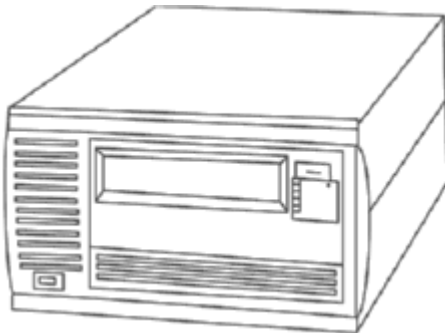
Ultrium 1840 External Tape Drive



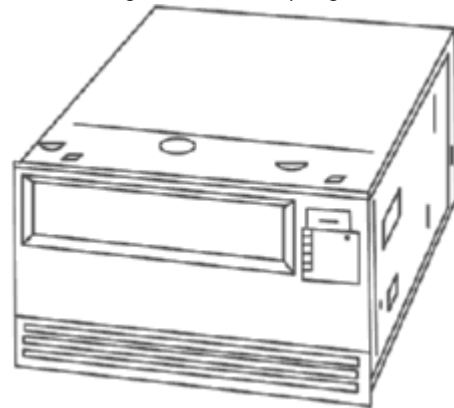
Ultrium 1840 Internal Tape Drive

#### HP StorageWorks LTO-3 Ultrium 960 Tape Drive

The HP StorageWorks LTO-3 Ultrium 960 tape drive delivers a capacity of 800 GB of compressed data on a single cartridge with a data transfer rate of 160MB/sec. The Ultrium 960 tape drive is fully read and write compatible with LTO-2 data cartridges, and offers a further degree of investment protection through its backward-read compatibility with LTO-1 media. For IT organizations with stringent, long-term data retention requirements, the Ultrium 960's WORM (Write-Once, Read-Many) media support offers a simple and secure method for archiving records as part of a compliance solution to meet the toughest of industry regulations.



Ultrium 960 External Tape Drive

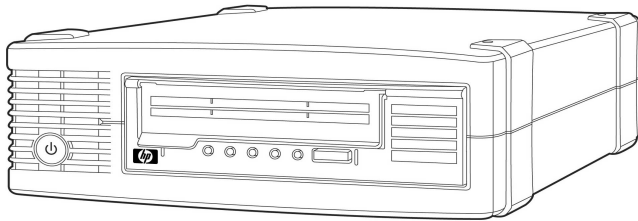


Ultrium 960 Internal Tape Drive

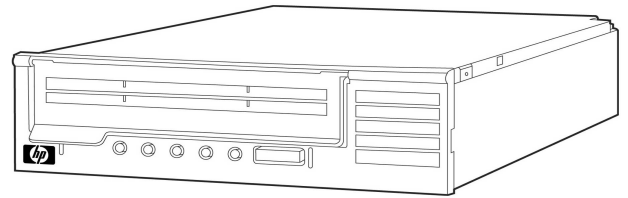
### Models

#### HP StorageWorks LTO-5 Ultrium 3000 Tape Drive

The HP StorageWorks LTO-5 Ultrium 3000 represents HP's fifth-generation of LTO tape drive technology capable of storing up to 3TB per cartridge while providing enterprise tape drive monitoring and management capabilities with HP TapeAssure and AES 256-bit hardware data encryption easy-to-enable security to protect the most sensitive data and prevent unauthorized access of tape cartridges. Capable of data transfer rates up to 1TB/Hour HP's exclusive Data Rate Matching feature further optimizes performance by matching speed of host to keep drives streaming and increase the reliability of the drive and media. HP LTO Ultrium half-height drives are designed for server customers in direct attached storage (DAS) environments where hard disk and system bottlenecks can impede data transfer rates. The Ultrium 3000 provides investment protection with full read and write backward support with LTO-4 media, and the ability to read LTO-3 cartridge. By nearly doubling the capacity of previous generation Ultrium drives, HP customers now require fewer data cartridges to meet their storage needs, significantly reducing their IT costs and increasing their ROI.



LTO-5 Ultrium 3000 External Tape Drive

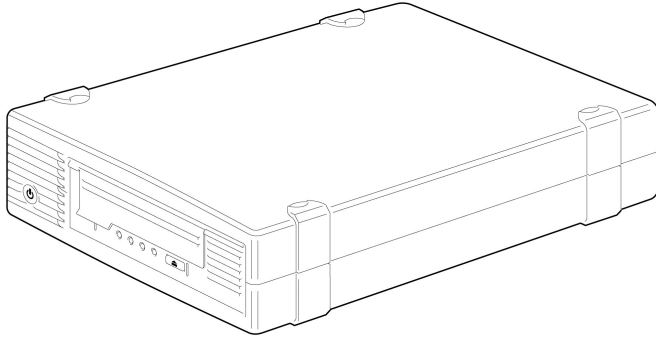


LTO-5 Ultrium 3000 Internal Tape Drive

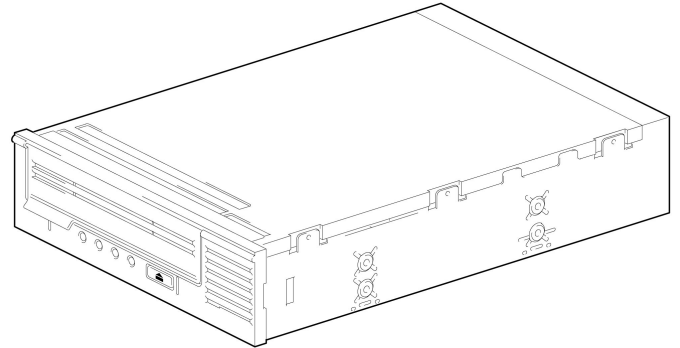
#### HP StorageWorks LTO-4 Ultrium 1760 Tape Drive

The HP StorageWorks LTO-4 Ultrium 1760 Tape Drive is HP's fourth-generation of half-height LTO tape drive technology capable of storing up to 1.6 TB per cartridge in under 3 hours. Available in both SCSI and SAS models, HP Ultrium half-height drives are designed for server customers in direct attached storage (DAS) environments where hard disk and system bottlenecks can impede data transfer rates. To further protect the most sensitive data, AES 256-bit hardware data encryption provides easy-to-enable security to prevent unauthorized access of tape cartridges. By using LTO-4 hardware data encryption, not only is data fully capable of being compressed therefore maximizing capacity, encrypted backups are completed without a loss in performance. Capable of data transfer rates up to 160 MB/sec, HP's exclusive Data Rate Matching feature further optimizes performance by matching speed of host to keep drives streaming and enabling the fastest performance of any tape drive in the industry. The Ultrium 1760 provides investment protection with full read and write support with LTO-4 and LTO-3 media, and the ability to read LTO-2 cartridge. By doubling the capacity of previous generation Ultrium drives, HP customers now require fewer data cartridges to meet their storage needs, significantly reducing their IT costs and increasing their ROI.

### Models



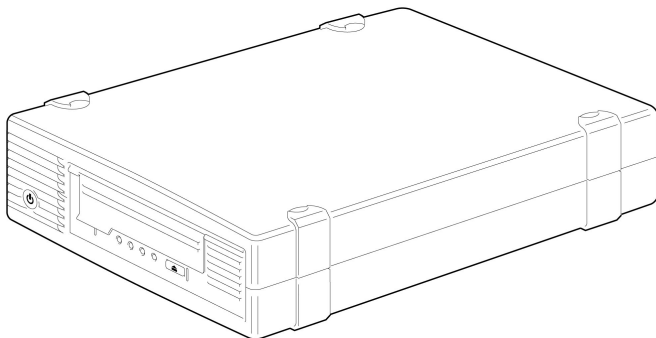
LTO-4 Ultrium 1760 External Tape Drive



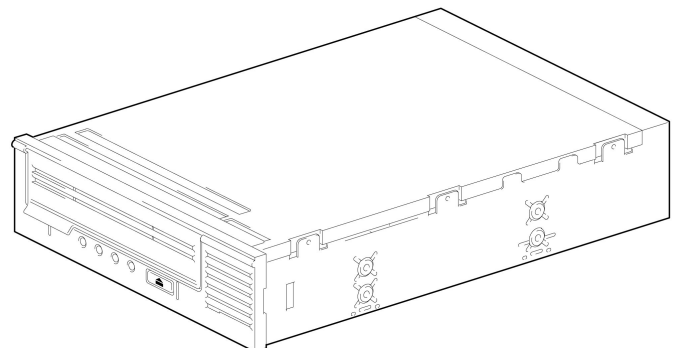
LTO-4 Ultrium 1760 Internal Tape Drive

### HP StorageWorks Ultrium 920 Tape Drive

The HP StorageWorks Ultrium 920 tape drive is HP's third generation of half-height LTO tape drive technology. The Ultrium 920 delivers a compressed storage capacity of 800 GB per data cartridge and a compressed data transfer rate of 432 GB per hour, two and a half times faster than the previous generation Ultrium 448 tape drive. Available in both SCSI and SAS models, the Ultrium 920 is ideal for midrange and departmental servers. The Ultrium 920 Tape Drive is fully read and write compatible with all second-generation Ultrium drives and media and offers further investment protection through its backward-read compatibility with first-generation Ultrium media. For IT organizations with stringent, long-term data retention requirements, the Ultrium 920's WORM (Write-Once, Read-Many) data protection feature offers a simple and secure method for archiving records as part of a compliance solution to meet the toughest of industry regulations.



Ultrium 920 External Tape Drive

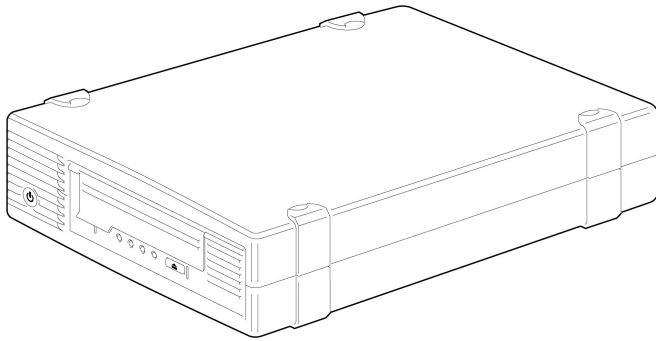


Ultrium 920 Internal Tape Drive

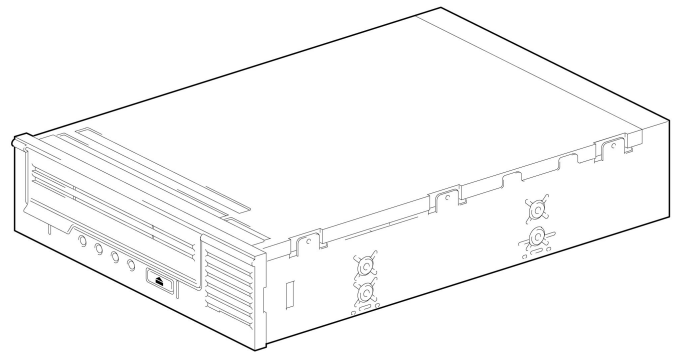
### Models

#### HP StorageWorks Ultrium 448 Tape Drive

The HP StorageWorks Ultrium 448 tape drive is HP's second generation of half-height LTO tape drive technology. Offering a choice of both SCSI and SAS models, this midrange capacity, low cost tape drive delivers a compressed storage capacity of 400 GB per data cartridge and a compressed data transfer rate of 172 GB per hour, double the capacity and one and a half times the performance of the Ultrium 232 tape drive. The Ultrium 448 tape drive is fully read and write compatible with all first- and second-generation Ultrium drives and media. These features, combined with low pricing, make the Ultrium 448 the ideal direct-attach and network backup solution for entry-level and midrange servers where capacity and low cost of ownership are critical. New SAS-based models allow for direct connect to SAS-based HP ProLiant servers via embedded SAS controller or SAS HBA.



Ultrium 448 External Tape Drive



Ultrium 448 Internal Tape Drive

### Features

#### Key Features

- **High-Capacity:** Large-capacity drive capable of storing up to 3TB (with LTO-5) of compressed storage on a single cartridge, requiring fewer data cartridges to meet storage needs, significantly reducing IT costs
- **Secure:** AES 256 bit data encryption and support for WORM media provide a secure method for long-term retention of critical data records
- **Fast:** Fast data transfer rate up to 280MB/sec (LTO-5) to meet demands of even the tightest backup window
- **Manageable:** HP StorageWorks TapeAssure provides life and health information, utilization and operational performance for media and drives. HP StorageWorks Library and Tape Tools (LTT) helps with installation, management, performance optimization, and troubleshooting
- **Affordable:** high capacity combined with low media cost delivers an exceptionally low cost of ownership and ensures a faster return on investment
- **Reliable:** HP's exclusive data rate matching feature automatically adjusts the drive's read and write speed based on the server and network environment, which increases performance, reduces mechanical wear on the drive, and extends tape life. Soft-load feature automatically takes the data cartridge and moves it into the load position. Advanced tape leader capture design ensures fail-safe cartridge loading. Active head cleaning provides automated cleaning that increases head life and reduces the need for using the cleaning cartridge. Lower power consumption for maximum reliability with minimum environmental costs
- **Compatible:** qualified/tested on all industry-leading operating systems, backup software and servers. Fully read-and-write compatible with LTO Ultrium drives and media from other manufacturers
- **Agile:** choice of models including internal, external, array module, and rack-mount to meet your backup configuration needs inside and outside of the server
- **Value:** Includes HP Data Protector Express Basic backup and recovery software, see: <http://www.hp.com/go/dataprotectorexpress/basic>
- **Easy:** HP One-Button Disaster Recovery (OBDR) makes it possible to quickly restore an entire system using a single tape cartridge in the event of a disaster
- **Investment Protection:** delivers a compelling technology roadmap that offers higher capacity and performance tape solutions with backward read and write compatibility for previous drive generations
- **Open:** based on the LTO technology open standard, delivering customers a greater choice of vendors and solutions without compromising compatibility across Ultrium products



### Product Highlights

**LTO Ultrium Technology** Linear Tape-Open technology was developed by three leaders in the storage industry - HP, IBM, and Quantum - who brought together their combined expertise in tape technology to develop an entirely new format based on the best of existing technologies. Because LTO Ultrium technology was a new format, it required no cumbersome support of legacy formats, so it could be designed without compromising on reliability or performance. The LTO Program, a consortium of the three technology provider companies, has developed a well-defined six-generation roadmap.

Ultrium LTO-2 tape drive technologies from HP use a linear format of 384 tracks and 512 tracks (respectively), writing eight tracks simultaneously. Ultrium LTO-3, LTO-4 and the new LTO-5 tape drive features a breakthrough in recording technology by writing sixteen tracks simultaneously on a linear format of 704 tracks, 896 tracks and 1280 tracks (respectively). The data is written in a serpentine pattern; the tape reverses direction after each set of tracks is written. This provides higher density recording, enabling customers to lower costs and increase efficiency by storing more data on a single tape in an industry standard format.

The LTO standard for backward compatibility is to write back one generation and read back two generations; therefore:

- First-generation LTO Ultrium drives (HP Ultrium 230, HP Ultrium 232) read and write LTO 1 media
- Second-generation LTO Ultrium drives (HP Ultrium 460, HP Ultrium 448) read and write LTO 1 and LTO 2 media.
- Third-generation LTO Ultrium drives (HP Ultrium 920, Ultrium 960) read and write LTO 2 and LTO 3 media and also read LTO 1 media.
- Fourth-generation LTO Ultrium drives (Ultrium 1840, Ultrium 1760) read and write LTO 3 and LTO 4 media and also read LTO 2 media.
- Fifth-generation LTO Ultrium drives (Ultrium 3280, Ultrium 3000) read and write LTO 4 and LTO 5 media and also read LTO 3 media.

As part of the LTO open standard, all HP tape drives and media offer the same standards of compatibility with tape drives and media manufactured by other LTO vendors.

LTO data compression (LTO-DC) is an enhanced version of Advanced Lossless Data Compression (ALDC) hardware compression. Compression is automatically turned off if the compressed data would cause an overall expansion in data size, hence optimizing the available capacity on the media. Data compression is also turned off if data is found to be uncompressible; thus, allowing for better data scans. The system is used in all Ultrium tape drives.

The decision about which tape technology you should buy next should be based on your future, not your past, investment. Choose the Ultrium format when you need the following advantages:

- Maximum reliability, capacity and performance
- Compatibility with a broad range of operating systems and servers (e.g., a mixed system environment)
- A legacy-free technology that uses the best attributes from a wide range of tape technologies without any compromises for backward compatibility requirements
- A solid roadmap for future generations of the technology
- An open format available from multiple vendors
- Lowest media cost of any 'superdrive' tape technology



### Product Highlights

#### Hardware Based Encryption

HP LTO-4 and 5 Ultrium tape drives support hardware-based encryption to enable greater levels of security:

- AES 256-bit Encryption
  - Easy-to-enable encryption for a secure backup
  - Helps prevent unauthorized accessed of tape media if cartridges are lost or stolen
  - Eliminates the need to purchase and manage additional h/w
- No loss in performance of backup
- The included HP Data Protector Express Basic backup and recovery software supports LTO-4 and LTO-5 encryption and makes writing encrypted backups simple. A passphrase is entered and Data Protector Express Basic creates and manages the encryption key.

For more information visit: <http://www.hp.com/go/encryption>

#### TapeAssure

HP StorageWorks TapeAssure makes managing, optimizing and archiving on the HP LTO Ultrium tape drives easier. This tool provides additional management and monitoring capabilities including:

- Life and health information for media and drives
- Information on media and drive utilization and operational performance
- Notifications of drive and media characteristics that fall below HP recommended standards

TapeAssure health reports and alerts give you peace of mind knowing the condition of the drives, the tapes and the data on each tape. TapeAssure monitors every backup to ensure the highest standards of reliability, sends alerts when these standards are not met, and ensures that you can maintain the drives and tapes used in an archive environment to have the highest integrity.

TapeAssure builds a database of drive and tape history information that you can export as .CSV (comma-separated-value) files and import into Excel or other tools to create pivot-charts, pie charts and bar charts for graphical presentation or further analysis. This data can be automatically exported on a schedule or on demand and written to a local or network drive where analysis scripts can also be run.

Instructions and downloads of HP TapeAssure are available at:  
<http://www.hp.com/go/TapeAssure>

#### Linear Tape File System (LTFS)

HP LTFS makes tape self-describing, file-based, and easy-to-use, it also provides users with the ability to use standard file operations on tape media for accessing, managing and sharing files with an interface that behaves just like a hard disk. In addition, LTFS provides the ability to share data across platforms, as you would with a USB drive or memory stick. Simply load a tape into the drive, mount it into the file system, and it becomes visible as a disk.

For more information, including user guide, downloads and compatibility, visit:  
<http://www.hp.com/go/TapeAssure>





### Product Highlights

#### Data Rate Matching

Data Rate Matching combines sophisticated buffer management with HP's exclusive Variable Adaptive Tape Speed technology to allow the tape drive to match its transfer rate to the host speed dynamically and continuously across the wide range of transfer rates. This feature ensures that the tape drive continues to stream data regardless of the environment, and brings two big advantages:

- It optimizes backup performance, regardless of the speed of the host or the network
  - It minimizes rewinding and repositioning of the tape, reducing wear and increasing reliability
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#### WORM (Write-Once, Read-Many) Drive and Media Support

Critical to the success of data retention policies in highly regulated environments is the ability to store and manage data in an unalterable state. Following stringent guidelines set forth by regulatory agencies such as the SEC and HIPAA, IT organizations must now integrate new solutions and policies that can verify the integrity of stored data for periods that can extend well beyond seven years.

LTO-3, 4 and 5 tape drives feature the ability to archive and store data in a non-rewriteable format that meets the most stringent regulatory guidelines. Using a combination of integrated fail-safe features in the drive firmware, cartridge memory, and tape formatting, LTO Ultrium drives can archive large amounts of data for periods of up to 30 years in a secure, untampered state. Since all LTO-3, 4 and 5 tape drives include support for both rewritable and WORM media, IT organizations can now easily integrate a secure, long-term archiving solution into their current data protection strategy. As compared to other technologies that feature support for WORM storage, LTO-3, 4 and 5 offers the advantages of:

- A single drive to support all backup and archiving needs
- Two distinctive tape cartridges to easily distinguish and manage both rewriteable and WORM data cartridges
- A specially designed WORM data cartridge with multiple integrated fail-safe features to prevent accidental or intentional overwriting of data
- High-capacity, low-cost HP WORM media that can store 800GB (LTO-3), 1.6TB (LTO-4) or 3TB (LTO-5) of data on a single data cartridge
- Support from many backup and archiving software vendors, providing the most comprehensive and mainstream support in the industry
- The LTO open standard that offers greater choice and compatibility across all third-generation Ultrium products

**NOTE:** While all HP LTO-3, 4 and 5 tape drives support LTO Ultrium WORM media, some third-generation LTO Ultrium tape drives from other manufacturers may not include read and write support for LTO Ultrium WORM media. For non-HP LTO-3 and LTO-4 tape drives, please check the manufacturers' specifications to ensure this support is provided if you are using your WORM media. If WORM support is not provided, the drive will eject the WORM tape cartridge immediately upon insertion into the tape drive.

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### Product Highlights

#### HP OBDR (One-Button Disaster Recovery)

One-Button Disaster Recovery is an HP exclusive feature that provides fast and simple disaster recovery through the use of an HP tape drive. OBDR is a firmware-driven utility that can restore a server's operating system, software applications, and data using a single tape cartridge. Depending on the size of the data set, OBDR can provide system recovery in less than one hour, reducing the recovery window by more than 50 percent and minimizing the risks and costs associated with downtime. There's no longer a need to search for software disks and manuals or make a new set of disaster recovery disks each time the network configuration is altered or a peripheral is added. The sheer simplicity of OBDR means less human error. Backup and disaster recovery preparation, previously two separate tasks, now become one process. For more information about OBDR, visit the HP website at: <http://www.hp.com/go/obdr>.

For a current list of servers, workstations, and software that support OBDR, check the tape backup compatibility pages on the HP website at: <http://www.hp.com/storage/SPOCK>.

#### Included Software

The HP StorageWorks Ultrium tape drives include HP Data Protector Express Basic backup and recovery software. Data Protector Express Basic is based on HP Data Protector Express software. It is an easy-to-use backup and recovery application that is installed in minutes and includes all the features needed to protect a single machine by backup to a HP StorageWorks tape drive. Data Protector Express Basic includes pre-defined and customizable media rotation schemes so you can define when you backup and how long your backups are retained, while easily managing your LTO data cartridges. Up to 4 parallel data streams keep the high-speed Ultrium tape drives streaming. Data Protector Express Basic supports all the features of the Ultrium tape drives. LTO-4 and LTO-5 data encryption can be specified for any backup job and is configured using the easy-to-manage interface. The Data Protector Express Basic Bare Metal Disaster Recovery (BMDR) feature supports the One Button Disaster Recovery capability of the Ultrium tape drives for fast and automated recovery of a ProLiant server after a major disaster. Backup to LTO WORM media is supported. Backup data compression can be turned on or off as part of the backup job specifications.

For more information please visit: <http://www.hp.com/go/dataprotectorexpress/basic>.

**NOTE:** Data Protector Express 5.0 Basic replaces Data Protector Express Single Server Edition as the software included with the HP StorageWorks LTO Ultrium tape drives. If your tape drive includes Data Protector Express Single Server Edition you should register this. At the end of the registration process you will be able to download Data Protector Express Basic.

#### Easy and economical upgrade of the included software to Data Protector Express

**NOTE:** Data Protector Express Basic will run in evaluation mode for up to 60 days from installation. For continued use a free permanent license key is acquired by registration at <https://webware.hp.com>. For more information see [www.hp.com/go/dataprotectorexpress/basic/register](http://www.hp.com/go/dataprotectorexpress/basic/register)

An additional benefit is a discount to the purchase of Data Protector Express. This discount is delivered using a special part number only available for customers of HP StorageWorks tape products. Part number TC333AAE enables Data Protector Express Basic to be upgraded to Data Protector Express for 1 Server at a significant discount to the regular buy price. Upgrading to Data Protector Express for 1 Server unlocks all the features of Data Protector Express while retaining all the jobs and settings created while using Data Protector Express Basic. Once upgraded to Data Protector Express for 1 Server, additional licenses can be purchased to protect other servers and to take advantage of the unique and all inclusive licensing of Data Protector Express.

For more information please visit: <http://www.hp.com/go/dataprotectorexpress/basic/upgrade>.

If the HP StorageWorks Ultrium tape drive is for a large environment that requires UNIX support and/or enterprise class application and feature support then HP Data Protector is the recommended backup and recovery software. There is no upgrade path from Data Protector Express Basic or Data Protector Express



### Product Highlights

to Data Protector. If current or future requirements will require Data Protector, this software should be installed from day 1. For more information and evaluation software please visit:  
<http://www.hp.com/go/dataprotector>.

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#### HP Ultrium Storage Media

HP recommends that you use HP-branded cartridges in your HP Ultrium tape drive to assure the highest level of protection for your valuable data. Our test program for HP Ultrium media is the most thorough and comprehensive in the industry.

All HP cartridges must satisfy an exhaustive battery of additional tests that relate directly to real life situations, where real data and real businesses are at stake. The benefit of the HP brand specification for media is consistent quality. Through the testing of thousands of HP drives and HP cartridges, the ideal formulation for backup performance is defined and then continuously monitored. This hugely resource-intensive process is unique to HP and affords deep insight into the HP+HP backup solution for a wide range of environments and duty cycles. Your best choice for ease of support and maximum dependability is to use HP-branded Ultrium cartridges at all times.

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#### Diagnostics

HP LTO Ultrium tape drives and automation are supported by HP StorageWorks Library and Tape Tools (LTT). This tool is intended to help in the installation and maintenance of HP tape drives and devices, including:

- Verifies installation of the drive
- Test/verify the health of the drive and media
- Provides HP support with detailed device information
- Multiple options for finding and upgrading new firmware
- Performance optimization and recommendations
- Included with each Ultrium tape drive and available via free download supporting all HP tape products

Instructions and downloads of Library and Tape Tools are available at:  
[http://www.hp.com/country/us/eng/software\\_drivers.html](http://www.hp.com/country/us/eng/software_drivers.html)



### Compatibility

HP's extensive compatibility testing program assures that your HP StorageWorks Ultrium tape drive works with leading servers, operating systems, and backup applications - and not just those sold by HP. HP Ultrium tape drives work seamlessly on many platforms, making them especially suitable if you have a mixed system environment. For the latest list of servers, workstations, operating systems, and backup software that support HP Ultrium tape drives, check the tape backup compatibility pages on our Web site at: <http://www.hp.com/storage/SPOCK>

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#### Server Compatibility

HP StorageWorks Ultrium tape drives are supported on the following classes of HP systems:

- HP ProLiant DL servers
- HP ProLiant ML servers
- HP Integrity servers
- HP 9000 servers
- HP AlphaServers
- HP workstations

HP StorageWorks Ultrium tape drives are also supported on server platforms from third-party manufacturers including:

- Dell
- IBM
- Sun

For details of which tape drive models work with which systems, including third-party systems, visit: <http://www.hp.com/storage/SPOCK> for the latest hardware compatibility information.

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#### OS Support

Microsoft® Windows, HP-UX, Tru64, Red Hat Linux, SUSE Linux, IBM-AIX, Sun Solaris and other operating systems.

**NOTE:** Please visit: <http://www.hp.com/storage/SPOCK> for the latest compatibility information.

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#### Backup Software Support

Supported with HP Data Protector, HP Data Protector Express Basic (included), HP Data Protector Express, CA ARCserve Backup, EMC NetWorker, EMC Retrospect, IBM Tivoli Storage Manager, Symantec NetBackup, Symantec Backup Exec, BakBone NetVault, Commvault Galaxy, Tolis Group BRU and Yosemite Backup

**NOTE:** Please visit: <http://www.hp.com/storage/SPOCK> for the latest compatibility information.

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### Compatibility

#### SAS Installation

HP StorageWorks SAS tape drives are available as internal and external models. Both models are supplied with SAS cables that allows you to connect to an internal port (if available) on the embedded SAS controller inside the server.

Some server models will allow direct connect to a spare SAS connector on the native SAS controller. Other servers which do not have a spare connector might require you to reconfigure hard disk drive bays and in a few instances, you may also lose the use of one of the hard disk drive bays and will need to rebuild your RAID configuration. In these configurations the simple, recommended solution is connecting to an option SAS host bus adapter and optional SAS cable.

For the most up-to-date information about recommended SAS HBAs and supported cabling configurations with your make and model of server, always refer to: <http://www.hp.com/storage/SPOCK>

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#### Cables and Termination

All cables required for a typical internal and external connection to HP servers are provided with your tape drive. For non-HP servers, please consult your manufacturers' server specifications to determine if the cable provided with your LTO Ultrium tape drive is appropriate for use with that server.

No terminator is required for SCSI internal models (assumes use of terminated cable). The SCSI external model features "auto-termination" - no terminator is required.

SAS-based Ultrium models ship with SAS cable which allows direct attach from embedded SAS controller.

**NOTE:** Visit: <http://www.hp.com/storage/SPOCK> for the latest compatibility information.

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#### Performance Tuning

There are several tools to assist in this area at <http://www.hp.com/support/pat>

HP TapePerf - will run data to an LTO drive direct from memory to prove the drive is capable of high performance if the data supply rate is fast enough.

HP Readdata - will read data from your primary storage device e.g. EVA disk array, and tell you how fast the array can supply multiple streams of data

HP CreateData - this tool generates data of a known size and compressibility for benchmarking purposes.



### Service and Support, HP Care Pack, and Warranty Information

**Warranty and Services Included with the Product** Hewlett-Packard provides a 3-year, next-day, product exchange, limited warranty for all the StorageWorks Ultrium Tape Drives, plus 9x5 phone support for the duration of the warranty.

For more information about HP's Global Limited Warranty and Technical Support, visit:  
[ftp://ftp.compaq.com/pub/products/storageworks/warranty/EN\\_321708-008.pdf](ftp://ftp.compaq.com/pub/products/storageworks/warranty/EN_321708-008.pdf)

**HP Care Pack Services:** Packaged server and storage services for increased uptime, productivity and ROI  
When you buy HP server and storage products and solutions, it's also a good time to think about what levels of support you may need. Our portfolio of service options reduce deployment and management worries while helping you get the most out of your server and storage investments. We take a holistic approach to your environment, bridging servers, blades, storage, software and network infrastructures with our packaged HP Care Pack Services for servers and storage.

#### Protect your business beyond warranty

When it comes to robustness and reliability, standard computing equipment warranties have matured along with technology. Good news that can also create problems stemming from depending on standard warranties designed to only protect against product defects and some downtime causes. Using a standard approach to warranty uplifts, such as HP Care Pack Services, helps reduce downtime risks and provides operational consistency for mission-critical and standard business computing.

#### HP Care Pack Services: Upgrading or extending standard server and storage warranties cost effectively

HP Care Pack Services offer a standard reactive hardware and software support services suite sold separately, or combined with our Support Plus and Support Plus 24 services. The portfolio also provides a combination of integrated proactive and reactive services, such as Proactive 24 Service and Critical Service. In addition with HP Proactive Select, you can acquire the specific proactive constancy and technical services. HP Proactive Select menu offers a broad set of service options that you can mix and match depending on your specific requirements. Proactive service options include offers for server, storage, network, SAN device, software, environment and education services.

HP server and storage lifecycle support services offers a full spectrum of customer care-from technology support to complex migrations to complete managed services. HP Factory Express provides customization, integration and deployment services for turnkey solutions. HP Education Services offer flexible, comprehensive training on to help your IT staff get the most out of your server and storage investments. HP Financial solutions extend innovative financing and cost-effective asset management programs-from purchase to equipment retirement.

Learn more: [www.hp.com/services/servers](http://www.hp.com/services/servers) and [www.hp.com/services/storage](http://www.hp.com/services/storage)

**NOTE:** Care Pack Services availability may vary by product and country.

HP Care Pack Services are sold by HP and HP Authorized Service Partners:

- Services for customers purchasing from HP or an enterprise reseller are quoted using HP order configuration tools.
- Customers purchasing from a commercial reseller can find HP Care Pack Services at <http://www.hp.com/go/lookuptool>

## Recommended HP Care Pack Services for optimal satisfaction with your HP product.

### Recommended Support 3-Year HP Support Plus 24

For a higher return on your storage investment, HP Support Plus 24 provides integrated hardware and software support services designed specifically for your technology. Available 24x7, this 3-year combined reactive support option delivers onsite hardware support and over-the-phone software support around-the-clock. Leverage the full strength of HP Technology Services - customers can trust the services



### Service and Support, HP Care Pack, and Warranty Information

professionals at HP to work collaboratively with them, putting our strategic and technical know-how to work across their entire infrastructure.

- Improve uptime with responsive hardware and software services
- Enjoy consistent service coverage across geographically dispersed sites
- Update HP software at a predictable cost
- Increase customer satisfaction-with no interoperability gaps

<http://h20195.www2.hp.com/V2/GetPDF.aspx/5981-6638EEE>

Important Notice for Tape Drives Installed in a 1U or 3U Rack Mount Kit **NOTE:** These Care Packs do not apply to Tape Drives mounted in a 1U or 3U Rack Mount Kit. The HP Rack Mount Kit Care Pack covers the all possible configurations of Tape Drives. Hence the Care Packs for 1U & 3U Rack Mount Kit covers all encumberant drives.

Please follow the following url for the correct Care Pack Services and descriptions:

[http://h18000.www1.hp.com/products/quickspecs/10854\\_div/10854\\_div.pdf](http://h18000.www1.hp.com/products/quickspecs/10854_div/10854_div.pdf)

Important Notice for Internal Tape Drives Installed in an HP Server

**NOTE:** These Care Packs do not apply to Internal Tape Drives because they do not have Care Packs associated with them if they are mounted in an HP Server. Hence the Care Packs for the HP Server covers all encumberant drives.

Please follow the following url for the correct Care Pack Services and descriptions:

For ProLiant use:

<http://h18000.www1.hp.com/products/quickspecs/ProductBulletin.html>

For BCS use:

<http://h18000.www1.hp.com/products/quickspecs/ProductBulletin.html>

Important Notice for Tape Drive Modules Installed in an HP Tape Array

**NOTE:** These Care Packs do not apply to Tape Drives mounted in an HP Tape Array because they do not have Care Packs associated with them. Hence the Care Packs for the HP Tape Array covers all encumberant drives.

Please follow the following url for the correct Care Pack Services and descriptions:

[http://h18000.www1.hp.com/products/quickspecs/11878\\_div/11878\\_div.pdf](http://h18000.www1.hp.com/products/quickspecs/11878_div/11878_div.pdf)

### Recommended Deployment

#### HP Installation Service

For smooth startup and better business outcomes, HP Hardware Installation - this service provides initial hardware installation of your product into your technology environment (system configuration is not included). In today's new era of business technology- customers can trust the services professionals at HP to work collaboratively with them, putting our strategic and technical know-how to work across their entire infrastructure.

- Allows your IT resources to stay focused on their core tasks and priorities
- Reduces implementation time, impact and risk to your storage environment

<http://h71028.www7.hp.com/ERC/downloads/5981-9356EN.pdf>



Service and Support, HP Care Pack, and Warranty Information

### Optional HP Care Pack Services that will enhance your HP product experience.

#### Related Services

#### 5-Year HP Support Plus 24

As an alternative to our recommended support level, for customers who need to improve uptime with responsive 24x7 product support:

HP Support Plus 24 helps you increase performance and availability with comprehensive, consistent hardware and software services. Working with your IT team, HP Services engineers deliver onsite hardware support and over-the-phone software support around-the-clock 365 days per year. Service coverage encompasses HP products and selected multivendor hardware and software.

In addition, this convenient HP Care Pack packaged service makes software updates available to you at substantial savings.

Choose Support Plus 24 when you need to:

- Improve uptime with responsive hardware and software services available anytime
- Cost-effectively obtain expert 24x7 multivendor hardware and software support
- Enjoy consistent service coverage across geographically dispersed sites
- Update HP and selected third-party software at a predictable cost
- Take advantage of subscription savings on software updates

<http://h20195.www2.hp.com/V2/GetPDF.aspx/5981-6638EN.pdf>

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#### eSupport

HP eSupport is a portfolio of technology-based services that assist you with managing your business environment - from the desktop to the data center.

#### Support Portal

The HP support portal provides one-stop access to the information, tools and services you need to manage the daily operations of your IT environment.

Features include:

- Access to self-solve tools (including search technical knowledge base)
- Efficient logging and tracking of support cases
- Collaboration with other business and IT professionals
- Download of patches and drivers
- Access to diagnostic tools
- Proactive notification of relevant information

Access to certain features of the support portal requires an HP service agreement. To access the support portal, visit: <http://www.hp.com/support>

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### Service and Support, HP Care Pack, and Warranty Information

#### Customer Technical Training

##### HP Education Services

In today's cost-conscious business environment, IT professionals, developers, consultants and users face an interesting challenge: how to keep up with the latest technologies and expand important skills while delivering profitable results on current projects. To help address this challenge, HP offers innovative training solutions that help keep you up-to-date on virtualization, server, storage, Insight Control, Citrix, Microsoft® and open source/Linux-related topics-while spending less time away from business-critical activities.

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#### HP Services Awards

HP Technology Services continues to be recognized for service and support excellence by customers, partners, industry organizations and publications around the world. Recent honors and award reflect our services team's dedications, technical expertise, professionalism and uncompromising commitment to customer satisfaction.

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#### Additional Services Information

To learn more on HP ProLiant servers, HP BladeSystem servers and HP StorageWorks storage products, please contact your HP sales representative or HP Authorized Channel Partner. Or visit: [www.hp.com/services/proliant](http://www.hp.com/services/proliant) or [www.hp.com/services/bladepystem](http://www.hp.com/services/bladepystem) or <http://www.hp.com/hps/storage>

To learn more on HP ProLiant servers, HP BladeSystem servers and HP StorageWorks storage products, please contact your HP sales representative or HP Authorized Channel Partner. Or visit: [www.hp.com/services/proliant](http://www.hp.com/services/proliant) or [www.hp.com/services/bladepystem](http://www.hp.com/services/bladepystem) or <http://www.hp.com/hps/storage>



### Options

#### HP StorageWorks LTO Ultrium Full-Height Tape Drives

Model Name/Kit	Contents Description	Part Number
LTO-5 Ultrium 3280 tape drives	<p>LTO-5 Ultrium 3280 SAS Internal</p> <ul style="list-style-type: none"> <li>HP StorageWorks LTO-5 Ultrium 3280 SAS Internal Tape Drive</li> <li>HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities, user manuals and Windows drivers)</li> <li>HP Data Protector Express Basic backup and recovery software CD</li> <li>HP Ultrium 3 TB Data Cartridge; Ultrium Cleaning Cartridge</li> <li>multi-language labels</li> <li>mini-SAS SFF8482 to SFF8087 cable</li> <li>performance tuning poster</li> <li>documentation</li> </ul> <p><b>NOTE:</b> OD1 will appear after this part number on your sales order if factory integration into a server or rack-mount enclosure is indicated.</p>	EH899A
	<p>LTO-5 Ultrium 3280 SAS External</p> <ul style="list-style-type: none"> <li>HP StorageWorks LTO-5 Ultrium 3280 SAS External Tape Drive;</li> <li>HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities, user manuals and Windows drivers);</li> <li>HP Data Protector Express Basic backup and recovery software CD;</li> <li>HP Ultrium 3 TB Data Cartridge;</li> <li>Ultrium Cleaning Cartridge;</li> <li>multi-language labels;</li> <li>power cord;</li> <li>mini-SAS SFF8088 to SFF8088 cable;</li> <li>performance tuning poster;</li> <li>documentation.</li> </ul>	EH900A
	<p>LTO-5 Ultrium 3280 SAS Rack-mount - single drive installed in a 3U Rack-mount kit</p> <ul style="list-style-type: none"> <li>3U 6Gb SAS rack-mount enclosure kit with power supply and fan</li> <li>one internal LTO-5 Ultrium 3280 SAS Tape Drive;</li> <li>power cord;</li> <li>HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities, user manuals and Windows drivers)</li> <li>HP Data Protector Express Basic backup and recovery software CD</li> <li>HP Ultrium 3 TB Data Cartridge</li> <li>Ultrium Cleaning Cartridge</li> <li>multi-language labels</li> <li>documentation</li> </ul> <p><b>NOTE:</b> OD1 will appear after this part number on your sales order if factory integration into a rack is indicated.</p>	EJ013A
Model Name/Kit	Contents Description	Part Number
LTO-4 Ultrium 1840 tape drives	<p>LTO-4 Ultrium 1840 SAS Internal</p> <ul style="list-style-type: none"> <li>HP StorageWorks LTO-4 Ultrium 1840 SAS Internal Tape Drive</li> <li>HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities, user manuals and Windows drivers)</li> <li>HP Data Protector Express Basic backup and recovery software CD</li> <li>HP Ultrium 1.6 TB Data Cartridge</li> <li>Ultrium Cleaning Cartridge</li> <li>multi-language labels</li> </ul>	EH860A



### Options

- mini-SAS SFF8482 to SFF8087 cable
  - performance tuning poster
  - documentation.
- NOTE:** OD1 will appear after this part number on your sales order if factory integration into a server or rack-mount enclosure is indicated.

#### LTO-4 Ultrium 1840 SAS External

EH861A

- HP StorageWorks LTO-4 Ultrium 1840 SAS External Tape Drive
- HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities, user manuals and Windows drivers)
- HP Data Protector Express Basic backup and recovery software CD
- HP Ultrium 1.6 TB Data Cartridge
- Ultrium Cleaning Cartridge
- multi-language labels
- power cord
- mini-SAS SFF8088 to SFF8088 cable
- performance tuning poster
- documentation.

#### LTO-4 Ultrium 1840 SCSI Internal

EH853A

- HP StorageWorks LTO-4 Ultrium 1840 SCSI Internal Tape Drive
  - HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities, user manuals and Windows drivers)
  - HP Data Protector Express Basic backup and recovery software CD
  - HP Ultrium 1.6 TB Data Cartridge
  - Ultrium Cleaning Cartridge
  - multi-language labels
  - internal SCSI cable
  - performance tuning poster
  - documentation.
- NOTE:** OD1 will appear after this part number on your sales order if factory integration into a server or rack-mount enclosure is indicated.

#### LTO-4 Ultrium 1840 SCSI External

EH854A

- HP StorageWorks LTO-4 Ultrium 1840 SCSI External Tape Drive
- HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities, user manuals and Windows drivers)
- HP Data Protector Express Basic backup and recovery software CD
- HP Ultrium 1.6 TB Data Cartridge
- Ultrium Cleaning Cartridge
- multi-language labels
- power cord
- 68-pin HD to 68-pin VHDCI multi-mode SCSI cable
- performance tuning poster
- documentation.

#### LTO-4 Ultrium 1840 SCSI Array Module (for use with HP StorageWorks Tape Array 5300)

EH856A

- HP StorageWorks LTO-4 Ultrium 1840 offline hot-swap array module
- HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities, user manuals and Windows drivers)
- HP Data Protector Express Basic backup and recovery software CD
- HP Ultrium 1.6 TB Data Cartridge
- Ultrium Cleaning Cartridge



### Options

- multi-language labels
- documentation.  
**NOTE:** 0D1 will appear after this part number on your sales order if factory integration is indicated.

LTO-4 Ultrium 1840 SCSI Rack-mount - single drive installed in a 3U Rack-mount kit EH926A

- Wide SCSI LVD 3U SCSI rack-mount enclosure kit with power supply and fan
- one internal LTO-4Ultrium 1840 SCSI Tape Drive
- power cord
- HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities, user manuals and Windows drivers)
- HP Data Protector Express Basic backup and recovery software CD
- HP Ultrium 1.6 TB Data Cartridge
- Ultrium Cleaning Cartridge
- multi-language labels
- documentation.  
**NOTE:** 0D1 will appear after this part number on your sales order if factory integration into a rack is indicated.

**Model Name/Kit Contents Description** **Part Number**

LTO-3 Ultrium 960 tape drives

LTO-3 Ultrium 960 SCSI Internal Q1538A

- HP LTO-3 Ultrium 960 Internal SCSI Tape Drive
- HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities, user manuals and Windows drivers)
- HP Data Protector Express Basic backup and recovery software CD
- HP Ultrium 800 GB Data Cartridge
- HP Ultrium Cleaning Cartridge
- multi-language labels
- internal SCSI cable
- performance tuning poster
- documentation.  
**NOTE:** 0D1 will appear after this part number on your sales order if factory integration into a server or rack-mount enclosure is indicated.

LTO-3 Ultrium 960 SCSI External Q1539B

- HP StorageWorks LTO-3 Ultrium 960 External SCSI Tape Drive
- HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities, user manuals and Windows drivers)
- HP Data Protector Express Basic backup and recovery software CD
- HP Ultrium 800 GB Data Cartridge
- Ultrium Cleaning Cartridge; multi-language labels
- power cord
- 68-pin HD to 68-pin VHDCI multi-mode SCSI cable
- performance tuning poster
- documentation.

LTO-3 Ultrium 960 SCSI Array Module (for use with HP StorageWorks Tape Array 5300) Q1540A

- HP StorageWorks LTO-3 Ultrium 960 offline hot-swap array module
- HP StorageWorks Tape CD-ROM (includes HP StorageWorks Library and Tape Tools utilities, user manuals and Windows drivers)
- HP Data Protector Express Basic backup and recovery software CD
- HP Ultrium 800 GB Data Cartridge



### Options

- Ultrium Cleaning Cartridge
- multi-language labels
- documentation.

**NOTE:** OD1 will appear after this part number on your sales order if factory integration is indicated.

LTO-3 Ultrium 960 SCSI Rack-mount - single drive installed in a 3U Rack-mount kit

Q1595B

- Wide SCSI LVD 3U SCSI rack-mount enclosure kit with power supply and fan
- one internal LTO-3 Ultrium 960 Tape Drive
- power cord
- HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities, user manuals and Windows drivers)
- HP Data Protector Express Basic backup and recovery software CD
- HP Ultrium 800 GB Data Cartridge
- Ultrium Cleaning Cartridge
- multi-language labels
- documentation.

**NOTE:** OD1 will appear after this part number on your sales order if factory integration into a rack is indicated.

**NOTE:** Data Protector Express Basic replaces Data Protector Express Single Server Edition as the software included with the HP StorageWorks LTO Ultrium tape drives. If your tape drive includes Data Protector Express Single Server Edition you should register this. At the end of the registration process you will be able to download Data Protector Express Basic.

## HP StorageWorks LTO Ultrium Half-Height Tape Drives

Model Name/Kit	Contents Description	Part Number
LTO-5 Ultrium 3000 tape drives	LTO-5 Ultrium 3000 SAS Internal <ul style="list-style-type: none"> <li>• HP StorageWorks LTO-5 Ultrium 3000 Internal SAS Tape Drive</li> <li>• HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities and localized user manuals)</li> <li>• HP Data Protector Express Basic software CD</li> <li>• HP LTO5 Ultrium 3 TB RW Data Cartridge</li> <li>• mini-SAS SFF8482 to SFF8087 cable</li> <li>• documentation.</li> </ul> <p><b>NOTE:</b> OD1 will appear after this part number on your sales order if factory integration is indicated.</p>	EH957A
	LTO-5 Ultrium 3000 SAS External <ul style="list-style-type: none"> <li>• HP StorageWorks LTO-5 Ultrium 3000 External SAS Tape Drive</li> <li>• HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities and localized user manuals)</li> <li>• HP Data Protector Express Basic software CD</li> <li>• HP LTO5 Ultrium 3 TB RW Data Cartridge</li> <li>• power cord</li> <li>• mini-SAS SFF8088 to SFF8088 cable</li> <li>• documentation.</li> </ul>	EH958A
	LTO-5 Ultrium 3000 SAS Rack-mount - single drive bundled with a 1U Rack-mount kit <ul style="list-style-type: none"> <li>• 6Gb SAS rack-mountable enclosure (1U) with power supply and fan</li> <li>• rail kit</li> </ul>	EJ014A



### Options

- one internal LTO-5 Ultrium 3000 SAS tape drive
- power cord
- HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities and localized user manuals)
- HP Data Protector Express Basic software CD
- HP LTO5 Ultrium 3 TB RW Data Cartridge
- documentation.  
**NOTE:** OD1 will appear after this part number on your sales order if factory integration into a rack is indicated.

Model Name/Kit	Contents Description	Part Number
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LTO-4 Ultrium 1760 tape drives	LTO-4 Ultrium 1760 SAS Internal <ul style="list-style-type: none"><li>• HP StorageWorks Ultrium 1760 Internal SAS Tape Drive</li><li>• HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities and localized user manuals)</li><li>• HP Data Protector Express Basic software CD</li><li>• HP LTO4 Ultrium 1.6 TB RW Data Cartridge</li><li>• mini-SAS SFF8482 to SFF8087 cable</li><li>• documentation. <b>NOTE:</b> OD1 will appear after this part number on your sales order if factory integration is indicated.</li></ul>	EH919A
	LTO-4 Ultrium 1760 SAS External <ul style="list-style-type: none"><li>• HP StorageWorks Ultrium 1760 External SAS Tape Drive</li><li>• HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities and localized user manuals)</li><li>• HP Data Protector Express Basic software CD</li><li>• HP LTO4 Ultrium 1.6 TB RW Data Cartridge</li><li>• power cord</li><li>• mini-SAS SFF8088 to SFF8088 cable</li><li>• documentation.</li></ul>	EH920A
	LTO-4 Ultrium 1760 SCSI Internal <ul style="list-style-type: none"><li>• HP StorageWorks Ultrium 1760 Internal SCSI Tape Drive</li><li>• HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities and localized user manuals)</li><li>• HP Data Protector Express Basic software and its Bare Metal Disaster Recovery option</li><li>• HP LTO4 Ultrium 1.6 TB RW Data Cartridge)</li><li>• internal SCSI cable</li><li>• documentation. <b>NOTE:</b> OD1 will appear after this part number on your sales order if factory integration is indicated.</li></ul>	EH921A
	LTO-4 Ultrium 1760 SCSI External <ul style="list-style-type: none"><li>• HP StorageWorks Ultrium 1760 External SCSI Tape Drive</li><li>• HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities and localized user manuals)</li><li>• HP Data Protector Express Basic software CD</li><li>• HP LTO4 Ultrium 1.6 TB RW Data Cartridge</li><li>• power cord</li><li>• 68-pin HD to 68-pin VHDCI multi-mode SCSI cable</li><li>• documentation.</li></ul>	EH922A



### Options

	Model Name/Kit Contents Description	Part Number
Ultrium 920 tape drives	Ultrium 920 SCSI Internal	
	<ul style="list-style-type: none"><li>● HP StorageWorks Ultrium 920 Internal SCSI Tape Drive</li><li>● HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities and localized user manuals)</li><li>● HP Data Protector Express Basic software CD</li><li>● HP LTO3 Data Cartridge (800 GB)</li><li>● internal SCSI cable</li><li>● documentation.</li></ul> <p><b>NOTE:</b> OD1 will appear after this part number on your sales order if factory integration is indicated.</p>	EH841A
	Ultrium 920 SCSI External	
	<ul style="list-style-type: none"><li>● HP StorageWorks Ultrium 920 External SCSI Tape Drive</li><li>● HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities and localized user manuals)</li><li>● HP Data Protector Express Basic software CD</li><li>● HP LTO3 Data Cartridge (800 GB)</li><li>● power cord</li><li>● 68-pin HD to 68-pin VHDCI multi-mode SCSI cable</li><li>● documentation.</li></ul>	EH842A
	Ultrium 920 SCSI Rack-mount - single drive bundled with a 1U Rack-mount kit	
	<ul style="list-style-type: none"><li>● Wide SCSI LVD rack-mountable enclosure (1U) with power supply and fan; rail kit</li><li>● one internal Ultrium 920 SCSI tape drive; power cord</li><li>● HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities and localized user manuals)</li><li>● HP Data Protector Express Basic software CD</li><li>● HP LTO3 Data Cartridge (800 GB)</li><li>● documentation.</li></ul> <p><b>NOTE:</b> OD1 will appear after this part number on your sales order if factory integration into a rack is indicated.</p>	EH903B
	Ultrium 920 SAS Internal	
	<ul style="list-style-type: none"><li>● HP StorageWorks Ultrium 920 Internal SAS Tape Drive</li><li>● HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities and localized user manuals)</li><li>● HP Data Protector Express Basic software CD</li><li>● HP LTO3 Data Cartridge (800 GB)</li><li>● mini-SAS SFF8482 to SFF8087</li><li>● documentation.</li></ul> <p><b>NOTE:</b> OD1 will appear after this part number on your sales order if factory integration is indicated.</p>	EH847A
	Ultrium 920 SAS External	
	<ul style="list-style-type: none"><li>● HP StorageWorks Ultrium 920 External SAS Tape Drive</li><li>● HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities and localized user manuals)</li><li>● HP Data Protector Express Basic software and its Bare Metal Disaster Recovery option</li><li>● HP LTO3 Data Cartridge (800 GB)</li><li>● power cord</li></ul>	EH848A



### Options

- mini-SAS SFF8088 to SFF8088 cable
- documentation.

Model Name/Kit	Contents Description	Part Number
Ultrium 448 tape drives	<p>Ultrium 448 SCSI Internal</p> <ul style="list-style-type: none"> <li>● HP StorageWorks Ultrium 448 Internal SCSI Tape Drive</li> <li>● HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities and localized user manuals)</li> <li>● HP Data Protector Express Basic software CD</li> <li>● HP LTO2 Data Cartridge (400 GB)</li> <li>● internal SCSI cable</li> <li>● documentation.</li> </ul> <p><b>NOTE:</b> 0D1 will appear after this part number on your sales order if factory integration is indicated.</p>	DW016A
	<p>Ultrium 448 SCSI External</p> <ul style="list-style-type: none"> <li>● HP StorageWorks Ultrium 448 External SCSI Tape Drive</li> <li>● HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities and localized user manuals)</li> <li>● HP Data Protector Express Basic software CD</li> <li>● HP LTO2 Data Cartridge (400 GB)</li> <li>● power cord</li> <li>● 68-pin HD to 68-pin VHDCI multi-mode SCSI cable</li> <li>● documentation.</li> </ul>	DW017B
	<p>Ultrium 448 SCSI Array Module - works with HP StorageWorks Tape Array 5300</p> <ul style="list-style-type: none"> <li>● HP Ultrium 448 offline hot-swap SCSI array module</li> <li>● HP StorageWorks Tape CD-ROM (includes HP StorageWorks Library and Tape Tools utilities and localized user manuals)</li> <li>● HP Data Protector Express Basic software CD</li> <li>● HP LTO2 Data Cartridge (400 GB)</li> <li>● documentation.</li> </ul> <p><b>NOTE:</b> 0D1 will appear after this part number on your sales order if factory integration is indicated.</p>	DW019A
	<p>Ultrium 448 SCSI Rack-mount - single drive bundled with a 1U Rack-mount kit</p> <ul style="list-style-type: none"> <li>● Wide SCSI LVD rack-mountable enclosure (1U) with power supply and fan</li> <li>● rail kit</li> <li>● one internal Ultrium 448 SCSI tape drive</li> <li>● power cord</li> <li>● HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities and localized user manuals)</li> <li>● HP Data Protector Express Single Server Edition software and its Bare Metal Disaster Recovery option</li> <li>● HP LTO2 Data Cartridge (400 GB)</li> <li>● documentation.</li> </ul> <p><b>NOTE:</b> 0D1 will appear after this part number on your sales order if factory integration into a rack is indicated.</p>	DW028C
	<p>Ultrium 448 SAS Internal</p> <ul style="list-style-type: none"> <li>● HP StorageWorks Ultrium 448 Internal SAS Tape Drive</li> <li>● HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities and localized user manuals)</li> <li>● HP Data Protector Express Basic software CD</li> </ul>	DW085A





### Options

- HP LTO2 Data Cartridge (400 GB)
- mini-SAS SFF8482 to SFF8087 cable
- documentation.  
**NOTE:** OD1 will appear after this part number on your sales order if factory integration is indicated.

#### Ultrium 448 SAS External

- HP StorageWorks Ultrium 448 External SAS Tape Drive DW086A
- HP StorageWorks Tape CD-ROM (contains HP StorageWorks Library and Tape Tools utilities and localized user manuals)
- HP Data Protector Express Basic software CD
- HP LTO2 Data Cartridge (400 GB)
- mini-SAS SFF8088 to SFF8088 cable
- documentation.

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#### Host Bus Adapters, Controllers, and Accessories for ProLiant Servers

HP SC11Xe Host Bus Adapter 412911-B21

**NOTE:** Recommended SCSI HBA for connecting Ultrium tape drives to G6/G7 ProLiant servers. Please visit: <http://www.hp.com/storage/SPOCK> for a complete list of Ultrium tape drive compatibility with ProLiant servers and other industry standard servers.

64-Bit/133-MHz Single Channel Ultra320 SCSI HBA G2 374654-B21

**NOTE:** Recommended SCSI HBA for connecting Ultrium tape drives to G5 ProLiant servers. Please visit: <http://www.hp.com/storage/SPOCK> for a complete list of Ultrium tape drive compatibility with ProLiant servers and other industry standard servers.

HP Smart Array P212 462828-B21

**NOTE:** Recommended SAS HBA for connecting Ultrium tape drives to G6/G7 ProLiant servers. Please visit: <http://www.hp.com/storage/SPOCK> for a complete list of Ultrium tape drive compatibility with ProLiant servers and other industry standard servers.

HP SC44Ge Host Bus Adapter 416096-B21

**NOTE:** Recommended SAS HBA for connecting Ultrium tape drives to G5 ProLiant servers. Please visit: <http://www.hp.com/storage/SPOCK> for a complete list of Ultrium tape drive compatibility with ProLiant servers and other industry standard servers.

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#### Host Bus Adapters, Controllers, and Accessories for HP PA-RISC and IPF servers

64-Bit/133-MHz Dual Channel Ultra320 SCSI Adapter A7173A

Please refer to the HP Tape Backup Products Compatibility website at: <http://www.hp.com/storage/SPOCK> for more information on support for HP PA-RISC and IPF servers.



### Options

Host Bus Adapters, Controllers, and Accessories for 3rd Party servers and workstations	64-Bit/133-MHz Single Channel Ultra320 SCSI HBA G2 <b>NOTE:</b> This SCSI controller supports a wide range of connectivity to non-HP 32-bit servers. Please refer to the HP Tape Backup Products Compatibility website at: <a href="http://www.hp.com/storage/SPOCK">http://www.hp.com/storage/SPOCK</a> for more information. HP Ultrium tape drives are supported on a wide range of non-HP server using third-party SCSI controllers and host bus adapters. Please refer to the HP Tape Backup Products Compatibility website at: <a href="http://www.hp.com/storage/SPOCK">http://www.hp.com/storage/SPOCK</a> for more information.	374654-B21
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Media	HP LTO1 Ultrium 200 GB Data Cartridge <b>NOTE:</b> Write and read support for Ultrium 230, Ultrium 232, Ultrium 448 and Ultrium 460. Read support for Ultrium 920 and Ultrium 960.	C7971A
	HP LTO2 Ultrium 400 GB Data Cartridge <b>NOTE:</b> Write and read support for Ultrium 448, Ultrium 460, Ultrium 920 and Ultrium 960. Read support for LTO-4 Ultrium 1840 and Ultrium 1760.	C7972A
	HP LTO3 Ultrium 800 GB RW Data Cartridge <b>NOTE:</b> Write and read only support for Ultrium 920 and Ultrium 960, LTO-4 Ultrium 1840 and Ultrium 1760. Read support for LTO-5 Ultrium 3280 and Ultrium 3000.	C7973A
	HP LTO3 Ultrium 800 GB WORM Data Cartridge <b>NOTE:</b> This data cartridge supports Write-Once recording format for LTO-3 and LTO-4 drives, and Read-Many for LTO-3, LTO-4 and LTO-5 drives. Data recorded to this data cartridge cannot be overwritten.	C7973W
	HP LTO4 Ultrium 1.6 TB RW Data Cartridge <b>NOTE:</b> Write and read support for LTO-4 Ultrium 1840, LTO-4 Ultrium 1760, LTO-5 Ultrium 3280 and LTO-5 Ultrium 3000.	C7974A
	HP LTO4 Ultrium 1.6 TB WORM Data Cartridge <b>NOTE:</b> This data cartridge supports Write-Once Read-Many recording format for LTO-4 and LTO-5 drives. Data recorded to this data cartridge cannot be overwritten.	C7974W
	HP LTO-5 Ultrium 3 TB RW Data Cartridge <b>NOTE:</b> Write and read support for LTO-5 Ultrium 3280 and Ultrium 3000.	C7975A
	HP LTO-5 Ultrium 3 TB WORM Data Cartridge <b>NOTE:</b> This data cartridge only supports Write-Once Read-Many recording format for LTO-5 drives. Data recorded to this data cartridge cannot be overwritten.	C7975W
	HP LTO1 Ultrium 200 GB Storage Media Kit	C8013A
	HP LTO2 Ultrium 400 GB Storage Media Kit	C8014A
	HP Ultrium Universal Cleaning Cartridge	C7978A

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### Options

<b>Rack-mount Options</b>	<p>1U SCSI Rack-mount Kit <span style="float: right;">A7445C</span></p> <p><b>NOTE:</b> For racked ProLiant servers. No drives included. Accommodates up to two internal half-height drives (such as the Ultrium 232, Ultrium 448, Ultrium 920, LTO-4 Ultrium 1760 and LTO-5 Ultrium 3000)).</p> <p><b>NOTE:</b> Please refer to web page for further information:  <a href="http://h18006.www1.hp.com/products/storageworks/1urackmount/index.html">http://h18006.www1.hp.com/products/storageworks/1urackmount/index.html</a></p> <p>1U SAS Rack-mount Kit <span style="float: right;">AE459B</span></p> <p><b>NOTE:</b> For racked ProLiant servers. No drives included. Accommodates up to two internal SAS half-height drives (such as the Ultrium 448, Ultrium 920, LTO-4 Ultrium 1760 and LTO-5 Ultrium 3000)).</p> <p><b>NOTE:</b> Please refer to web page for further information:  <a href="http://h18006.www1.hp.com/products/storageworks/1urackmount/index.html">http://h18006.www1.hp.com/products/storageworks/1urackmount/index.html</a></p> <p>3U SAS Rack-mount Kit <span style="float: right;">AG576B</span></p> <p><b>NOTE:</b> For racked SAS-based ProLiant servers. No drives included. Accommodates up to four internal half-height drives (such as the Ultrium 448 SAS, Ultrium 920 SAS LTO-4 Ultrium 1760 and LTO-5 Ultrium 3000) or two full-height drives (such as the Ultrium 1840 SAS or LTO-5 Ultrium 3280).</p> <p><b>NOTE:</b> Please refer to web page for further information:  <a href="http://h18006.www1.hp.com/products/storageworks/3urackmount/index.html">http://h18006.www1.hp.com/products/storageworks/3urackmount/index.html</a></p> <p><b>NOTE:</b> #OD1 will appear after this part number on your sales order if factory integration into a rack is indicated.</p>
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<b>Upgrade included software to Data Protector Express</b>	<p>Upgrade to HP Data Protector Express 5.0 for 1 Server from HP Data Protector Express Basic (eDelivery) <span style="float: right;">TC333AAE</span></p> <p>Upgrade to HP Data Protector Express 5.0 for 1 Server from HP Data Protector Express Basic (media kit) <span style="float: right;">TC333A</span></p>
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<b>Cables and Adapters</b>	<p>68-pin HD/68-pin VHDCI, 12 ft/3.66 m SCSI cable for external drives <span style="float: right;">341177-B21</span></p> <p>68-pin HD/68-pin HD, 16.40 ft/5 m SCSI cable for external drives <span style="float: right;">328215-001</span></p> <p>68-pin HD/68-pin HD, 32.81 ft/10 m SCSI cable for external drives <span style="float: right;">328215-002</span></p> <p>Ultra320 SCSI Cable Kit (for installing Ultra320 SCSI tape drives in the 3U and 5U Rack-Mount Kits) <span style="float: right;">DW063B</span></p> <p>SAS cable, Int. Drive SFF8482, split to 2 x Internal SFF8484, 1m <span style="float: right;">AE490A</span></p> <p><b>NOTE:</b> Use this cable to connect HP StorageWorks Ultrium 448, 920, 960, 1760, and 1840 SAS internal tape drives to SAS 4i (SFF8484) connectors.</p> <p>SAS cable, Int. Drive SFF8482, split to 2 x Internal SFF8484, with power, 1m <span style="float: right;">AE491A</span></p> <p><b>NOTE:</b> Use this cable to connect HP StorageWorks Ultrium 3280 and 3000 SAS internal tape drives to SAS 4i (SFF8484) connectors.</p> <p>HP StorageWorks Mini-SAS Cable for LTO Internal Tape Drive <span style="float: right;">AP746A</span></p> <p><b>NOTE:</b> Use this cable to connect HP StorageWorks LTO Ultrium internal tape drives to Mini-SAS (SFF8087) ports.</p> <p>2M External Infiniband (SFF8470) to Mini-SAS (SFF8088) 1x SAS Cable <span style="float: right;">AE466A</span></p> <p><b>NOTE:</b> Use this cable to connect HP StorageWorks SAS external tape devices to HP SAS controllers with Infiniband (SFF8470) connectors.</p> <p>4M External Infiniband (SFF8470) to Mini-SAS (SFF8088) 1x SAS Cable <span style="float: right;">AE468A</span></p> <p><b>NOTE:</b> Use this cable to connect HP StorageWorks SAS external tape devices to HP SAS controllers with Infiniband (SFF8470) connectors.</p>



### Options

2M External Mini-SAS (SFF8088) to Mini-SAS (SFF8088) 1x SAS Cable <b>NOTE:</b> Use this cable to connect HP StorageWorks SAS external tape devices to HP SAS controllers with external Mini-SAS (SFF8088) connectors.	AE470A
4M External Mini-SAS (SFF8088) to Mini-SAS (SFF8088) 1x SAS Cable <b>NOTE:</b> Use this cable to connect HP StorageWorks SAS external tape devices to HP SAS controllers with external Mini-SAS (SFF8088) connectors.	AE465A
4M External Mini-SAS (SFF8088) to SAS 4i (SFF8484) 3x/1x Split SAS Cable <b>NOTE:</b> This split cable connects internally to SAS Hard Drive Cage (3x) and externally to the tape device (1x) with other connector attaching to HP SAS controllers with SAS 4i (SFF8484) connectors. The 1x cable occupies additional PCI slot on the server.	AE464A
4M External Mini-SAS (SFF8088) to Internal Mini-SAS (SFF8087) 3x/1x Split SAS Cable <b>NOTE:</b> This split cable connects internally to SAS Hard Drive Cage (3x) and externally to the tape device (1x) with other connector attaching to the Smart Array P400i controller inside a DL360 G5 or DL365 G5 server. The 1x cable occupies additional PCI slot on the server.	AG452A



# QuickSpecs

## HP StorageWorks LTO Ultrium Tape Drives

### Technical Specifications

		LTO-3 Ultrium 960	LTO-4 Ultrium 1840	LTO-5 Ultrium 3280
Dimensions	<b>Form Factor</b>	5¼-inch full-height	5¼-inch full-height	5¼-inch full-height
	<b>Physical (HxWxD)</b>	3.3 x 5.7 x 8.2 in	3.3 x 5.7 x 8.2 in	3.3 x 5.7 x 8.2 in
	<b>Internal</b>	(8.3 x 14.6 x 20.7 cm)	(8.5 x 14.5 x 20.7cm)	(8.3 x 14.6 x 20.7 cm)
	<b>Physical (HxWxD)</b>	4.7 x 8.6 x 11.7 in	4.7 x 8.6 x 11.7 in	4.7 x 8.6 x 11.7 in
	<b>External</b>	(12.0 x 21.8 x 29.7 cm)	(12.0 x 21.8 x 29.7 cm)	(12.0 x 21.8 x 29.7 cm)
	<b>Physical (HxWxD)</b>	3.3 x 6.1 x 11.2 in	3.3 x 6.1 x 11.2 in	3.3 x 6.1 x 11.2 in
	<b>Array Module</b>	(8.5 x 15.5 x 28.5 cm)	(8.5 x 15.5 x 28.5 cm)	(8.5 x 15.5 x 28.5 cm)
	<b>Physical (HxWxD)</b>	5.2 x 16.8 x 23.0 in	5.2 x 16.8 x 23.0 in	5.2 x 16.8 x 23.0 in
	<b>Rack-mount</b>	(13.2 x 42.7 x 58.4 cm)	(13.2 x 42.7 x 58.4 cm)	(13.2 x 42.7 x 58.4 cm)
	<b>Shipping (HxWxD)</b>	10.6 x 10.6 x 13 in	10.6 x 10.6 x 13 in	10.6 x 10.6 x 13 in
	<b>Internal</b>	(27.0 x 27.0 x 33 cm)	(27.0 x 27.0 x 33 cm)	(27.0 x 27.0 x 33 cm)
	<b>Shipping (HxWxD)</b>	11 x 12.2 x 15.4 in	11 x 12.2 x 15.4 in	11 x 12.2 x 15.4 in
<b>External</b>	(28 x 31 x 39 cm)	(28 x 31 x 39 cm)	(28 x 31 x 39 cm)	
<b>Shipping (HxWxD)</b>	13.4 x 17.7 x 12.2 in	13.4 x 17.7 x 12.2 in	13.4 x 17.7 x 12.2 in	
<b>Array Module</b>	(34.0 x 45.0 x 31.0 cm)	(34.0 x 45.0 x 31.0 cm)	(34.0 x 45.0 x 31.0 cm)	
<b>Shipping (HxWxD) Rack-mount</b>	15.75 x 23.75 x 33.5in	15.75 x 23.75 x 33.5 in	15.75 x 23.75 x 33.5in	
		(40.0 x 60.3 x 85.1 cm)	(40.0 x 60.3 x 85.1 cm)	(40.0 x 60.3 x 85.1 cm)
Weight	<b>Out of box, Internal</b>	4.94 lb (2.24 kg)	4.94 lb (2.24 kg)	4.94 lb (2.24 kg)
	<b>Out of box, External</b>	12.28 lb (5.57 kg)	12.28 lb (5.57 kg)	12.28 lb (5.57 kg)
	<b>Out of box, Array Module</b>	6.5 lb (2.97 kg)	6.5 lb (2.97 kg)	6.5 lb (2.97 kg)
	<b>Out of box, Rack-mount</b>	31.6 lb (14.4 kg)	31.6 lb (14.4 kg)	31.6 lb (14.4 kg)
	<b>Shipping, Internal</b>	7.9 lb (3.6 kg)	7.9 lb (3.6 kg)	7.9 lb (3.6 kg)
	<b>Shipping, External</b>	16.1 lb (7.3 kg)	16.1 lb (7.3 kg)	16.1 lb (7.3 kg)
	<b>Shipping, Array Module</b>	9.7 lb (4.4 kg)	9.7 lb (4.4 kg)	9.7 lb (4.4 kg)
	<b>Shipping, Rack-mount</b>	56 lb (25 kg)	56 lb (25 kg)	56 lb (25 kg)
Capacity	<b>Native</b>	400 GB	800 GB	1.5 TB
	<b>Compressed</b> (assumes 2:1 data compression)	800 GB	1.6 TB	3 TB
	<b>Buffer Size</b>	128 MB	128 MB	256 MB
Performance (1Kb = 1,000 bytes)	<b>Native Data transfer rate</b>	80 MB/s with LTO 3 media	120 MB/s with LTO 4 media	140 MB/s with LTO 5 media
		30 MB/s with LTO 2 media	80 MB/s with LTO 3 media	120 MB/s with LTO 4 media
		20 MB/s with LTO 1 media	35.6 MB/s with LTO 2 media	80 MB/s with LTO 3 media
	<b>Data transfer rate, compressed</b> (assumes 2:1 data compression)	160 MB/s with LTO 3 media	240 MB/s with LTO 4 media	280 MB/s with LTO 5 media
		60 MB/s with LTO 2 media	160 MB/s with LTO 3 media	240 MB/s with LTO 4 media
		40 MB/s with LTO 1 media	71.2 MB/s with LTO 2 media	160 MB/s with LTO 3 media



### Technical Specifications

	<b>Burst transfer rate</b>	Ultra320 SCSI: 160 MB/s	Ultra320 SCSI: 190 MB/s 3Gb/sec SAS: 240 MB/s	600 MB/s with 6Gb/s SAS
	<b>Data rate matching range</b>	27-80 MB/s	40-120 MB/s	47-140 MB/s
	<b>Data access time (from BOT)</b>	46 seconds typical for LTO 1 and LTO 2 media 53 seconds typical for LTO 3 media	46 seconds typical for LTO 2 media 52 seconds typical for LTO 3 media 62 seconds typical for LTO 4 media	42 seconds typical for LTO 3 media 50 seconds typical for LTO 4 media 52 seconds typical for LTO 5 media
	<b>Rewind time from EOT</b>	< 88 seconds for LTO 2 media < 98 seconds for LTO 3 media	< 92 seconds for LTO 2 media < 102 seconds for LTO 3 media < 124 seconds for LTO 4 media	< 78 seconds for LTO 3 media < 93 seconds for LTO 4 media < 96 seconds for LTO 5 media
	<b>Rewind tape speed</b>	7 m/s for (LTO 3 and LTO 2 media)	7 m/s for (LTO 4 and LTO 3 media)	9 m/s for (LTO 5 and LTO 4 media)
	<b>Average load time</b>	<19 seconds (RW) 22 seconds (WORM)	<19 seconds (RW) 22 seconds (WORM- initialized) Uninitialized WORM media can take up to 70 seconds	<19 seconds (RW) 22 seconds (WORM- initialized) Uninitialized WORM media can take up to 70 seconds
	<b>Average unload time</b>	<19 seconds (RW) 22 seconds (WORM)	<19 seconds (RW) 22 seconds (WORM- initialized) Uninitialized WORM media can take up to 70 seconds	<19 seconds (RW) 22 seconds (WORM- initialized) Uninitialized WORM media can take up to 70 seconds
<b>Security</b>	<b>Encryption</b>	n/a	AES 256 bit	AES 256 bit
	<b>WORM media support</b>	LTO 3 media	LTO 4 media	LTO-5 media
<b>Reliability</b>	<b>MTBF</b>	250,000 hours at 100% duty cycle	250,000 hours at 100% duty cycle	250,000 hours at 100% duty cycle
	<b>Uncorrected Error Rate</b>	1 in 1x10 <sup>17</sup> bits	1 in 1x10 <sup>17</sup> bits	1 in 1x10 <sup>17</sup> bits
<b>Rewriteable Media Compatibility</b>	<b>Read</b>	LTO Ultrium 3 LTO Ultrium 2 LTO Ultrium 1	LTO Ultrium 4 LTO Ultrium 3 LTO Ultrium 2	LTO Ultrium 5 LTO Ultrium 4 LTO Ultrium 3
	<b>Write</b>	LTO Ultrium 3 LTO Ultrium 2	LTO Ultrium 4 LTO Ultrium 3 [unencrypted]	LTO Ultrium 5 LTO Ultrium 4
<b>WORM Media Compatibility</b>	<b>Read</b>	LTO Ultrium 3 WORM	LTO Ultrium 4 WORM LTO Ultrium 3 WORM	LTO Ultrium 5 WORM LTO Ultrium 4 WORM LTO Ultrium 3 WORM
	<b>Write</b>	LTO Ultrium 3 WORM	LTO Ultrium 4 WORM LTO Ultrium 3 WORM	LTO Ultrium 5 WORM LTO Ultrium 4 WORM



### Technical Specifications

Tape Format	Recording method	16-channel linear serpentine	16-channel linear serpentine	16-channel linear serpentine
	Recording format	LTO Ultrium 3 LTO Ultrium 2	LTO Ultrium 4 LTO Ultrium 3 [unencrypted]	LTO Ultrium 5 LTO Ultrium 4
	Data compression	LTO DC dual mode compression (an enhanced version of ALDC)	LTO DC dual mode compression (an enhanced version of ALDC)	LTO DC dual mode compression (an enhanced version of ALDC)
	Error detection/correction	Reed-Solomon	Reed-Solomon	Reed-Solomon
	Read Channel Technology	Partial Response Maximum Likelihood (PRML)	Partial Response Maximum Likelihood (PRML)	Partial Response Maximum Likelihood (PRML)
	Data Tracks	704	896	1280
	Data Encoding Method	RLL 0,13/11	RLL 0,13/11	RLL 32/33
	Interface	Interface type	Ultra320 SCSI (LVDS)	Ultra320 SCSI (LVDS) or 3Gb/sec SAS
SCSI connector		Internal: 68-pin LVDS External: 68-pin HD LVDS Array module: 80-pin SCA (SCSI and power) Rack-mount: 68-pin HD LVDS	SCSI Internal: 68-pin LVDS SCSI External: 68-pin HD LVDS SCSI Array module: 80-pin SCA (SCSI and power) SCSI Rack-mount: 68-pin HD LVDS	
SAS connector			SAS Internal: mini-SAS SFF8482 SAS External: mini-SAS SFF8088	SAS Internal: mini-SAS SFF8482 SAS External: mini-SAS SFF8088

		LTO-3 Ultrium 960	LTO-4 Ultrium 1840	LTO-5 Ultrium 3280
Power Specifications	Power requirements, Internal (including rack-mount model)	+5V@3.5A (typical) +5V@4.5A (max) +12V@1.0A (typical) +12V@2.0A (max)	+5V@4.2A (typical) +5V@4.5A (max) +12V@0.75A (typical) +12V@2.5A (max)	+5V@3.6A (typical) +5V@3.7A (max) +12V@0.7A (typical) +12V@2.2A (max)
	Power requirements, External	100 to 240 VAC, 50-60 Hz, auto-ranging, 0.8A max	100 to 240 VAC, 50-60 Hz, auto-ranging, 0.8A max	100 to 240 VAC, 50-60 Hz, auto-ranging, 0.8A max
	Power requirements, Array Module	+5V@3.5A (typical) +5V@4.5A (max) +12V@1.0A (typical) +12V@2.0A (max)	+5V@4.2A (typical) +5V@4.5A (max) +12V@0.75A (typical) +12V@2.5A (max)	N/A
	Power consumption	12 Watts idle 30 Watts typical 35 Watts max	12 Watts idle 30 Watts typical 52 Watts max	7 Watts idle 24 Watts typical 41 Watts max



### Technical Specifications

		<b>Ultrium 448</b>	<b>Ultrium 920</b>	<b>Ultrium 1760</b>	<b>Ultrium 3000</b>
<b>Dimensions</b>	<b>Form Factor</b>	5¼-inch half-height	5¼-inch half-height	5¼-inch half-height	5¼-inch half-height
	<b>Physical (HxWxD) Internal</b>	1.6 x 5.7 x 8.1 in (4.1 x 14.5 x 20.6 cm)	1.6 x 5.7 x 8.1 in (4.1 x 14.5 x 20.6 cm)	1.6 x 5.7 x 8.1 in (4.1 x 14.5 x 20.6 cm)	1.6 x 5.7 x 8.1 in (4.1 x 14.5 x 20.6 cm)
	<b>Physical (HxWxD) External</b>	3 x 8.8 x 11.7 in (7.7 x 22.3 x 29.5 cm)	3 x 8.8 x 11.7 in (7.7 x 22.3 x 29.5 cm)	3 x 8.8 x 11.7 in (7.7 x 22.3 x 29.5 cm)	3 x 8.8 x 11.7 in (7.7 x 22.3 x 29.5 cm)
	<b>Physical (HxWxD) Array Module</b>	1.7 x 6.3 x 11.2 in (4.3 x 16 x 28.5 cm)	1.7 x 6.3 x 11.2 in (4.3 x 16 x 28.5 cm)	1.7 x 6.3 x 11.2 in (4.3 x 16 x 28.5 cm)	N/A
	<b>Physical (HxWxD) 1U Rack-mount</b>	1.7 x 16.88 x 25.25 in (4.32 x 42.88 x 64.14 cm)	1.7 x 16.88 x 25.25 in (4.32 x 42.88 x 64.14 cm)	1.7 x 16.88 x 25.25 in (4.32 x 42.88 x 64.14 cm)	1.7 x 16.88 x 25.25 in (4.32 x 42.88 x 64.14 cm)
	<b>Physical (HxWxD) 3U Rack-mount</b>	N/A	N/A	N/A	N/A
	<b>Shipping (HxWxD) Internal</b>	7.9 x 9.4 x 11.4 in (24 x 31 x 39 cm)	7.9 x 9.4 x 11.4 in (24 x 31 x 39 cm)	7.9 x 9.4 x 11.4 in (24 x 31 x 39 cm)	7.9 x 9.4 x 11.4 in (24 x 31 x 39 cm)
	<b>Shipping (HxWxD) External</b>	9.4 x 12.2 x 15.4 in (24 x 31 x 39 cm)	9.4 x 12.2 x 15.4 in (24 x 31 x 39 cm)	9.4 x 12.2 x 15.4 in (24 x 31 x 39 cm)	9.4 x 12.2 x 15.4 in (24 x 31 x 39 cm)
	<b>Physical (HxWxD) Array Module</b>	11.4 x 17.7 x 12.2 in (29.0 x 45.0 x 31.0 cm)	11.4 x 17.7 x 12.2 in (29.0 x 45.0 x 31.0 cm)	N/A	N/A
	<b>Shipping (HxWxD) 1U Rack-mount</b>	12.0 x 23.5 x 33.5 in (30.5 x 59.7 x 85.1 cm)	12.0 x 23.5 x 33.5 in (30.5 x 59.7 x 85.1 cm)	12.0 x 23.5 x 33.5 in (30.5 x 59.7 x 85.1 cm)	12.0 x 23.5 x 33.5 in (30.5 x 59.7 x 85.1 cm)
	<b>Shipping (HxWxD) 3U Rack-mount</b>	N/A	N/A	N/A	N/A





# QuickSpecs

## HP StorageWorks LTO Ultrium Tape Drives

### Technical Specifications

Weight	Out of box, Internal	3.2 lb (1.45 kg)	3.2 lb (1.45 kg)	3.2 lb (1.45 kg)	3.2 lb (1.45 kg)
	Out of box, External	10.3 lb (4.65 kg)	10.3 lb (4.65 kg)	10.3 lb (4.65 kg)	10.3 lb (4.65 kg)
	Out of box, Array Module	4.1 lb (1.85 kg)	4.1 lb (1.85 kg)	N/A	N/A
	Out of box, 1U Rack-mount	21.0 lb (9.52 kg)	21.0 lb (9.52 kg)	21.0 lb (9.52 kg)	21.0 lb (9.52 kg)
	Out of box, 3U Rack-mount	N/A	N/A	N/A	N/A
	Shipping, Internal	5.1 lb (2.3kg)	5.1 lb (2.3kg)	5.1 lb (2.3kg)	5.1 lb (2.3kg)
	Shipping, External	11 lb (5 kg)	11 lb (5 kg)	11 lb (5 kg)	11 lb (5 kg)
	Shipping, Array Module	8.8 lb (4.0 kg)	8.8 lb (4.0 kg)	N/A	N/A
	Shipping, 1U Rack-mount	32.9 lb (14.8 kg)	32.9 lb (14.8 kg)	32.9 lb (14.8 kg)	32.9 lb (14.8 kg)
	Shipping, 3U Rack-mount	N/A	N/A	N/A	N/A
Capacity	Native	200 GB	400 GB	800 GB	1.5 TB
	Compressed (assumes 2:1 data compression)	400 GB	800 GB	1.6 TB	3 TB
Performance	Buffer Size	64 MB	64 MB	128 MB	256 MB
	Sustained transfer rate, native	24 MB/s	60 MB/s	80 MB/s	140 MB/s
	Sustained transfer rate, compressed (assumes 2:1 data compression)	48 MB/s	120 MB/s	160 MB/s	280 MB/s
	Burst transfer rate	160 MB/s (with Ultra3 SCSI wide); 300 MB/s (with 3Gb/sec SAS)	320 MB/s (with Ultra320 SCSI); 300 MB/s (with 3Gb/sec SAS)	300 MB/s (with 3Gb/sec SAS)	600 MB/s (with 6Gb/s SAS)
	Data rate matching range	0-24 MB/s (native)	20-60 MB/s (native)	33-80 MB/s (native)	47-140 MB/s (native)
	Data access time (from BOT)	64 s typical for a 200 GB tape (native)	64 s typical for a 200 GB tape (native)	64 s typical for a 800 GB tape (native)	52 s typical for a 1.5 TB tape (native)
	Average load time	>19 s	>19 s	>19 s	>19 s
Average unload time	19 s	19 s	19 s	19 s	
Rewind time from EOT	121 s (200 GB tape)	121 s (400 GB tape)	124 s (800 GB tape)	96 s (1.5 TB tape)	
Rewind tape speed	5.0 m/s	5.0 m/s	7.0 m/s	9.0 m/s	
Reliability	MTBF	250,000 hours at 100% duty cycle	250,000 hours at 100% duty cycle	250,000 hours at 100% duty cycle	250,000 hours at 100% duty cycle
	Uncorrected Error Rate	1 in 1x10 <sup>17</sup> bits	1 in 1x10 <sup>17</sup> bits	1 in 1x10 <sup>17</sup> bits	1 in 1x10 <sup>17</sup> bits



### Technical Specifications

<b>Media Compatibility</b>		LTO Ultrium 1 (Read and Write);	LTO Ultrium 1 (Read only);	LTO Ultrium 2 (Read only);	LTO Ultrium 3 (Read only);
		LTO Ultrium 2 (Read and Write)	LTO Ultrium 2 (Read and Write);	LTO Ultrium 3 (Read and Write);	LTO Ultrium 4 (Read and Write);
			LTO Ultrium 3 (Read and Write)	LTO Ultrium 4 (Read and Write)	LTO Ultrium 5 (Read and Write)
<b>Tape Format</b>	<b>Recording method</b>	8-channel linear serpentine	16-channel linear serpentine	16-channel linear serpentine	16-channel linear serpentine
	<b>Recording format</b>	LTO Ultrium 2 LTO Ultrium 1 (for 100 GB tape)	LTO Ultrium 3 LTO Ultrium 2 (for 200 GB tape)	LTO Ultrium 4 LTO Ultrium 3 (for 400 GB tape)	LTO Ultrium 5 LTO Ultrium 4 (for 800 GB tape)
	<b>Data compression</b>	LTO DC dual mode compression (an enhanced version of ALDC)	LTO DC dual mode compression (an enhanced version of ALDC)	LTO DC dual mode compression (an enhanced version of ALDC)	LTO DC dual mode compression (an enhanced version of ALDC)
	<b>Error detection/correction</b>	Reed-Solomon	Reed-Solomon	Reed-Solomon	Reed-Solomon
	<b>Read channel technology</b>	Partial Response Maximum Likelihood (PRML)	Partial Response Maximum Likelihood (PRML)	Partial Response Maximum Likelihood (PRML)	Partial Response Maximum Likelihood (PRML)
	<b>Data encoding method</b>	RLL 0,13/11	RLL 0,13/11	RLL 0,13/11	RLL 32/33
	<b>Interface</b>	<b>Interface type</b>	Wide Ultra3 SCSI (LVDS) or 3Gb/sec SAS	Ultra320 SCSI (LVDS) or 3Gb/sec SAS	Ultra320 SCSI (LVDS) or 3Gb/sec SAS
	<b>SCSI connector</b>	SCSI Internal: 68-pin LVDS SCSI External: 68-pin HD LVDS SCSI Array module: 80-pin SCA (SCSI and power) SCSI Rack-mount: 68-pin HD LVDS	SCSI Internal: 68-pin LVDS SCSI External: 68-pin HD LVDS SCSI Rack-mount: 68-pin HD LVDS	SCSI Internal: 68-pin LVDS SCSI External: 68-pin HD LVDS	N/A
	<b>SAS connector</b>	SAS Internal: mini-SAS SFF8482 SAS External: mini-SAS SFF8088	SAS Internal: mini-SAS SFF8482 SAS External: mini-SAS SFF8088	SAS Internal: mini-SAS SFF8482 SAS External: mini-SAS SFF8088	SAS Internal: mini-SAS SFF8482 SAS External: mini-SAS SFF8088



### Technical Specifications

		Ultrium 448	Ultrium 920	Ultrium 1760	Ultrium 3000
Power Specifications	<b>Power requirements, Internal</b> (including rack-mount model)	+5V@2.5A (typical) +5V@2.5A (max) +12V@0.7A (typical) +12V@2.1A (max)	+5V@2.5A (typical) +5V@2.5A (max) +12V@0.7A (typical) +12V@2.1A (max)	+5V@2.5A (typical) +5V@2.5A (max) +12V@0.7A (typical) +12V@2.1A (max)	5V@3.5A (typical) +5V@3.7A (max) +12V@0.7A (typical) +12V@1.9A (max)
	<b>Power requirements, External</b>	100 to 240 VAC, 50-60 Hz, auto-ranging, 0.7A max	100 to 240 VAC, 50-60 Hz, auto-ranging, 0.7A max	100 to 240 VAC, 50-60 Hz, auto-ranging, 0.7A max	100 to 240 VAC, 50-60 Hz, auto-ranging, 0.7A max
	<b>Power requirements, Array Module</b>	+5V@2.5A (typical) +5V@2.5A (max) +12V@0.7A (typical) +12V@2.1A (max)	+5V@2.5A (typical) +5V@2.5A (max) +12V@0.7A (typical) +12V@2.1A (max)	N/A	N/A
	<b>Power consumption</b>	13 Watts idle 20 Watts typical 33 Watts max	13 Watts idle 20 Watts typical 33 Watts max	13 Watts idle 20 Watts typical 33 Watts max	7 Watts idle 24 Watts typical 34 Watts max

Environmental Specifications	<b>Temperature range</b>	Operating: 50° F to 95° F (10° C to 35° C) if 6 CFM airflow is provided 50° F to 104° F (10° C to 40° C) if 8CFM airflow is provided for Full-Height, 5CFM airflow for Half-Height Non-Operating: -40° F to 151° F (-40° C to 66° C)
	<b>Non-condensing humidity range</b>	Operating: 20 to 80% RH (Non-condensing, max wet bulb temperature = 26C) Non-Operating: 10 to 95% RH (Non-condensing, max wet bulb temperature = 26C)

Standards Compliance	CSA Certification to C22.2, No.60950 (cCSAus) TÜV EN60950 (IEC 60950 and EN60950) CE Declaration of Conformity FCC 47 CFR Parts 15 NOM VCCI C-TICK RRL BSMI GOSH CB Certificate and Report (IEC 60950)
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### Technical Specifications

#### Front Panel LED Indicators

HP LTO Ultrium 2,3 and 4 tape drives have four LED indicators on the front panel:

- Ready
- Drive Error
- Tape Error
- Clean

HP LTO Ultrium 5 tape drives have five LED indicators on the front panel:

- Ready
- Drive Error
- Tape Error
- Clean
- Encryption

Please consult your HP StorageWorks Ultrium Tape Drive "Getting Started Guide" for more information on how to use these LED indicators for ascertaining drive status and for help in troubleshooting your HP LTO Ultrium tape drive.

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For tape drives and media, 1 GB = 1 billion bytes. Actual formatted capacity is less.

