

## IBM LTO Full High Ultrium 4 Tape Drives, T1600P for OEM customers



IBM LTO Ultrium 4 Tape Drives, T1600P

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### Highlights

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- **Offers a data transfer rate of up to 240 MBps<sup>1</sup> to help shorten backup times**
- **Provides a cartridge capacity of up to 1.6 TB<sup>1</sup> to address the need to store ever greater amounts of data**
- **Designed to be backward compatible with previous-generation Ultrium™ tape drives and media to help protect prior investments**
- **Designed to support data encryption for optimal security**
- **Designed to provide adaptive data compression, Digital Speed Matching (DSM) and a 256 MB buffer for optimal performance and storage capacity**
- **Available with either a 3 Gb SAS, LVD Ultra160 SCSI or 4 Gbps capable Fibre Channel interface for flexible attachment**
- **Incorporates advanced tape threading features, redesigned electronics and error correction functions designed to enhance drive robustness and reliability**

The fourth-generation IBM LTO® Ultrium™ tape drives, T1600P are designed to help meet the storage challenges faced by IT organizations today. First, there is the enormous growth in data, fueled by business continuity, regulatory compliance and information lifecycle management initiatives. The T1600P tape drives are designed with 256 MB encryption to help ensure your data meets security compliance.

### Greater capacity and speed

Offering up to twice the capacity and 50% increased performance of the preceding Ultrium 3 generation of drives, the T1600P tape drives are designed for integration into servers, desktop enclosures, autoloaders and scalable, automated tape libraries.

To further increase capacity, Digital Speed Matching (DSM) is designed to adjust the drive's native data rate to better match the data rate of the server. This feature, along with a larger 256 MB buffer, is designed to help improve data throughput and reduce tape repositions in an environment where the host data rate is less than optimal.

In addition, the T1600P tape drives use an IBM-patented compression algorithm to help optimize compression. The compression algorithm is designed to synchronously swap the data compression scheme dynamically between ALDC (adaptive lossless data compression) and a pass-thru mode. While data compression is being performed, a separate circuit—designed to perform simultaneous decompression—helps support data integrity.

### **Securing Your Data**

Businesses are proactively focusing on securing customer and business data. With increasing regulatory requirements, the need for security of data for audit and compliance has become critical. T1600P tape drives are designed with AES256 encryption to ensure your data meets security compliance issues.

### **Compatibility with prior-generation Ultrium media**

Compatibility with prior-generation Ultrium tape media eases the introduction of these high-performance tape drives, helping to protect prior investments in drives, media and tape automation systems. The T1600P drives are backward read and write compatible<sup>3</sup> with Ultrium 3 media and read compatible with Ultrium 2 media.

By using Ultrium 4 media, you can further shorten backup and restore times, reduce the number of tapes required and further improve the backup window.

### **Flexible host attachment**

The IBM LTO Ultrium 4 tape drives support SCSI, SAS or native Fibre Channel attachment. The T1600P tape drives are designed to allow standalone servers to exploit the tape drive when natively attached. The T1600P tape drive with Fibre Channel allows deployment into second-generation storage area network (SAN) environments, supporting both the Fibre Channel-Arbitrated Loop (FC-AL) topology as well as direct connection to a fabric port on a Fibre Channel fabric such as a Brocade switch.

### **SAN and library integration**

The T1600P tape drive with Fibre Channel is designed to auto-configure to establish its operational mode (FC-AL or point-to-point) and attachment speed. The T1600P tape drive features advanced library support (LDI or ADI) through an RS-422 connector. This is designed to allow the drive to respond quickly to library commands and help avoid contention on the attachment bus.

### **Greater data protection with reliability and serviceability**

The T1600P is designed for overall reliability. The advanced independent tape loader and threader motors combine with positive pin retention improvements to increase the reliability of loading, recovering and tape extraction during a sudden power down. In addition, the Partial Response Maximum Likelihood (PRML) channel includes an adaptive channel calibration feature. This feature is designed to compensate for variations in the recording function, media and read/write head to help optimize interchangeability between LTO vendors' drives.

Despite the increases in performance, the T1600P tape drive consumes less power than previous generations of IBM LTO tape drives. Highly integrated electronics use IBM copper-based technology to help reduce power consumption. These lower power requirements are particularly important for systems in which heat dissipation must be limited.

For enhanced serviceability, the T1600P drive is designed to capture error information which is stored in flash memory. During a power outage, this information can help reduce troubleshooting time for IT staff as well as for system manufacturers.

### **Low total cost of ownership**

The high performance and capacity of the IBM LTO Ultrium 4 Tape Drives, T1600P can help reduce the number of tape cartridges, tape drives and tape libraries required in a storage environment. Compatibility with prior generations of Ultrium media makes it possible for customers to easily migrate to this new generation.

### **Features of fourth-generation drives**

The T1600P tape drive introduces features that help increase throughput, capacity and reliability over previous generation LTO drives—while also helping to protect critical data.

- **New encryption** designed to help users address security concerns by enabling the writing of encrypted data to the LTO Ultrium tape cartridge and the management of encryption keys to help protect the storage and transport of sensitive information. Encryption is available for LTO-4 SAS and FC drives only. Ultrium 800 GB media is required.
- **A 16-channel head design** is designed to help provide double data throughput while maintaining backward compatibility with previous generation drives. The 16-channel head, coupled with the 31 percent increase in linear density, increases drive performance.
- **IBM-patented, timing-based servo positioning** is designed to help data be written to tape with greater precision. The tracks are narrower on the 16-channel head, which helps to increase cartridge capacity. Compared to the T800/T800F, the track density of the T1600P is increased by 27 percent to 896 tracks.
- **Advanced tape loader and threader mechanism** helps improve error recovery when loading, threading and unloading a cartridge. Independent loader and threader motors, coupled with positive pin retention, help retain the pin during a mis-pick. This independent control can help improve load and thread reliability.
- **A graceful, dynamic braking feature** helps enable the reel motors to gradually decelerate instead of stopping abruptly in the event of a power failure. It helps prevent tape stretching and loose tape wraps and can reduce tape damage and breakage.
- **“On-the-fly” adaptive channel calibration** is designed to allow the drive to adjust to variations in the media and head. Calibrating the channel can help improve higher data throughput rates and data integrity among LTO vendors’ drives.
- **Redesigned electronics** Even though the number of tracks have increased, the overall power consumption of the drive has been optimized from that of previous generation LTO drives.
- **Superior power management** results in reduced heat dissipation and greater operational efficiency than that of previous generation LTO drives. The drive operates in two modes: write mode and idle mode (for when the drive is not in use).
- **Digital Speed Matching (DSM)** is supported on Ultrium 4 media in increments of 60 MBps to 120 MBps. This feature, along with a larger buffer, is designed to help improve throughput in environments where the host data rate is less than optimal.
- **A larger 256 MB buffer** is designed to work in combination with DSM to mask the impact of data rate fluctuations, allowing the tape drive to perform at its optimal speed.
- **WORM support** To help meet the needs of evolving regulatory initiatives, the T1600P tape drive will adopt the LTO industry specification for WORM. WORM-enabled drives are designed to automatically determine whether the inserted cartridge is a WORM (write once, read many) or read/write cartridge. WORM cartridges provide the ability to store vital data in a non-erasable, non-rewriteable format.

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## IBM LTO Full High Ultrium Tape Drives, T1600P at a glance

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### Characteristics

Tape drive type	LTO Ultrium 4
Capacity per cartridge	1.6 TB compressed <sup>1</sup> ; 800 GB native
Data transfer rate	Up to 240 MBps compressed <sup>1</sup> ; 120 MBps native
Number of tracks	824
Media	LTO Ultrium 2, 3 and 4
Data cartridge	LTO Ultrium 4 (rewritable) LTO Ultrium 4 (WORM)
Universal cleaning cartridge	For LTO Ultrium 2, 3 and 4
Backward compatibility	Read/write compatible with Ultrium 3 media Read compatible with Ultrium 2 media
Interface	LVD Ultra160 SCSI FC-4 at 2 Gbps or 4 Gbps SAS 3 Gb
Library interface	LDI, ADI
Data compression	SLDC (LTO data compression per ECMA-321) <sup>2</sup>
Encryption	AES256
Buffer	256 MB
Rewind speed	Up to 8 meters/sec
Operating speed	6.33 meters/sec
Data rate matching	Digital Speed Matching 30 – 120 MBps
Locate speed	8 meters/sec
Average file access	54 seconds
Load to BOT	15 seconds
Unload from BOT	15 seconds
Average rewind time	78 seconds

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## IBM LTO Full High Ultrium Tape Drives, T1600P at a glance

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### Physical characteristics

Dimensions (internal drive)	8.5 cm H x 14.9 cm W x 21.1 cm D (3.33 in x 5.83 in x 8.33 in)
Weight	3.0 kg (6.6 lb)

### Reliability

Mean time between failures (MTBF)	250,000 hours at 100 percent duty cycle*
Error rate (calculated)	1 x 10 <sup>17</sup> bytes per permanent read error*
Error rate (validated)	1 x 10 <sup>14</sup> bytes per permanent read error*
	1 x 10 <sup>13</sup> bytes per permanent write error*

### Operating environment

Operating temperature	10° to 45° C (50° to 100° F)
Relative humidity	10% to 80% (non-condensing)
Electrical power	T1600P (U160 SCSI): 5 V at 3.4 A, 12 V at 1.1 A (steady state) T1600P (FC): 5V at 2.4 A, 12 V at 1.1 A (steady state)
Power dissipation	T1600P (U160 SCSI): 11.5 W (idle, with cartridge), 26.5 W (read/write) T1600P (FC): 14.5 W (idle, with cartridge), 29.5 W (read/write)

### Open systems support

Microsoft® Windows® 2000; Microsoft Windows Server® 2003; Sun Solaris® 10;  
HP-UX 11.0, 11i; Linux® (Red Hat Enterprise Server 4, SUSE Linux Enterprise Server 9;  
AIX® Version 5.1, 5.2, 5.3; and Novell NetWare)

### Warranty

Three-year mail-in exchange

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\* All performance and reliability values are provided 'AS IS' and no warranties or guarantees are expressed or implied by IBM. Actual values may vary and depend upon many factors including system hardware configuration and software design and configuration.

## Media

You can order media for all your IBM LTO Ultrium tape products from your IBM Representative or visit [ibm.com/servers/storage/media](http://ibm.com/servers/storage/media)

## For more information

Contact your IBM representative or visit:

[ibm.com/servers/storage/tape/oem](http://ibm.com/servers/storage/tape/oem)



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MB, GB and TB equal 1,000,000, 1,000,000,000 and 1,000,000,000,000 bytes, respectively, where referring to storage capacity. Actual storage capacity will vary based upon many factors and may be less than stated. Some numbers given for storage capacities give capacity in native mode followed by capacity using data compression technology.

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<sup>1</sup> Assuming 2:1 compressible data.

<sup>2</sup> Prior to the release of ECMA-321, SLDC (streaming lossless data compression) was known as "LTO-DC." SLDC uses ALDC as its primary data compression scheme, but also has a pass-thru scheme to avoid the expansion of incompressible data—a problem ALDC and most other compression algorithms encounter.

<sup>3</sup> Encrypted files cannot be written to prior generation media.