

Excellent storage capacity and reliable data backup and recovery
for midrange and enterprise server environments



IBM TotalStorage Ultrium Tape Drive T400/T400F



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Highlights

- **Designed to provide a data transfer rate of up to 70MB/sec¹ and a cartridge capacity of up to 400GB¹ to address the challenge of rapid data growth**
- **Designed to provide backward read/write compatibility and coexist with first-generation Ultrium tape drives and media to help protect prior investment**
- **Features enhanced data compression and digital speed matching designed to provide optimal performance and storage capacity for disparate server environments**
- **Provides either an Ultra-160 SCSI or 2Gb FC-AL interface to standalone server attachment, and provides a 2Gb Fibre Channel interface to a Storage Area Network (SAN) fabric interface, which is capable of connecting to either an FC-AL or point-to-point topology**
- **Adheres to the Linear Tape-Open™ (LTO®) specification to allow enterprises to adopt a standard tape drive/tape format**

Enhanced performance and capacity

To help meet the twin challenges of today's enterprise environment—rapid data growth and shrinking backup windows—IBM® has introduced the second-generation IBM TotalStorage® Ultrium® Tape Drive T400/T400F. Using advanced technologies, this tape drive offers more than twice the data transfer rates of the preceding generation and doubles the cartridge capacity when used with the new Ultrium 2 media.

Compatibility with first-generation Ultrium technology

The IBM TotalStorage Ultrium Tape Drive T400/T400F can also help improve performance when used with first-generation Ultrium media; however, using Ultrium 2 media can require fewer tapes to help lower cost of ownership. Coexistence with first-generation Ultrium tape technology is designed to allow for upgrades, helping to protect customers' investments in drives, media and tape automation platforms.



IBM TotalStorage LTO Ultrium 2 media

Flexible attachment

The TotalStorage Ultrium Tape Drive T400/T400F supports either Ultra-160 SCSI or FC-2 attachment. The Ultra-160 SCSI attachment is designed to allow standalone servers to exploit the tape drive when natively attached. The FC-2 attachment allows deployment into second-generation SAN environments, supporting both the FC-AL topology as well as direct connection to a fabric port (F_port) on a Fibre Channel fabric such as a McDATA switch. These attachments can help reduce the time required to back up data or the number of drives required to support business continuity.

SAN and tape library integration

In a SAN environment, the IBM TotalStorage Ultrium Tape Drive T400F is designed to auto-configure to establish its operational mode (FC-AL or point-to-point) and attachment speed. In addition, the tape drive features advanced library

support through an RS-422 interface, which is designed to allow the drive to respond quickly to the library and avoid contention on the attachment bus.

Low total cost of ownership

Exploiting the performance and capacity of the IBM TotalStorage Ultrium Tape Drive T400/T400F can help reduce the number of tape cartridges, tape drives and tape libraries required in a storage environment, allowing existing customers to expand their current installation and new customers to install a cost-effective solution.

Second-generation enhancements

The T400 and T400F tape drives feature several technology enhancements designed to help optimize data throughput, increase cartridge capacity and provide excellent data protection:

- **Digital speed matching (DSM)** is designed to allow the drive to adjust its native data rate to closely match the host data rate. This feature, along with an increased buffer, can help improve throughput in an environment where the host data rate is less than optimal.
- A **64MB buffer** works in combination with DSM to help mask the impact of data rate fluctuations by helping reduce backhitch operations to allow the tape drive to perform at its optimal speed.
- An **optimal LTO data compression (SLDC)** implementation uses an IBM-patented algorithm designed to synchronously swap the data compression scheme between ALDC and pass-thru for optimal data compression to help produce increased storage capacity. While data compression is being performed, a separate circuit, designed to perform simultaneous decompressions, help support data integrity.
- The IBM-patented **Partial Response Maximum Likelihood (PRML)** channel is used to read and write new tapes, while maintaining first-generation Ultrium peak-detect technology to allow backwards compatibility.

IBM TotalStorage Ultrium Tape Drive T400 (SCSI)/T400F (Fibre Channel) at a glance

Characteristics

Tape drive type	LTO Ultrium 2
Physical capacity per cartridge	400GB ¹ ; 200GB native
Sustained data transfer rate	Up to 70MB/second ¹ ; 35MB/second native
Aggregate sustained data rate	Up to 247GB/hour ¹
Number of tracks	512
Media	LTO Ultrium 1 and Ultrium 2
Data cartridge	LTO Ultrium 1: Part number 08L9120 LTO Ultrium 2: Part number 08L9870
Universal cleaning cartridge	For both LTO Ultrium 1 and Ultrium 2: Part number 35L2086
Backward compatibility	Read/write compatible with Ultrium 1
Interface	T400: Ultra-160 SCSI LVD T400F: FC-2 at 1Gbps or 2Gbps
Data compression	SLDC (LTO data compression per ECMA-321) ²
Rewind speed	Up to 8 meters/second
Operating speed	Up to 6.22 meters/second
Data rate matching	Digital speed matching (DSM) from 17.5MB/second to 35MB/second
Maximum locate speed	Up to 8 meters/second
Average file access	49 seconds
Average load to BOT	15 seconds
Average unload from BOT	15 seconds
Average rewind time	49 seconds (average Ultrium 2 cartridge)

Reliability

MTBF (hours)	250,000 @ 100% duty cycle
Error rate (calculated)	1 x 10 ¹⁷ bytes per permanent read error
Error rate (validated)	1 x 10 ¹⁴ bytes per permanent read error
Error rate (validated)	1 x 10 ¹³ bytes per permanent write error

Physical characteristics

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

Operating environment

Operating temperature	50° to 104° F (10° to 40° C)
Relative humidity	20% to 80% (non-condensing)
Electrical power	T400: 5 V at 3.1 A, 12 V at 1.1 A (steady state) T400F: 5 V at 3.7 A, 12 V at 1.1 A (steady state)
Power dissipation	T400: 13 W (idle-cartridge), 29 W (read/write), 9 W (sleep-no cartridge) T400F: 16 W (idle-cartridge), 32 W (read/write), 12 W (sleep-no cartridge) ³

Supported systems

Microsoft® Windows® NT® 4.0 with Service Pack 6.0, Microsoft Windows 2000; Sun® Solaris; HP-UX; Linux® (Intel® processor-based servers); AIX® Version 4.3.3, 5.1, 5.2 and Novell NetWare

Warranty

Internal drive	Three-year mail-in exchange
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- **Enhanced servo positioning** is designed to allow data to be written to tape with great precision. This feature, along with improved magneto-resistive (MR) head design, helps increase the number of tracks by 33 percent to 512 tracks compared to the previous generation.
- **Additional reel motor enhancements** have allowed the maximum tape speed to be increased by 33 percent to 8 meters/second compared to the previous generation. Additionally, the average file access time has been reduced by 33 percent to 49 seconds, and the unload time has been reduced by 17 percent to 15 seconds.
- **Smart power management** helps reduce power consumption and heat dissipation and is designed to switch the drive to either an idle or standby mode when it is not in use.

Media

You can order media for all your IBM TotalStorage Ultrium tape products from your IBM Authorized Distributor. Or visit ibm.com/totalstorage/lto

For more information

For more information, contact your IBM representative or IBM Authorized Distributor. For updated attachment, supported operating system and storage management software information, visit ibm.com/totalstorage/lto



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¹ Assuming 2:1 compressible data.

² Prior to the release of ECMA-321, SLDC 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.

³ Depending upon configuration.



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