IBM TS4500 Tape Library supports LTO Ultrium 7, 18 frames, 128 tape drives, mixed media, and automatic media verification

At a glance

IBM[(R)] TS4500 tape libraries combine IBM tape and automation reliability at open systems prices. New features expand capacity and function, and are designed to deliver the following enhancements:

- Support for Linear Tape-Open™ (LTO™) Ultrium™ 7 tape drives
- 18 Frame support (scalability)
  - Maximum capacity with TS1150 is 175 PB native, 526 PB (assuming 3:1 compression ratio)
  - Maximum capacity with TS1070 is 148 PB native, 370 PB (assuming 2.5:1 compression ratio)
- Support for up to 128 tape drives
  - Support for up to 7 drive expansion frames (D25 or D55)
- Mixed media support (LTO and enterprise tape frames intermixed in one library)
- Support for new and field merged LTO Ultrium 7 tape drives into 3584 models L55 and D55
- Models S24 and S54 MES upgrades for redeployment into TS4500 libraries (Investment protection)
- Support for automatic media verification

Order now

For ordering, contact your IBM representative or an IBM Business Partner. For more information, contact the Americas Call Centers at: 800-IBM-CALL (426-2255).

Reference: YE001

Overview

IBM TS4500 delivers enhanced capabilities for supporting intermix of LTO and 3592 drives and scalability up to 18 frames in a single tape library (for single accessor configurations).

In addition, TS4500 now supports storage frame conversions for redeployment of S24 and S54 frames from TS3500 to TS4500, introducing a new TS4500 control

upgrade feature code to allow S24 or S54 frames to be converted to a TS4500 control system in the field.

- 18 Frame support (scalability)
  - Maximum capacity with TS1150 is 175 PB native, 526 PB (assuming 3:1 compression ratio)
  - Maximum capacity with TS1070 is 148 PB native, 370 PB (assuming 2.5:1 compression ratio)
- Limited to 128 tape drives maximum
  - Limited to seven frames (D25 or D55) maximum
- Mixed media Support (LTO and enterprise tape frames intermixed in one tape library)
- Support for new and field merge TS1070 (3588-F7C) drives into 3584 models L55 and D55
- Models S24 and S54 MES Upgrades for redeployment onto TS4500 libraries (Investment protection)
- Automatic Media health verification

IBM TS1070 Model F7C is designed to be installed in an IBM TS4500 Tape Library to deliver high capacity and performance for the midrange open systems environment. These models incorporate the new LTO IBM Ultrium 7 Tape Drive with enhanced maximum tape drive throughput over the IBM LTO generation 6 tape drive (Ultrium 6). It has a native data transfer of up to 300 MB/sec.

The TS1070 Tape Drive supports the LTO Generation 7 media specification of over double the compressed capacity of up to 15 TB with 2.5 to 1 compression (up to 6 TB native capacity) as compared to previous LTO 6 compressed capacity of up to 6.25 TB with 2.5:1 compression (up to 2.5 TB native capacity) per tape cartridge. IBM Ultrium 7 Tape Drives can read and write LTO Ultrium 6 and read LTO Ultrium 5 Data Cartridges. The TS1070 has an 8 Gbps Fibre Channel dual-ported interface for connection to a wide spectrum of open system servers.

IBM Ultrium 7 enhancements that help improve performance and reliability include:

- Native data transfer rate up to 300 MB/sec
- LTO Generation 7 media specification tape cartridge compressed capacity of up to 15 TB (up to 6 TB native)
- 8 Gbps Fibre Channel dual-ported drive attachment
- A 1 GB internal buffer
- Support for media partitioning and self describing tape with IBM Spectrum Archive™ Enterprise Edition
- LTO Ultrium 7 encryption support
- LTO Ultrium 7 cartridge capacity of up to 139 PB per library (up to 347.5 PB with 2.5:1 compression)

Key prerequisites

Appropriate levels of host and drive software are required to attach TS1070 Model F7C to a wide range of environments, including select IBM Power Systems™, IBM System p, IBM z Systems™ (zLinux), other servers running Linux™ and Microsoft™ Windows™ operating system environments that support Fibre Channel interfaces.

Prerequisites for using encryption

Certain hardware and software prerequisites must be met before using encryption with TS4500 tape libraries.

With TS4500 tape libraries, encryption is managed at the logical library level. All encryption-enabled drives that are assigned to a logical library use the same method of encryption. The rules for setting up encryption differ based on whether the library is installed with 3592 or LTO tape drives, and whether you use Library-Managed Encryption (LME) or Application-Managed Encryption (AME). If the library contains 3592 tape drives, the following prerequisites apply:

- IBM Security Key Lifecycle Manager (formerly Tivoli[R] Key Lifecycle Manager) must be attached to the TS4500 and configured for LME
- Tape drives must be enabled for encryption from the Logical Libraries page of the TS4500 management GUI

If the library contains LTO tape drives, the following prerequisites apply:

- Tape drives must be enabled for encryption from the Logical Libraries page of the TS4500 management GUI
- Feature code 1604, Transparent LTO Encryption, is required for LTO tape drives if using LME
- IBM Security Key Lifecycle Manager is required as the key manager when using LME with LTO

Planned availability date

November 20, 2015

Description

IBM TS1070 Model F7C are IBM LTO Ultrium 7 Tape Drives is designed for the heavy demands of backup and archive tape storage. TS1070 Model F7C can be mounted in a TS4500 tape library, and has an 8 Gbps Fibre Channel dual-ported interface for attachment to a wide range of environments, including select IBM Power Systems, IBM System p, IBM System z[R] (zLinux), other servers running Linux and Microsoft Windows operating system environments.

TS1070 models incorporate seventh-generation IBM LTO Ultrium technology and are supported by HD2 frames of the TS4500 tape library. They offer the following significant improvements over prior generations:

- **Increased performance:** Maximum tape drive throughput native data rate performance is of up to 300 MB/sec. Data tracks are written 32 at a time. IBM LTO7 Tape Drives can read and write LTO Ultrium 6 Data Cartridges at Ultrium 6 capacities and rates, and read LTO Ultrium 5 Data Cartridges at Ultrium 5 capacities and rates.

  Note: Although the Ultrium 7 Tape Drive delivers the capability for excellent tape performance, other components of the system may limit the actual performance achieved. Although the compression technology used in the tape drive can typically 2.5 the amount of data that can be stored on the media, the actual degree of compression achieved is highly sensitive to the characteristics of the data being compressed.
- **Increased tape cartridge capacity:** The LTO Generation 7 media specification tape cartridge physical capacity is up to 15 TB compressed physical capacity, more than double that of Ultrium 4, 5, and 6 data cartridges. This is achieved by increasing the linear density, track density, and the media length. IBM Ultrium 7 tape itself is an advanced Barium Ferrite tape developed to help provide durability and increased capacity.
- **Encryption:** The IBM TS1070 LTO Ultrium 7 Tape Drive supports data encryption on the base drive with Ultrium 7 or Ultrium 6 media. System-Managed and Library-Managed Encryption and associated IBM Security Key Lifecycle Manager access are all available as a chargeable licensed key (feature 1604, Transparent

LTO Encryption) under the TS4500 tape library L-frames. IBM Security Key Lifecycle Manager V1.0 is required with this feature.

- **Attachment options:** The TS1070 Tape Drive comes with 8 Gbps Fibre Channel dual-ported attachment models for connection to a wide spectrum of open system servers. They are supported on a wide range of environments including select IBM Power Systems, IBM System p, IBM z Systems (zLinux), other servers running Linux and Microsoft Windows operating system environments.

- **WORM media support:** LTO Generation 7 media specification delivers up to 6 TB native capacity, up to 15 TB in compressed mode, and up to 300 Mbps native data rate. IBM 3589 Ultrium 7 WORM Tape Cartridges are designed for archiving and data retention applications, as well as those applications requiring an audit trail. These cartridges work with the IBM LTO Ultrium 7 Tape Drive to help prevent the alteration or deletion of user data. IBM LTO 7 WORM Tape Cartridges can be ordered as unique 3589 models with the following features:

  - Color coding and prelabeling with the ability to specify a starting volume serial number
  - Packaging that comes in individual jewel cases or in bulk
  - Cartridge memory, built into every cartridge, enhances functionality and media reliability by storing access history and media performance information for use by the tape drive every time the cartridge is accessed
  - Half-inch particle tape delivers up to 15 TB WORM compressed capacity in a single cartridge

- **Internal data buffer:** There is a 1 GB internal data buffer in the Ultrium 7 Tape Drive.

- **Digital speed matching:** The Ultrium 7 Tape Drive is designed to perform dynamic speed matching (at one of twelve speeds: 300, 287, 268, 250, 231, 213, 194, 175, 157, 138, 120, 101 MB/s) to adjust the drive's native data rate as closely as possible to the net host data rate after data compressibility has been factored out. This helps reduce the number of backhitch repositions and improve throughput performance. Speed matching on Ultrium 7 ranges from 100 to 300 MB/sec versus 40 to 160 MB/sec on Ultrium 6.

- **Giant Magneto Resistive (GMR) head design:** Use of flat lap head technology in GMR heads from enterprise tape drives for Ultrium 7 help minimize contact, edge damage, debris accumulation, and wear on the tape as it moves over the read/write heads.

- **Dual-stage 32-channel head skew actuator:** The actuator is designed to enable precision head alignment to help support higher track density and improved data integrity. Track following skew actuator supports flangeless tape guide rollers and dynamic skew to enable the head to follow skew tape motion and improve linear actuation.

- **Power management:** The Ultrium 7 Tape Drive power management function is designed to control the drive electronics to be either completely turned off or in a low-power mode when the circuit functions are not needed for drive operation.

- **IBM Linear Tape File System™ (LTFS) partitioning support:** The principal function of media partitioning is to enable faster data access by splitting the cartridge into two media partitions. LTFS media partitioning is supported in the TS1070 Tape Drive, and Spectrum Archive EE will be supported in the TS4500 tape library. WORM media can also be partitioned.

IBM LTFS software leverages LTO7 tape partitioning. It is designed to enable a self-describing tape file format and to deliver an easy tape storage and distribution solution without the use of additional database applications. IBM LTFS software is a perfect choice for customers requiring a standard tape cartridge format at a low cost and will use standalone IBM LTO7 tape drives. IBM LTFS is the perfect solution for those in the media and entertainment industry, and other fields that need massive data storage on tape for long retention periods, such as banking, scientific research, and government sectors. For further information and list of supported operating systems, refer to the LTFS website

http://www.ibm.com/tape/ltfs

IBM maintains the latest levels of Storage tape drive and library device drivers and documentation on the Internet. Utilize the Fix Central download portal by accessing the following website

http://www.ibm.com/support/fixcentral

There are several menus to navigate to the correct download as follows:

1. On the first menu item Click **Select Product** > **Product Group** > *System Storage(R)*
2. Expand **Select from System Storage** *>Tape Systems*
3. Expand **Select from Tape systems** *>Tape drivers and software*
4. Expand **Select from Tape drivers and software** *>user product*
5. Expand **Platform** *>user operating system*
6. Click **Continue** to view what drivers are available

The *IBM Tape Device Drivers Installation and User's Guide* can be found at the following website

http://www-01.ibm.com/support/docview.wss?rs=577&uid=ssg1S7002972

The following IBM LTO Ultrium feature enhancements are included in the IBM LTO Ultrium 7 Tape Drive:

- **Positive pin retention and independent tape loader and threader motors:** These are designed to help improve the reliability of loading and unloading a cartridge, and to retain the pin even if tension is dropped. An independent loader motor, coupled with the positive pin retention, is designed to cause the tape to thread with a higher level of reliability.
- **Graceful dynamic braking:** In the event of power failure, reel motors are designed to maintain tension and gradually decelerate instead of stopping abruptly, helping reduce tape breakage, stretching, or loose tape wraps during a sudden power outage.
- **Servo and track layout technology:** There are 3,584 data tracks in Ultrium 7 versus 2,176 data tracks in Ultrium 6. The high-bandwidth servo system features a low-mass servo to help more effectively track servo bands and improve data throughput with damaged media in less-than-optimal shock and vibration environments.
- **Surface Control Guiding Mechanism:** The patented Surface Control Guiding Mechanism from IBM is designed to guide the tape along the tape path in the Ultrium 7, 6, 5, and 4 Tape Drives. This method uses the surface of the tape, rather than the edges, to control tape motion. This helps to reduce tape damage (especially to the edges of the tape) and tape debris, which comes from the damaged edges and can accumulate in the head area.
- **Optimized robust drive components for automation environments:** Using some of the most robust components available, steel ball bearings in the loader, robust leader block design, and a single circuit card, helps to enhance reliability and prolong the life of drives.
- **Adaptive read equalization:** This feature is designed to automatically compensate for dynamic changes in readback signal response.
- **Dynamic amplitude asymmetry compensation:** This feature optimizes readback signals for linear readback response from MR read head transducers.
- **Separate writing of multiple filemarks:** This is designed to cause any write command of two or more filemarks to cause a separate data set to be written containing all filemarks after the first. This feature helps improve performance if a subsequent append overwrites somewhere after the first filemark.
- **LTO Data Compression (LTO-DC):** The Ultrium 7 uses LTO-DC, which is an implementation of a Lempel-Ziv class 1 (LZ-1) data compression algorithm. LTO-DC is an extension of Adaptive Lossless Data Compression (ALDC) and an improvement over previous IBM lossless compression algorithms. Scheme-Swapping compression, patented by IBM, is designed to look ahead at incoming data and determine the most efficient storage method (either ALDC or pass-thru

mode) to help provide optimal data compression and increase data throughput. The compression ratio for LTO Ultrium 7 is 2.5 to 1.

- **LTO Cartridge Memory (LTO-CM):** Contained within the LTO Ultrium data cartridge is the LTO-CM, which is a passive, contactless silicon storage device that is part of the cartridge. The LTO-CM is designed to hold information about that specific cartridge, the media in the cartridge, and the data on the media. The storage capacity of the Generation 7 LTO-CM is 16320 bytes. Communication between the drive and the LTO-CM is via a low-level RF field transmitted by the drive to the cartridge.
- **Statistical Analysis and Reporting System (SARS):** The Ultrium 7 Tape Drive uses SARS to help isolate failures between media and hardware. SARS uses the cartridge performance history saved in the Cartridge Memory module and the drive performance history kept in the drive flash to help determine the most likely cause of failure. SARS is designed to cause the drive to request a cleaner tape, to mark the media as degraded, and to indicate that the hardware has degraded.
- **Highly integrated electronics using IBM-engineered copper technology:** This technology is designed to reduce the total number of components in the drive, help lower chip temperatures, and reduce power requirements to deliver a more reliable drive. The seventh-generation drive electronics are designed to provide error correction of soft errors in the memory arrays in data and control paths.

With support for LTO Ultrium-format tape data cartridges, TS1070 Model F7C with the TS4500 tape library can be a cost-effective solution for backup, save-and-restore, and archiving functions.

Ultrium 7 Data Cartridges

The physical compressed capacity of the LTO 7 data cartridges have more than doubled the capacity of the IBM Ultrium 6 Data Cartridge with a capacity of up to 15 TB with 2.5 to 1 compression. IBM LTO Ultrium 7 Tape Drives can read and write Ultrium 6, and read Ultrium 5 data cartridges. IBM LTO 7 cartridges can be resident in the same TS4500 tape libraries with the Ultrium 6 and 5 data cartridges. IBM LTO 7 data cartridges can be ordered using IBM machine type 3589, IBM LTO Ultrium Tape Cartridges.

These cartridges have been designed to deliver several enhancements over previous tape technologies and to work with tape drives that have increased tape speeds and high-density data recording. The case is specially designed for use in automated libraries and is designed for repeated, unattended handling.

TS4500 features and functions

The TS4500 tape library supports LTO 5 and later LTO tape drives.

The LTO 5, LTO 6, and LTO 7 tape drives are dual-ported drives that facilitate 8 Gbps Fibre Channel connectivity. These drives are differentiated from other LTO drives by their machine type and model numbers. You can identify the LTO tape drives by the logo at the front of the drive or by the label at the rear of the drive's canister.

LTO tape drives communicate with the TS4500 tape library through an internal Ethernet interface and use SARS to isolate failures between media and hardware. They read and write non-WORM media, so you can load WORM-capable firmware on your tape drives and use any media that is supported by these drives. In this case, only the data that is written on WORM media is treated as WORM data. Data that is written on other types of media can be overwritten.

LTO tape drives do not read from or write to 3592 tape cartridges, and 3592 tape drives do not read or write to LTO tape cartridges. LTO tape drives can read tapes that were written by non-IBM LTO drives. They also write to tapes that can be read by non-IBM LTO drives.

All supported generations of LTO tape drives and cartridges can reside in the same frame.

When a cartridge is labeled according to IBM bar code label specifications, the last character of its VOLSER number indicates the generation of the medium. For example, a cartridge with a VOLSER of 000764L7 is an LTO 7 cartridge and a cartridge with a VOLSER of 000764L6 is an LTO 6 cartridge.

To enhance library performance, the LTO tape drives include speed matching, channel calibration, and power management. Speed matching dynamically adjusts the drive's native (uncompressed) data rate to the slower data rate of a server. Channel calibration customizes each read and write data channel for optimum performance. The customization enables compensation for variations in the recording channel transfer function, media characteristics, and read/write head characteristics. Power management reduces the drive's power consumption during idle power periods.

To ensure that your tape drive conforms to IBM specifications for reliability, use only IBM LTO tape cartridges. You can use other LTO-certified data cartridges, but they might not meet IBM standards of reliability.

Encryption

The LTO 5 and later LTO tape drives are encryption capable, which means they can convert data into a cipher that ensures data security. To perform encryption, the drive must be encryption enabled by your selection of one of three methods of encryption management. Two of these methods, system-managed and library-managed encryption, require the purchase of feature number 1604 (Transparent LTO Encryption).

A key is required to encrypt and decrypt the data. How a key is generated, maintained, controlled, and transmitted depends on the operating environment where the tape drive is installed. Some data management applications are capable of performing key management.

For an alternative solution, IBM provides a key manager that works in conjunction with the keystore of your choice to perform all necessary key management tasks. There is no recovery for lost encryption keys. Refer to the IBM Encryption Key Manager and IBM Security Key Lifecycle Manager (formerly Tivoli Key Lifecycle Manager) publications.

Product positioning

As you compare competitive tape solutions, consider:

- Capacity and performance requirements
- Data integrity and encryption, reliability, and availability
- Data partitioning, formatting, and management, such as LTFS
- Storage usage and application requirements
- Affordability
- Loyalty to legacy or existing tape formats

TS4500 Tape Library and IBM software applications excel in addressing these requirements and deliver a functionally rich tape storage solution incorporating LTO Ultrium and 3592 tape technology. You also gain flexibility of automated tape library management and unattended save, restore, and archive operations.

The TS4500 tape library models are a smart choice in tape automation for IBM System i[(R)], IBM System p, or IBM z Systems products, and other open systems. TS4500 utilizes the patented Multi-Path Architecture, designed to enable homogeneous or heterogeneous open systems applications to share the library robotics, with Advanced Library Management System (ALMS) for storage slot pooling and flexible drive assignment.

The TS4500 is part of a family of IBM tape products and can be the answer to growing storage requirements and shrinking backup windows.

If you have existing digital linear tape experience or require high-performance automated tape backup, the TS4500 tape library constitutes an excellent tape storage solution.

Additional TS4500 features include advanced electronics, HD frames, Capacity on Demand entry library frames, and LTO and 3592 drive technology choices and integration.

Depending on capacity requirements, a wide spectrum of tape libraries are available from the IBM Ultrium Tape family of products, based on your storage usage and requirements. Lower capacity tape automation products to choose from include the IBM TS3310, TS3200, or TS3100 Tape Libraries.

For high duty-cycle and start/stop intensive tape applications, with mission-critical data protection and high-capacity requirements, consider the IBM TS1140 or TS1150 or 3592 Tape Drive with the IBM TS4500 tape library.

Reference information

For more information, refer to the following announcements:

- IBM TS1140 Tape Drive Model EH7, Hardware Announcement 114-078, dated May 19, 2014
- IBM TS4500 Tape Library, Hardware Announcement 114-072, dated May 19, 2014
- IBM TS1060 Tape Drive Model F6A, Hardware Announcement 112-162, dated October 03, 2012
- IBM TS1140 Tape Drive Model E07, Hardware Announcement 111-087, dated May 09, 2011
- IBM TS1050 Tape Drive Model F5A, Hardware Announcement 110-075, dated April 12, 2010
- IBM TS1150 Tape Drive models EH8 and E08, Hardware Announcement 114-165, dated October 06, 2014

For IBM statement on compliance with European Union Directive on Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment (2002/95/EC) (RoHS), visit

http://www.ibm.com/ibm/environment/products/rohs.shtml

Product number

Description	Machine type	Model	Feature number
TS1070 Ultrium 7 Tape Drive	3588	F7C	
3588 F7A/F7C Drive Plant Install	3588	F7C	9607
3588 F7A/F7C Drive Field Install	3588	F7C	9608
TAA Compliance	3588	F7C	0983*
TS1140 and TS1150 tape drive support	3584	L25, L55	1404
LTO5 and LTO6 tape drive support	3584	L25, L55	1405
LTO6 and LTO7 tape drive support	3584	L25, L55	1407

Description	Machine type	Model	Feature number
Additional LTO Cartridge Magazine	3584	L25	1628*
Additional 3592 Cartridge Magazine	3584	L55	1629*
TS4500 Control upgrade	3584	S24, S54	1742
7-14 Frame X-Track Cable	3584	L25, L55	1814*
9-18 Frame X-Track Cable	3584	L25, L55	1818
IMC Separate Power Source	3584	S25, S55	2737
Mixed Media Library	3584	L25, L55	9080
3588 F7A/F7C Plant Install	3584	D55, L55	9607
Dual 4.3M Pwr Cord WT	3584	S25, S55	9970*
Dual 4.3M Pwr Cord Non-WT	3584	S25, S55	9972*
Dual 4.3M Pwr Cord Argentina	3584	S25, S55	9976*
Dual 4.3M Pwr Cord Brazil	3584	S25, S55	9977*
Dual 4.3M Pwr Cord Aust/NZ	3584	S25, S55	9978*
Dual 4.3M Pwr Cord Japan	3584	S25, S55	9979*
Dual 4.3M Pwr Cord China	3584	S25, S55	9980*
Dual 4.3M Pwr Cord Korea	3584	S25, S55	9981*
Dual 4.3M Pwr Cord Taiwan	3584	S25, S55	9982*
Dual 4.3M Pwr Cord So.Africa	3584	S25, S55	9983*
Dual 4.3M Power Cord NEMA L6-20 Non-Watertight	3584	S25, S55	9984*
Dual 4.3M Power Cord Russellstoll Watertight	3584	S25, S55	9985*
Power Cord to adjacent frame PDUs	3584	S25, S55	9989*

* This feature was previously announced on other model.

Model conversions

From Model	To Model	Conversion requirements
3588-F7A	3588-F7C	Field only

Business Partner information

If you are a Direct Reseller - System Reseller acquiring products from IBM, you may link directly to Business Partner information for this announcement. A PartnerWorld ID and password are required (use IBM ID).

Education support

Call IBM IT Education Services at 800-IBM-TEACH (426-8322) for catalogs, schedules, and enrollments.

Publications

Information on TS1070 Model F7A and Model F7C Tape Drives are contained in the following TS4500 Tape Library publications. Additional copies are available. To order, contact your IBM representative.

Title	Order number
IBM Tape Device Driver Installation and User's Guide (English)	GC27-2130
IBM TS1050 (Model 3588 F5A), TS1060 (Model 3588 F6A), and TS1070 (Model 3588 F7A) Installation instructions for 3588 drive model conversion F5A to F5C, F6A to F6C, or F7A to F7C	12X4574

The following publications are shipped with the product. Additional copies are available. To order, contact your IBM representative.

Title	Order number
IBM TS4500 Lx5 Base Frame Installation Roadmap	SC27-5987
IBM TS4500 Product Information CD	

http://www-05.ibm.com/e-business/linkweb/publications/servlet/pbi.wss

Title	Order number
IBM TS4500 Introduction and Planning Guide	SC27-8990

http://www.ibm.com/support/fixcentral

TS4500 Knowledge Center

http://www-01.ibm.com/support/knowledgecenter/STQRQ9/ com.ibm.storage.ts4500.doc/ts4500_ ichome.html

IBM Knowledge Center provides you with a single information center where you can access product documentation for IBM systems hardware, operating systems, and server software. Through a consistent framework, you can efficiently find information and personalize your access. IBM Knowledge Center is located at

http://www.ibm.com/support/knowledgecenter/

IBM Publications Center Portal

The Publications Center is a worldwide central repository for IBM product publications and marketing material with a catalog of 70,000 items. Extensive search facilities are provided. A large number of publications are available online in various file formats, which can currently be downloaded.

The IBM Publications Center Portal is located at

http://www.ibm.com/shop/publications/order

Services

Global Technology Services

IBM services include business consulting, outsourcing, hosting services, applications, and other technology management.

These services help you learn about, plan, install, manage, or optimize your IT infrastructure to be an on-demand business. They can help you integrate your high-speed networks, storage systems, application servers, wireless protocols, and an array of platforms, middleware, and communications software for IBM and many non-IBM offerings. IBM is your one-stop shop for IT support needs.

For details on available services, contact your IBM representative or visit

   http://www.ibm.com/services/

For details on available IBM Business Continuity and Recovery Services, contact your IBM representative or visit

   http://www.ibm.com/services/continuity

For details on education offerings related to specific products, visit

   http://www.ibm.com/services/learning/ites.wss/zz/en?pageType=tp_search_new

Technical information

Specified operating environment

Physical specifications
Height and length of the LTO7 tape drives:

- Width: 156 mm (6.1 in)
- Depth: 366 mm (14.4 in)
- Height: 84.76 mm (3.3 in)
- Weight: 3.29 kg (7.25 lb)

Operating environment
Equipment environment specifications for IBM TS1070 Tape Drives :
- Temperature: 10°C to 40°C (50°F to 104°F)
- Relative humidity: 20 - 80% noncondensing
- Electrical power: 4.0 amps peak at 12 V dc, 33 watts max continuous
- Noise level: 5.8 Bels operating

Equipment environment specifications for IBM TS4500 tape library:

- Temperature: 15°C to 32°C (60°F to 90°F)
- Relative humidity: 20 - 80% noncondensing
- Electrical power: 5.1 amps at 200-240 V ac, 1.1 kVA (max per frame)

The TS4500 tape library is classified as a Category 1 product as defined in C-S 1-1710-006. The maximum noise level (operating/idle) in bels (at recommended ambient temperature) is:

- Sound power level (LwAd): Operating: 7.5 bels

Hardware requirements

TS1070 Model F7C is designed for installation in TS4500 tape library Model L55 or D55. There can be up to 16 TS1070 models installed in one of these frames (up to 12 in frame 1) for a total of up to 60 Ultrium Tape Drives. TS1070 can be installed and intermixed within the same frame with other Ultrium 5, 6 or 7 Tape Drives.

TS1070 Model F7C has an 8 Gbps Fibre Channel interface that may attach in either Fabric topology or Arbitrated Loop topology.

A Quad Drive Mounting Kit feature (#1521, #1522, #1523, or #1524) is required on a TS4500 tape library frame to install up to four TS1070 tape drives. TS1070 Model F7C must be ordered separately. When ordered with a new TS4500 coming from the plant, one of the following feature numbers should be specified:

- Feature number 9607 (3588 F7A/F7C Plant Install) should be specified on the TS1070, and the TS4500 tape library frame into which it will be installed, if it is going to be shipped with the TS4500 tape library frame.
- Feature number 9608 (3588 F7A/F7C Field Install) should be specified on the TS1070 if it is going to be shipped for installation into an already installed TS4500 tape library frame.
- Feature number 9690 (3588/3592 Field Install) should be specified on the TS4500 Tape Library frame into which it will be installed.

Customer-owned or field-converted TS1070 Model F7C Tape Drive can be installed in a new or existing TS4500 frame. A Quad Drive Mounting Kit feature (#1521, #1522, #1523, or #1524) is required for installing up to four 3588 Tape Drives in a drive slot in a TS4500 Tape Library Model L55 or D55 frame. Feature number 9690 (3588/3592 Field Install) should also be specified on the TS4500 Tape Library frame into which it will be installed.

Labeled or bulk quantities of LTO Ultrium cartridges can be ordered using machine type 3589 or purchased through distributors. Refer to the **Supplies** section for additional information.

Note: The TS4500 requires that cartridges have appropriate bar code labels.

A TS1070 Model F7C in the TS4500 Tape Library can be attached to a wide range of environments, including select IBM Power Systems, IBM System p, IBM z Systems (zLinux), or other servers running Linux and Microsoft Windows operating system environments that support Fibre Channel interfaces.

A current list of supported open system configurations for Model F7C is available from the following website

   http://www-03.ibm.com/systems/support/storage/config/ssic

Select the **model,** then **Interoperability Matrix,** and view the*Supported Servers and Operating Systems*for the product.

Cables

Cables are required to attach tape drives in the TS4500 tape library to each server connection, up to the number of tape drive attachments installed. A Fibre Channel cable should be specified on the TS4500 frame.

Fibre Channel cables

A Fibre Channel cable is required to attach a TS1070 Model F7C in the TS4500 Tape Library Models L25 or L55 to host Fibre Channel adapters, the IBM 2109 SAN Fibre Switch, or other Fibre Channel components. The cable can be customer supplied or ordered with the TS4500 tape library in the lengths shown. The attaching Fibre Channel cable must be a 50.0/125 micrometer, short wavelength fiber-optic cable for distances up to 500 meters. These tape drives come with LC Duplex connectors. Eight LC-LC Fibre Channel drive-to-patch panel cables are included with each Quad Drive Mounting Kit (#152x).

The following features are available for Fibre Channel cables in the TS4500 frame:

- Feature number AGK1 - 10 m OM3 fiber Cable (LC)
- Feature number AGK2 - 25 m OM3 fiber Cable (LC)
- Feature number AGK3 - 80 m OM3 fiber Cable (LC)

Refer to the **Special Features** section of the TS4500 or 3584 tape library Sales Manual for detailed descriptions of these features.

Host bus adapter (HBA) support

For a current list of HBAs that support the TS1070 or TS4500, visit

http://www-03.ibm.com/systems/support/storage/config/ssic/index.jsp

Software requirements

LTO Ultrium or Enterprise Tape Drives in the TS4500 Tape Library

For the latest supported hardware interoperability configurations, refer to the Interoperability Center website

http://www.ibm.com/systems/support/storage/config/ssic

The installation of a TS4500 or 3584 Tape Library may require code updates for supported open systems device drivers or storage management software. According to the *Solutions Assurance Product Review (SAPR) Guide,* the account team or Business Partner should ensure that the customer checks the support levels required for their particular software environment prior to the installation of the TS1170. A Solutions Assurance call is required at a minimum for the installation of the first TS1170 in an account.

IBM Security Key Lifecycle Manager and other industry-leading compatible software offerings provide storage and tape management software for the TS4500 (machine type 3584). Supporting software and applications must be obtained separately from IBM, IBM Business Partners, or ISVs. A list of compatible software is available from your IBM representative or at

http://www.ibm.com/systems/storage/tape/library.html#compatibility

The *IBM Tape Device Drivers Installation and User's Guide* can be found at

http://www-01.ibm.com/support/docview.wss?rs=577&uid=ssg1S7002972

Application software

For a list of compatible software, operating systems, and servers for LTO tape drives, visit

http://www.ibm.com/servers/storage/LTO

1. Click **IBM TS4500 Tape Library** >*Product details*
2. Click **Learn more** >*Interoperability matrix* or *ISV matrix for LTO*

For a list of compatible software, operating systems, and servers for 3588 tape drives, visit

http://www.ibm.com/servers/storage/tape/drives

1. Click the appropriate tape drive >*Product details*
2. Click **Learn more** >*Interoperability matrix* or *ISV matrix*

For complete IBM storage interoperability information, including operating systems, servers, switches, and adapters supported by the TS4500 tape library in a SAN configuration, visit the IBM Interoperation Center (SSIC) at

http://www-03.ibm.com/systems/support/storage/ssic/ interoperability.wss

Compatibility

Compatible servers and software

The TS4500 tape library is supported by a wide variety of servers, operating systems, and adapters. There are many ways to determine the servers and software that support the TS4500 tape library.

These attachments can change throughout the lifecycle of the product. To determine the latest attachments, or to get a comprehensive list of compatible software, perform one of the following actions:

For a list of compatible software, operating systems, and servers for LTO tape drives, visit

http://www.ibm.com/storage/lto

For a list of compatible software, operating systems, and servers for 3592 tape drives, visit

http://www.ibm.com/servers/storage/tape/drives

For complete IBM storage interoperability information, including operating systems, servers, switches, and adapters supported by the TS4500 tape library in a SAN configuration, visit the IBM Storage Interoperation Center (SSIC) at

http://www-03.ibm.com/systems/support/storage/ssic/ interoperability.wss

Contact your IBM sales representative.

Notes:

1. IBM does not provide application software with the TS4500 tape library. To order software, contact your IBM sales representative, IBM Business Partner, or an Independent Software Provider.
2. If you attach your library to a non-IBM platform with non-IBM software, it is recommended that you contact your software vendor to obtain a matrix of compatible hardware, software, firmware revisions, and adapter cards.

Limitations

- The TS4500 tape library supports a mixture of LTO drive types in a logical library, but it does not support a mixture of LTO and 3592 tape drives in a logical library. Some ISVs support mixed drive types within logical libraries; others do not. Some ISVs that support mixed drive types do so with restrictions. For details, contact your ISV.
- For situations where the ISV support does not exist or does not meet your requirements, the TS4500 tape library provides another option to protect your investment by partitioning the tape drives into separate logical libraries. You can customize the partition to any number of slots by using menus.
- Drive model 3588 F7A is not supported by the HD2 frames of the TS4500 tape library.
- Although the compression technology can increase the amount of data stored on the media, the actual degree of compression achieved is highly sensitive to the characteristics of the data being compressed.
- Fibre Channel cable lengths are limited to 500 meters (1,650 ft).
- Although multiple systems may be attached to a tape drive, the systems cannot use the drive simultaneously.
- A Model S24 or Model S54 frame cannot be an end (left-most or right-most) frame in a TS4500 tape library.

Planning information

Customer responsibilities

Physical planning is a customer responsibility. Detailed planning information is in the *IBM TS4500 Introduction and Planning Guide*(SC27-8990). Current levels of the open systems device drivers should be obtained to ensure that the TS1070 LTO Ultrium Tape Drives are supported.

Customers are responsible for obtaining the appropriate adapters, cables, and interposers (if required) for system attachment. Customers are also responsible for ordering media.

You are responsible for downloading or obtaining from IBM, and installing designated Machine Code (microcode, basic input/output system code (called BIOS), utility programs, device drivers, and diagnostics delivered with an IBM machine) and other software updates in a timely manner from an IBM Internet website or from other electronic media, and following the instructions that IBM provides. You may request IBM to install Machine Code changes; however, you may be charged for that service.

Cable orders

Cables are required to attach tape drives in the TS4500 Tape Library to each server connection, up to the number of tape drive attachments installed.

Installability

Installation time for each field-installed TS1070 tape drive in the TS4500 tape libraries is approximately 0.5 to 0.7 hours.

Direct customer support

Eligible customers can obtain installation and usage assistance through ASK Support using the search word 3584, 3588, TS4500, or TS1070.

Packaging

Product	Shipment group	Number of boxes
3588 Model F7C	3588 Tape Drive Model F7C	1

Security, auditability, and control

This product uses the security and auditability features of the host hardware, software, and application software.

The customer is responsible for evaluation, selection, and implementation of security features, administrative procedures, and appropriate controls in application systems and communications facilities.

IBM Electronic Services

IBM has transformed its delivery of hardware and software support services to help you achieve higher system availability. Electronic Services is a web-enabled solution that offers an exclusive, no-additional-charge enhancement to the service and support available for IBM servers. These services are designed to provide the opportunity for greater system availability with faster problem resolution and preemptive monitoring. Electronic Services comprises two separate, but complementary, elements: Electronic Services news page and Electronic Services Agent.

The Electronic Services news page is a single Internet entry point that replaces the multiple entry points traditionally used to access IBM Internet services and support.

The news page enables you to gain easier access to IBM resources for assistance in resolving technical problems.

The Electronic Service Agent™ is no-additional-charge software that resides on your server. It monitors events and transmits system inventory information to IBM on a periodic, client-defined timetable. The Electronic Service Agent automatically reports hardware problems to IBM. Early knowledge about potential problems enables IBM to deliver proactive service that may result in higher system availability and performance. In addition, information collected through the Service Agent is made available to IBM service support representatives when they help answer your questions or diagnose problems. Installation and use of IBM Electronic Service Agent for problem reporting enables IBM to provide better support and service for your IBM server.

To learn how Electronic Services can work for you, visit

http://www.ibm.com/support/electronic

Terms and conditions

Volume orders

Contact your IBM representative.

IBM Global Financing

Yes

Products - terms and conditions

Warranty period

One year

To obtain copies of the IBM Statement of Limited Warranty, contact your reseller or IBM.

An IBM part or feature installed during the initial installation of an IBM machine is subject to the full warranty a period specified by IBM. An IBM part or feature that replaces a previously installed part or feature assumes the remainder of the warranty period for the replaced part or feature. An IBM part or feature added to a machine without replacing a previously installed part or feature is subject to a full warranty. Unless specified otherwise, the warranty period, type of warranty service, and service level of a part or feature are the same as those for the machine in which it is installed.

Warranty service

If required, IBM provides repair or exchange service depending on the types of warranty service specified for the machine. IBM will attempt to resolve your problem over the telephone, or electronically via an IBM website. Certain machines contain remote support capabilities for direct problem reporting, remote problem determination, and resolution with IBM. You must follow the problem determination and resolution procedures that IBM specifies. Following problem determination, if IBM determines on-site service is required, scheduling of service will depend upon the time of your call, machine technology and redundancy, and availability of parts.

Service levels are response-time objectives and are not guaranteed. The specified level of warranty service may not be available in all worldwide locations. Additional charges may apply outside IBM's normal service area. Contact your local IBM representative or your reseller for country-specific and location-specific information.

On-site Service

IBM will repair the failing machine at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well lit, and suitable for the purpose.

Service level is 24 hours per day, 7 days a week, 4 hour average, same day response.

Warranty service

IBM is now shipping machines with selected non-IBM parts that contain an IBM field replaceable unit (FRU) part number label. These parts are to be serviced during the IBM machine warranty period. IBM is covering the service on these selected non-IBM parts as an accommodation to their customers, and normal warranty service procedures for the IBM machine apply.

Warranty service upgrades

During the warranty period, warranty service upgrades provide an enhanced level of On-site Service for an additional charge. Service levels are response-time objectives and are not guaranteed. See the Warranty services section for additional details.

IBM will attempt to resolve your problem over the telephone or electronically by access to an IBM website. Certain machines contain remote support capabilities for direct problem reporting, remote problem determination, and resolution with IBM. You must follow the problem determination and resolution procedures that IBM specifies. Following problem determination, if IBM determines on-site service is required, scheduling of service will depend upon the time of your call, machine technology and redundancy, and availability of parts.

Maintenance service options

On-site Service

IBM will repair the failing machine at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well lit, and suitable for the purpose. The following on-site response-time objectives are available as warranty service upgrades for your machine. Available offerings are24 hours per day, 7 days a week, 2 hour average response.

Maintenance services

If required, IBM provides repair or exchange service depending on the types of maintenance service specified for the machine. IBM will attempt to resolve your problem over the telephone or electronically, via an IBM website. Certain machines contain remote support capabilities for direct problem reporting, remote problem determination, and resolution with IBM. You must follow the problem determination and resolution procedures that IBM specifies. Following problem determination, if IBM determines on-site service is required, scheduling of service will depend upon the time of your call, machine technology and redundancy, and availability of parts. Service levels are response-time objectives and are not guaranteed. The specified level of maintenance service may not be available in all worldwide locations. Additional charges may apply outside IBM's normal service area. Contact your local IBM representative or your reseller for country-specific and location-specific information. The following service selections are available as maintenance options for your machine type.

On-site Service

IBM will repair the failing machine at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well lit, and suitable for the purpose.

Service levels are:

- 9 hours per day, Monday through Friday, excluding holidays, next business day response
- 9 hours per day, Monday through Friday, excluding holidays, 4 hour average response
- 24 hours per day, 7 days a week, 4 hour average response
- 24 hours per day, 7 days a week, 2 hour average response

Machine Exchange Service

IBM will initiate shipment of a replacement machine to your location. You are responsible for its installation and verification of operation. You must pack the failed machine into the shipping container that contained the replacement machine and return the failed machine to IBM. Transportation charges, both ways, are paid by IBM. You may be charged for the replacement machine if IBM does not receive the failed machine within 15 days of your receipt of the replacement.

Non-IBM parts service

Under certain conditions, IBM provides services for selected non-IBM parts at no additional charge for machines that are covered under warranty service upgrades or maintenance services.

This service includes hardware problem determination (PD) on the non-IBM parts (for example, adapter cards, PCMCIA cards, disk drives, memory) installed within IBM machines and provides the labor to replace the failing parts at no additional charge.

If IBM has a Technical Service Agreement with the manufacturer of the failing part, or if the failing part is an accommodations part (a part with an IBM FRU label), IBM may also source and replace the failing part at no additional charge. For all other non-IBM parts, customers are responsible for sourcing the parts. Installation labor is provided at no additional charge, if the machine is covered under a warranty service upgrade or a maintenance service.

Usage plan machine

No

IBM hourly service rate classification

Two

When a type of service involves the exchange of a machine part, the replacement may not be new, but will be in good working order.

General terms and conditions

Field-installable features

Yes

Model conversions

Yes

Machine installation

Installation is performed by IBM. IBM will install the machine in accordance with the IBM installation procedures for the machine. In the United States, contact IBM at 1-800-IBM-SERV (426-7378). In other countries, contact the local IBM office.

Graduated program license charges apply

No

Licensed Internal Code and Licensed Machine Code

This product does not contain Licensed Internal Code or Licensed Machine Code.

Educational allowance

A reduced charge is available to qualified education customers. The educational allowance may not be added to any other discount or allowance.

The educational allowance is 15% for the products in this announcement.

Prices

For additional information and current prices, contact your local IBM representative.

Description	Machine type	Model	Feature number	Field install only	Plant install only
TS1070 Ultrium7 Tape Drive	3588	F7C			
3588 F7A/F7C Drive Plant Install	3588	F7C	9607	N	Y
3588 F7A/F7C Drive Field Install	3588	F7C	9608	N	Y
TAA Compliance	3588	F7C	0983*	N	Y
TS1140 and TS1150 tape drive support	3584	L25, L55	1404	Y	Y
LTO5 and LTO6 tape drive support	3584	L25, L55	1405	Y	Y
LTO6 and LTO7 tape drive support	3584	L25, L55	1407	Y	Y
Additional LTO Cartridge Magazine	3584	L25	1628*	Y	Y
Additional 3592 Cartridge Magazine	3584	L55	1629*	Y	Y
TS4500 Control upgrade	3584	S24, S54	1742	Y	N
7-14 Frame X-Track Cable	3584	L25, L55	1814*	Y	N
9-18 Frame	3584	L25, L55	1818	Y	N

Description	Machine type	Model	Feature number	Field install only	Plant install only
X-Track Cable					
IMC Separate Power Source	3584	S25, S55	2737	Y	Y
Mixed Media Library	3584	L25, L55	9080	Y	Y
3588 F7A/ F7C Plant Install	3584	D55, L55	9607	N	Y
Dual 4.3M Pwr Cord WT	3584	S25, S55	9970*	Y	Y
Dual 4.3M Pwr Cord Non-WT	3584	S25, S55	9972*	Y	Y
Dual 4.3M Pwr Cord Argentina	3584	S25, S55	9976*	Y	Y
Dual 4.3M Pwr Cord Brazil	3584	S25, S55	9977*	Y	Y
Dual 4.3M Pwr Cord Aust/NZ	3584	S25, S55	9978*	Y	Y
Dual 4.3M Pwr Cord Japan	3584	S25, S55	9979*	Y	Y
Dual 4.3M Pwr Cord China	3584	S25, S55	9980*	Y	Y
Dual 4.3M Pwr Cord Korea	3584	S25, S55	9981*	Y	Y
Dual 4.3M Pwr Cord Taiwan	3584	S25, S55	9982*	Y	Y
Dual 4.3M Pwr Cord So.Africa	3584	S25, S55	9983*	Y	Y
Dual 4.3M Power Cord NEMA L6-20 Non-Watertight	3584	S25, S55	9984*	Y	Y
Dual 4.3M Power Cord Russellstoll Watertight	3584	S25, S55	9985*	Y	Y
Power Cord to adjacent frame PDUs	3584	S25, S55	9989*	Y	Y

* This feature was previously announced on other model.

Model conversions

Model From	Model To
3588-F7A	3588-F7C

For current prices visit

http://www-03.ibm.com/systems/p/

You may also contact us at 1-888-Shop-IBM.

Pricing terms

Prices in the following PDF prices link are suggested list prices on day of announcement for the U.S. only. They are provided for your information only. Dealer prices may vary, and prices may also vary by country. IBM list price does not include tax or shipping and is subject to change without notice.

ENUS-115-129-LIST_PRICES_2015_10_06.PDF

Alternative service

Machine type-model	IOR IBM Same day On-site Repair (IOR, 24 x 7)
3588-F7A	

ServiceElect (ESA) charges

For ServiceElect (ESA) maintenance service charges, contact IBM Global Services at 888-IBM-4343 (426-4343).

IBM Global Financing

IBM Global Financing offers competitive financing to credit-qualified customers to assist them in acquiring IT solutions. Offerings include financing for IT acquisition, including hardware, software, and services, from both IBM and other manufacturers or vendors. Offerings (for all customer segments: small, medium, and large enterprise), rates, terms, and availability can vary by country. Contact your local IBM Global Financing organization or visit

http://www.ibm.com/financing

IBM Global Financing offerings are provided through IBM Credit LLC in the United States and other IBM subsidiaries and divisions worldwide to qualified commercial and government customers. Rates are based on a customer's credit rating, financing terms, offering type, equipment type and options, and may vary by country. Other restrictions may apply. Rates and offerings are subject to change, extension or withdrawal without notice.

Financing solutions from IBM Global Financing can help you stretch your budget and affordably acquire the new product. But beyond the initial acquisition, our end-to-end approach to IT management can also help keep your technologies current, reduce costs, minimize risk, and preserve your ability to make flexible equipment decisions throughout the entire technology life cycle.

For more financing information, visit

http://www.ibm.com/financing

Order now

To order, contact your Americas Call Centers, local IBM representative, or your IBM Business Partner. To identify your local IBM representative or IBM Business Partner call 800-IBM-4YOU (426-4968). For more information, contact the Americas Call Centers.

Phone: 800-IBM-CALL (426-2255)

Fax: 800-2IBM-FAX (242-6329)

For IBM representative: callserv@ca.ibm.com

For IBM Business Partner: pwcs@us.ibm.com

Mail:

IBM Teleweb Customer Support
ibm.com^(R) Sales Execution Center, Americas North
3500 Steeles Ave. East, Tower 3/4
Markham, Ontario
Canada L3R 2Z1

Reference:
YE001

The Americas Call Centers, our national direct marketing organization, can add your name to the mailing list for catalogs of IBM products.

Note: Shipments will begin after the planned availability date.

Trademarks

IBM Spectrum Archive, Power Systems, IBM z Systems, Linear Tape File System and Electronic Service Agent are trademarks of IBM Corporation in the United States, other countries, or both.
IBM, Tivoli, ibm.com, Global Technology Services, System Storage, System z and System i are registered trademarks of IBM Corporation in the United States, other countries, or both.
Linux is a registered trademark of Linus Torvalds in the United States, other countries, or both.
Microsoft and Windows are trademarks of Microsoft Corporation in the United States, other countries, or both.
Other company, product, and service names may be trademarks or service marks of others.

Terms of use

IBM products and services which are announced and available in your country can be ordered under the applicable standard agreements, terms, conditions, and prices in effect at the time. IBM reserves the right to modify or withdraw this announcement at any time without notice. This announcement is provided for your information only.Additional terms of use are located at:

Terms of use

For the most current information regarding IBM products, consult your IBM representative or reseller, or visit the IBM worldwide contacts page

http://www.ibm.com/planetwide/us/

Corrections

(Corrected on October 13, 2015)

The Model conversions table was added to the Prices section and to the US Price PDF.