IBM TS4500 Tape Library supports LTO Ultrium 8 tape drive technology

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At a glance

IBM TS1080 Model F8C can help improve data center economics as the number of tape drives, cartridges, and associated floor space may be reduced, delivering higher performance and greater capacity as compared to IBM TS1070 Tape Drive Model F7C.

IBM Ultrium™ 8 features to help improve performance and reliability include:

- Native data transfer rate of up to 360 MBps for full-high (FH) tape drives
- LTO™ generation 8 media specification tape cartridge compressed capacity of up to 30 TB (up to 12 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 8 encryption support
- Support for new and field merge TS1080 (3588-F8C) drives into 3584 models L55 and D55
- LTO Ultrium 8 cartridge capacity of up to 278 PB per library (up to 695 PB with 2.5 to 1 compression)

Overview

IBM TS1080 Model F8C is designed to be installed in an IBM TS4500 Tape Library to deliver high capacity and performance for midrange to hyperscale open systems environments. This model incorporates the new IBM LTO Ultrium 8 Tape Drive with enhanced maximum tape drive throughput over the IBM LTO Generation 7 tape drives (Ultrium 7). It has a native data transfer of up to 360 MBps for FH tape drives and 300 MBps for HH tape drives.

TS1080 tape drives support the LTO Generation 8 media specification of over double the compressed capacity of up to 30 TB with 2.5 to 1 compression (up to 12 TB native capacity) as compared to previous LTO 7 compressed capacity of up to 15 TB with 2.5 to 1 compression (up to 6 TB native capacity) per tape cartridge. IBM LTO 8 tape drives can read and write LTO Ultrium 7. The TS1080 has an 8 Gbps Fibre Channel dual-ported interface for connection to a wide spectrum of open system servers.
Key prerequisites

Appropriate levels of host and drive software are required to attach TS1080 Model F8C to a wide range of environments, including select IBM Power Systems™, IBM System p, and 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 you use library-managed encryption (LME) or application-managed encryption (AME). The following prerequisites apply:

- Tape drives must be enabled for encryption from the logical libraries page of the TS4500 management GUI
- Feature number 1604, LTO Library Managed 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 17, 2017

Description

IBM TS1080 Model F8C with IBM LTO Ultrium 8 tape drives is designed for the heavy demands of backup and archive tape storage. TS1080 Model F8C 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, and other servers running Linux and Microsoft Windows operating system environments.

TS1080 models incorporate eighth-generation IBM LTO Ultrium technology and are supported by HD2 frames of the TS4500 tape library. They offer the following features:

- **Increased performance:** Maximum tape drive throughput native data rate performance of up to 360 MBps for FH tape drives. Data tracks are written 32 at a time. IBM LTO 8 tape drives can read and write LTO Ultrium 7 data cartridges at Ultrium 7 capacities and rates.

  **Note:** Although Ultrium 8 tape drives deliver 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 compress 2.5 times 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 8 media specification tape cartridge physical capacity is up to 30 TB compressed physical capacity, double the capacity of Ultrium 7 data cartridges. This is achieved by increasing the linear and track density. IBM Ultrium 8 tape itself is an advanced Barium Ferrite tape developed to help deliver durability and increased capacity.

- **Encryption:** The IBM TS1080 LTO Ultrium 8 Tape Drive supports data encryption on the base drive with Ultrium 8 or Ultrium 7 media. Library-managed encryption and associated IBM Security Key Lifecycle Manager access are all available as a
chargeable licensed key (feature 1604, LTO Library Managed Encryption) under
the TS4500 tape library L-frames. IBM Security Key Lifecycle Manager V1.0 is
required with this feature.

- **Attachment options:** TS1080 tape drives come 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, and other servers running Linux and
Microsoft Windows operating system environments.

- **WORM media support:** LTO Generation 8 media specification delivers up to
12 TB native capacity, up to 30 TB in compressed mode, and up to 360 Mbps
native data rate for FH tape drives and up to 300 MBps for HH tape drives.
IBM 3589 Ultrium 8 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 8 Tape Drive to help prevent
the alteration or deletion of user data. IBM LTO 8 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 30 TB WORM compressed capacity in a
    single cartridge

- **Internal data buffer:** There is a 1 GB internal data buffer in the Ultrium 8 Tape
  Drive.

- **Digital speed matching:** The Ultrium 8 Tape Drive is designed to perform
dynamic speed matching at one of twelve speeds: 360.0, 341.0, 318, 306.4,
273.0, 249.5, 226.0, 203.0, 180.0, 157.5, 135.0, or 112.0 MBps 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 8
ranges from 112 to 360 MBps.

- **New head technology:** LTO 8 has tunneling magnetoresistive (TMR) head
technology for the first time in LTO drives.

- **Dual-stage 32-channel head skew actuator:** LTO 8 tape drives come with
  a high-bandwidth, dual-stage actuator that is designed to enable precision head
  alignment to help support higher track density and improved data integrity.
The 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 8 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
TS1080 Tape Drive, and Spectrum Archive EE will be supported in the TS4500
tape library. WORM media can also be partitioned.

IBM LTFS software leverages LTO8 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
great choice for customers requiring a standard tape cartridge format at a low cost
and will use standalone IBM LTO8 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, go to the LTFS website.

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

See the *IBM Tape Device Drivers Installation and User's Guide* website.

The following IBM LTO Ultrium features are included in the IBM LTO Ultrium 8 Tape Drive:

- **Positive pin retention and independent tape loader and threadium 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 6,656 data tracks in Ultrium 8. 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 8 and 7 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 magnetoresistive 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 8 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 8 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 8 LTO-CM is 16320 bytes. Communication between the drive and the LTO-CM is through a low-level RF field transmitted by the drive to the cartridge.
• **Statistical Analysis and Reporting System (SARS):** The Ultrium 8 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, TS1080 Model F8C with the TS4500 tape library can be a cost-effective solution for backup, save-and-restore, and archiving functions.

**Ultrium 8 data cartridges**

The physical compressed capacity of LTO 8 data cartridges have more than doubled the capacity of IBM Ultrium 7 data cartridges with a capacity of up to 30 TB with 2.5 to 1 compression. IBM LTO Ultrium 8 tape drives can read and write Ultrium 7. IBM LTO 8 cartridges can be resident in the same TS4500 tape libraries with the Ultrium 7. IBM LTO 8 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.

Data cartridges are sold separately and subject to availability.

**TS4500 features and functions**

The TS4500 supports LTO 5 and later LTO tape drives.

The LTO 6, LTO 7, and LTO 8 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 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 TS4500 tape libraries 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 000764L8 is an LTO 8 cartridge and a cartridge with a VOLSER of 000764L7 is an LTO 7 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**

LTO 5 and later LTO tape drives are encryption capable, which means they can convert data into a cipher that ensures data security.

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. See the IBM Security Key Lifecycle Manager (formerly Tivoli® Key Lifecycle Manager) publications in the IBM Knowledge Center website.

**Accessibility by people with disabilities**

A US Section 508 Voluntary Product Accessibility Template (VPAT) containing details on accessibility compliance can be found on the IBM Accessibility website.

**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®, IBM System p, or IBM z Systems® products, and other open systems. TS4500 utilizes patented multipath architecture designed to enable homogeneous or heterogeneous open systems applications to share the library robotics, with Advanced Library Management System 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 TS4300 Tape Library.

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 TS1155 or 3592 Tape Drive with the IBM TS4500 Tape Library.

Reference information

For more information, see the following announcements:

- IBM TS4500 Tape Library, Hardware Announcement 114-072, dated May 19, 2014
- IBM TS1155 Tape Drive, Hardware Announcement 117-038, dated May 9, 2017
- IBM TS1070 Tape Drive Model F7C, Hardware Announcement 115-129, dated October 6, 2015
- IBM TS1140 Tape Drive Model E07, Hardware Announcement 111-087, dated May 9, 2011

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), go to the IBM and the Environment website.

Product number

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<td>3588</td>
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Model conversions

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Feature conversions

Not applicable.

Business Partner information

IBM United States Hardware Announcement 117-078   IBM is a registered trademark of International Business Machines Corporation
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 IBMid).

BP Attachment for Announcement Letter 117-079

Education support

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

Publications

Information about TS1080 Model F8C Tape Drive is contained in the TS4500 Tape Library publications. See the TS4500 documentation in IBM Knowledge Center.

<table>
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<th>Title</th>
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<td>TS4500 Introduction and Planning Guide</td>
<td>SC27-5990-06</td>
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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.

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For details on available services, contact your IBM representative or go to the IBM Global Technology Services® website.

For details on available IBM Business Continuity and Recovery Services, contact your IBM representative or go to the Resiliency Services website.

Details on education offerings related to specific products can be found on the IBM authorized training website.

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**Technical information**

**Specified operating environment**

**Physical specifications**

**Height and length of the LTO 8 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 TS1080 tape drives:

- Temperature: 10°C to 40°C (50°F to 104°F)
- Relative humidity: 20% - 80% noncondensing
- Wet bulb temperature: 26°C (78.8°F) maximum
- Electrical power: 5.0 amps peak at 12 V DC, 40 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
- Wet bulb temperature: 26°C (78.8°F) maximum
- Electrical power: 4.1 amps at 200-240 V AC, 1.1 kVA (max per frame)

TS4500 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 7.5 bels.

**Hardware requirements**

TS1080 Model F8C is designed for installation in TS4500 tape library Model L55 or D55. There can be up to 16 TS1080 models installed in one of these frames (up to 12 in frame 1) for a total of up to 128 Ultrium tape drives. TS1080 can be installed and intermixed within the same frame with other LTO 5 or higher tape drives.

TS1080 Model F8C 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 TS1080 tape drives. TS1080 Model
F8C 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 9609 (3588 F8A/F8C Plant Install) should be specified on the TS1080 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 9610 (3588 F8A/F8C Field Install) should be specified on the TS1080 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.

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

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

A TS1080 Model F8C in the TS4500 Tape Library can be attached to a wide range of environments, including select IBM Power Systems, IBM System p, 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 F8C is available at the IBM System Storage Interoperation Center (SSIC) website.

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 TS1080 Model F8C in 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)

See 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 TS1080 or TS4500, go to the IBM SSIC website.

### Software requirements

LTO Ultrium or Enterprise tape drives in the TS4500 Tape Library
For the latest supported hardware interoperability configurations, go to the [IBM SSIC website](#).

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 TS1080. A Solutions Assurance call is required at a minimum for the installation of the first TS1080 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 the [IBM Tape Storage](#) website.

See the *[IBM Tape Device Drivers Installation and User's Guide](#)* website.

**Application software**

For a list of compatible software, operating systems, and servers for LTO tape drives, go to the [IBM Tape Storage](#) website.

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, go to the [IBM Tape Storage](#) website.

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, go to the [IBM SSIC](#) website.

**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 and 3588 tape drives, see the [IBM Tape storage](#) website.
- For complete IBM storage interoperability information, including operating systems, servers, switches, and adapters supported by the TS4500 tape library in a SAN configuration, go to the [IBM SSIC](#) website.

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.
- 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* (SC27-5990-06). Current levels of the open systems device drivers should be obtained to ensure that the TS1080 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 TS1080 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 TS1080.

**Packaging**

<table>
<thead>
<tr>
<th>Product</th>
<th>Shipment group</th>
<th>Number of boxes</th>
</tr>
</thead>
<tbody>
<tr>
<td>3588 Model F8C</td>
<td>3588 Tape Drive Model F8C</td>
<td>1</td>
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</table>
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 Systems Lab Services

For details on available services, contact your IBM representative or go to the Lab Services website.

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, go to the IBM Electronic Support website.

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 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.

**International Warranty Service**

International Warranty Service allows you to relocate any machine that is eligible for International Warranty Service and receive continued warranty service in any country where the IBM machine is serviced. If you move your machine to a different country, you are required to report the machine information to your Business Partner or IBM representative.

The warranty service type and the service level provided in the servicing country may be different from that provided in the country in which the machine was purchased. Warranty service will be provided with the prevailing warranty service type and service level available for the eligible machine type in the servicing country, and the warranty period observed will be that of the country in which the machine was purchased.

The following types of information can be found on the International Warranty Service website:

- Machine warranty entitlement and eligibility
- Directory of contacts by country with technical support contact information
- Announcement Letters
**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 are:

- 24 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.

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

<table>
<thead>
<tr>
<th>Description</th>
<th>Machine type</th>
<th>Model</th>
<th>Feature number</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS1080 Ultrium7 Tape Drive</td>
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<td>F8C</td>
<td></td>
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<tr>
<td>TAA Compliance</td>
<td>3588</td>
<td>F8C</td>
<td>0983</td>
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<td>3588 F8A/F8C Drive Plant Install</td>
<td>3588</td>
<td>F8C</td>
<td>9609</td>
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<tr>
<td>3588 F8A/F8C Drive Field Install</td>
<td>3588</td>
<td>F8C</td>
<td>9610</td>
</tr>
<tr>
<td>LTO7 and LTO8 tape drive support</td>
<td>3584</td>
<td>L25, L55</td>
<td>1408</td>
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<tr>
<td>Drive removal</td>
<td>3584</td>
<td>D55, D25, L25, L55</td>
<td>1663</td>
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<tr>
<td>3588 F8A/F8C Drive Plant Install</td>
<td>3584</td>
<td>D55, L55</td>
<td>9609</td>
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</table>

<table>
<thead>
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<th>MES removal charge</th>
<th>CSU</th>
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<td>F8C</td>
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<tr>
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<tr>
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<tr>
<td>1408</td>
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<td>D55, D25, L25, L55</td>
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</tbody>
</table>

*Install type:
- "Plant" denotes plant installation only
- "Field" denotes field installation only
- "Both" denotes both plant and field installation

CSU = Customer setup

**Alternative service**

<table>
<thead>
<tr>
<th>Machine type-model</th>
<th>IOR IBM Same day On-site Repair (IOR, 24 x 7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3588-F8C</td>
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</tbody>
</table>

**ServiceElect (ESA) charges**

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

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IBM United States

Corrections
(Corrected on November 6, 2017)

A statement about data cartridge availability was added to the Description section.