IBM TS1160 Tape Drive Model 60F for IBM TS4500 and rackmount features deliver up to 20 TB native capacity with increased throughput for investment protection

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At a glance

IBM$^{(R)}$ TS1160 tape drives offer organizations an easy way to improve capacity and deliver fast access to data and secure long-term retention for less than the cost of disk or flash solutions. It also helps protect investments in tape automation by offering compatibility with existing automation and reuse of existing media.

With a 100% increase in capacity as compared to the IBM TS1150 tape drive, TS1160 tape drives consist of one new model designed for the TS4500 tape library, as well as standalone installation with traditional Fibre Channel host attachment interfaces for cloud-based and open-compute environments.

Features of TS1160 include:

- Native data rate of 400 MBps (900 MBps compressed)
- Dual-port 16 Gb Fibre Channel and support for standalone, rack-mount applications on Model 60F
- 20 TB capacity on the new JE media type
- Effective reuse of existing JD/JZ/JL media types with the capability to read and write TS1150 and TS1155 formatted media, and format the same media with up to 15 TB uncompressed capacity
- Support for JC 4 TB format (read only) and JC 7 TB format (read/write)
- Encryption capabilities that work with IBM Security Key Lifecycle Manager
- RAO (Recommended Access Order) improves recall and time to first byte
- RoHS 3 compliant rack mount kit features to accept two TS1160 (3592-60F) or a combination with its predecessors TS1155 (3592-55F), TS1150 (3592-EH8), or TS1140 (3592- EH7)
- Support for IBM Spectrum Archive™ (LTFS format) for direct, intuitive, and graphical access to data

To help optimize drive utilization and reduce infrastructure requirements, TS1160 can be shared among supported open-system hosts on a storage area network. It also offers multiplatform support and can scale from midrange to enterprise environments, delivering flexible storage for heterogeneous server environments.

Also, the IBM TS4500 will be introducing the following features:

- Export logs direct in call home to IBM
- Intelligent PDU with 3-phase (wye) or single phase input power

Overview

IBM TS1160 Tape Drive (3592-60F Fibre Channel) is designed to deliver a 100% increase in capacity on the new JE media compared to TS1150. TS1160 Model 60F delivers a native data rate of 400 MBps (900 MBps compressed) when using the new JE media (up to 20% faster throughput than its predecessor), the same load/ready, locate speeds, and access times as the TS1150, and includes dual-port 16 Gb Fibre Channel support. TS1160 Model 60F is supported in IBM TS4500 tape libraries, as well as rack-mount installations.

TS1160 tape drives are able to read and write 20 TB capacities on the new JE media type. They can also read and write JD media in both the TS1155 (15 TB capacity) and TS1150 formats (10 TB capacity), and read and write JC media in TS1150 format (7 TB capacity) and read only JC media (4 TB capacity) in TS1140 format. Media written in TS1160 format is not readable by TS1155 / TS1150, but is back-portable for reformatting the TS1155 format of 15 TB.

Model conversions are also supported to convert TS1155 Model 55F to TS1160 Model 60F and TS1150 Model EH8 to TS1160 Model 60F.

TS1160 is not currently supported by IBM TS7700 environments.

IBM TS1160 tape drives Model 60F can be installed on most 19-inch racks through a rack mount kit that provides better space utilization and enables installation and removal from either the front or the back without any tooling. The kit is RoHS 3 compliant and is compatible with TS4500 high density tape drives. The rack mount kit is available in a 3U form factor and includes adjustable depth shelves for rack adaptability. It can enclose up to two TS1160 (3592-60F) or combine them with its predecessors TS1150 (3592-EH8), TS1155 (3592-55F), or TS1140 (3592-EH7). It is equipped with two redundant, hot-swappable power supplies, two C13-C14 power cords for both tape drives, and a logic card for management of power. A drive filler panel (feature number 4806) can be also be used when only one tape drive resides on a rack mount kit.

TS1160 Model 60F is supported by the IBM Spectrum Archive family of products.

TS1160 also supports drive-based data encryption to help protect data. The TS1160-based encryption and associated IBM Security Key Lifecycle Manager components are supported in a wide range of environments, including select IBM Power Systems™, IBM System i®, IBM System p, IBM System x, and other servers running AIX®, Linux®, Oracle Solaris, and Microsoft™ Windows™ operating systems.

Note: For the latest version of the IBM Security Key Lifecycle Manager, see the IBM Security Key Lifecycle Manager website.

Note: Model conversions are only supported *once* in the life of the tape drive. A second conversion would have more than 80% of new components.

Product Preview

In order to help customers backup and restore data on IBM and other open systems platforms, IBM intends to enable the TS1160 Tape Drive Model 60F to support IBM Spectrum Protect™ between announcement and before the end of first quarter of 2019.

In addition, availability of Type E media for this Tape Drive TS1160 Model 60F delivering up to 20 TB storage capacity is planned to be announced before end of first half of 2019.

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Key prerequisites

TS1160 Tape Drive Model 60F is supported in a wide range of environments, including select IBM Power Systems, IBM System i, IBM System p, IBM System x, and other servers running AIX, Linux, Oracle Solaris, and Microsoft Windows operating system environments.

See the Software requirements section for details.

Planned availability date

- December 7, 2018: Model 60F and all features except features 1752, 1952, 9948, and 9949
- March 8, 2019: Features 1752, 1952, 9948, and 9949
- Features 1752, 1952, 9948, and 9949 are not available in Morocco

Description

TS1160 tape drives

IBM TS1160 tape drives offer an increased capacity of 100% on the new JE media compared to the TS1150 tape drive. It is designed for high-performance and high-capacity tape applications, including:

- High-speed data save operations where backup windows are critical and large amounts of data are archived to tape
- Hyperscale, automated tape environments where performance, reliability, and durability are required
- Hyperscale, mass-data archive applications where massive amounts of data need to be quickly saved to tape for storage and later recalled, such as data warehousing, cloud service providers, record management applications, and within the seismic industry

TS1160 Model 60F delivers a native data rate of 400 MBps (900 MBps compressed), the same load/ready, locate speeds, and access times as TS1150, and includes dual-port 16 Gb Fibre Channel and support for standalone, rack-mount applications.

TS1160 tape drives communicate with TS4500 tape libraries through an internal Ethernet interface and uses the Statistical Analysis and Reporting System to isolate failures between media and hardware.

TS1160 tape drives deliver the following performance, capacity, and availability features:

- N+1 power supplies
- Speed matching
- High-resolution tape directory
- Channel calibration and dynamic adaptive equalization
- Recursive accumulating backhitchless flush
- Backhitchless backspace
- Capacity scaling

- WORM
- RAO (Recommended Access Order) for improving recall and time to first byte
- RoHS 3 compliant rack mount kit features to accept two TS1160 (3592-60F) or a combination with its predecessors TS1155 (3592-55F), TS1150(3592-EH8), or TS1140 (3592- EH7)
- Capacity-based and position-based logical end-of-tape (LEOT) reporting
- Enhanced format for recording error-correction codes
- Mechanical and electrical drive reliability
- Data compression
- Data buffer with read ahead feature
- Offboard data string searching
- Encryption

Capacity

The TS1160 tape drive is capable to read and write 20 TB capacity on the new JE media compared to 10 TB for TS1150.

The following table compares the cartridge capacity (native and with 3:1 compression) of the TS1160, TS1155, TS1150, and TS1140:

	TS1160 Model 60F/60G native cartridge capacity (native/ compressed)	TS1155 Model 55E/55F/55G native cartridge capacity (native/ compressed)	TS1150 Model E08/ EH8 native cartridge capacity (native/ compressed)	TS1140 Model E07/ EH7 native cartridge capacity (native/ compressed)
IBM Tape Cartridge 3592 Type E	20.0 TB / 60.0 TB	NA / NA	NA / NA	NA / NA
IBM Tape Cartridge 3592 Type E (Economy)	5.0 TB / 15.0 TB	NA / NA	NA / NA	NA / NA
IBM Tape Cartridge 3592 Type D (Advanced Data)	15.0 TB / 45.0 TB	15.0 TB / 45.0 TB	10.0 TB / 30.0 TB	NA / NA
IBM Tape Cartridge 3592 Type C (Advanced Data)	7.0 TB / 21.0 TB	7.0 TB / 21.0 TB	7.0 TB / 21.0 TB	4.0 TB / 12.0 TB
IBM Tape Cartridge 3592 Type D (Advanced Economy)	3.0 TB / 9.0 TB	3.0 TB / 9.0 TB	2.0 TB / 6.0 TB	2.0 TB / 6.0 TB

NA = Not Applicable

Performance

TS1160 tape drives are designed to provide a native data rate to up to 400 MBps (900 MBps compressed) with other enhancements designed to help aid small file and hierarchical storage manager performance.

Note: The actual throughput achieved is a function of many components, such as system processor, disk data rate, data block size, data compressibility, I/O attachments, SAN, and the system or application software used. Although the drive is capable of a 400 MBps native data rate, other components may limit the actual effective data rate.

Capacity scaling

TS1160 is designed to support capacity scaling of an individual tape cartridge to various percentages of the maximum capacity. Capacity scaling allows the utilized length of tape to be logically shortened for improved data access times in exchange for reduced capacity. The tapes can subsequently be scaled back to full capacity as needed.

TS1160 allows an application to issue a command to scale the IBM Tape Data 3592 cartridge, enabling capacity scaling to be exploited by an application that permits media pools to be defined by the VOLSER range. You can exploit the capacity scaling capability of TS1160 Model 60F. For more information about using capacity scaling, see the IBM 3592 Model 60F Tape Drive Knowledge Center website.

Media and cartridge capacity

TS1160 delivers capacity leadership with media reuse and use Type E tape cartridges with tape specifically optimized for the enterprise tape environment. This model provides a native cartridge capacity of 20 TB and can be beneficial for space savings and the cost of data storage as they can help lower the cost of storage per megabyte. For applications that fill current data cartridges, this can help reduce the number of tape cartridges required. The reduced number of cartridges may also help free up floor space for other requirements and reduce the number of automation slots used.

The robust cartridge shell is designed to sustain a 1-meter drop. IBM Tape Cartridge 3592 contains cartridge memory that is a passive, contactless, silicon storage device. It is used to hold information about the specific cartridge, including the VOLSER, the media in the cartridge, and the drive.

Attachment options

TS1160 Model 60F has a dual-ported 16 Gbps native switched fabric Fibre Channel interface to offer attachment flexibility in an open systems environment. These drives can be directly attached to open systems servers with Fibre Channel.

TS1160 Model 60F is supported in a wide range of environments, including select IBM Power$^{(R)}$, System i, System p, and System x systems, and Oracle servers, as well as Intel^{TM} compatible servers running Linux and Microsoft Windows operating system environments.

Rack optimization

As space becomes an increasingly critical issue in corporate IT environments, the demand for rack-mounted storage solutions continues to grow. As a result, the rack mount kit for enterprise tape drives enables them to be installed on most 19-inch racks enclosing up to two TS1160 (3592-60F), or TS1155 (3592-55F), TS1150 (3592-EH8), or TS1140 (3592-EH7) tape drives, or a combination of them, delivering the following features:

• Each rack mount kit can be populated with either one or two drives, enabling flexibility to scale your rack-mounted backup solutions. You can start with just one rack-mounted tape drive and then add a second drive when needed.
• Adjustable depth shelves design provides adaptability to most 19-inch racks.
• Better space utilization based on its 3U form factor allows up to fourteen rack mount kits in a 42U rack for a total of twenty eight drives per rack providing high scalability.
• RoHS 3 directive compliant against hazardous materials.
• Quick and easy installation based on common canister design with the TS4500 high-density enterprise tape libraries, enabling installation and removal from either the front or the back without any tooling.
• Easier CE access for gathering logs and loading code to the drives through Ethernet ports located under a removable bezel.

- Equipped with two redundant, hot-swappable power supplies, two C13-C14 power cords for both tape drives, and a logic card for management of power that provides better reliability.
- The rack mount kit enables two tape drives to run in parallel, reducing the backup time for multiple server environments. The two drives can also be attached to a single server for increased backup performance.

All rack mount solutions can be ordered with one JC data cartridge, one cleaning cartridge, and one CE Diagnostic cartridge, an Ethernet cable for service, and the drive maintenance manuals.

Each TS1160, TS1155, TS1150, or TS1140 tape drive must be ordered separately, and can be installed in a rack mount kit with one of the following feature numbers:

- 9806 - Install first drive in a rack mount kit
- 9807 - Install second drive in a rack mount kit

A drive filler panel, feature number 4806, can be also be added when only a tape drive resides on the rack mount kit.

Appropriate Fibre Channel cables should be ordered for each tape drive. See the Cable orders section for a list of available cables. Also, see the **Fibre Channel Cables** section of the **Special Feature Codes** in the TS1160, TS1155, TS1150, or TS1140 Sales Manuals for Fibre Channel cable information.

Security

TS1160 also supports drive-based data encryption to help protect data. The TS1160-based encryption and associated IBM Security Key Lifecycle Manager components are supported in a wide variety of operating system environments, including IBM Power, IBM System i, IBM System x, IBM System p, Oracle, Linux, and Microsoft Windows. Application, system, or library managed encryption management methods are supported.

Note: For the latest version of IBM Security Key Lifecycle Manager, see the IBM Security Key Lifecycle Manager website.

Tape usage and performance monitoring

TS1160 will be supported on IBM Spectrum Archive by providing tape usage and performance monitoring with open source monitoring tool and alerts through Simple Network Management Protocol (SNMP):

- Historical performance statistics and resource usage
- Visualized data to understand trends and outlook of the system
- Alerts to notify users to take immediate action

Statistical Analysis and Recording System

TS1160 uses the Statistical Analysis and Recording System to assist in isolating failures between media and hardware. These tape drives are designed to use the cartridge performance history saved in the cartridge and drive performance history kept in the drive to determine the more likely cause of failure, and to mark the media as degraded, and indicate that the hardware has degraded.

High-availability data path failover

High-availability data path failover is available for TS1160 Model 60F with the AIX, Linux, Oracle Solaris, IBM i, and Microsoft Windows IBM tape device drivers. The failover mechanism is designed to enable configuration of multiple redundant paths in a SAN environment that includes the TS1160. In the event of a path or component failure, the failover mechanism is designed to automatically enable error recovery to retry the current operation using an alternate, preconfigured

path without aborting the current job in progress. This supports flexibility in SAN configuration, availability, and management.

Dynamic load balancing

Dynamic load balancing is a function in the AIX, Linux, Microsoft Windows, and Oracle Solaris tape device drivers that is also available for TS1160 Model 60F used in a SAN environment. Dynamic load balancing support is designed to improve resources for devices that have physical connections to multiple HBAs in the same machine. When an application opens a device that has multiple HBA paths configured, the device driver determines which path has the HBA with the lowest usage, and assigns that path to the application. The device driver is designed to dynamically track the usage on each HBA as applications open and close devices, and balance the number of applications using each HBA in the machine. This can help optimize HBA resources and improve overall performance.

Additional enhancements

TS1160 tape drives incorporate the following tape enhancements that were introduced with the 3592 Tape Drive and are designed to help improve performance, capacity, and availability:

- High reliability of the 3592 drive and media is maintained and improved with added features:
  - 32-channel head technology for increased native data rate performance.
  - Head overcoat technology into tape for improved head protection and wear characteristics.
  - Standby power management improvements that automatically reduce fan speed when idle to lower power dissipation and reduce the risk of unnecessary airborne debris contamination over extended idle periods.
- Enhanced performance with functions such as Recursive Accumulating Backhitchless Flush and the addition of a new Same Wrap Backhitchless Flush function extends virtual backhitch effectiveness for large files.
- N+1 power supply when TS1160 tape drives are installed in an automation frame helps increase drive availability in the event of a power supply failure.
- Digital speed matching in 12 speeds enables TS1160 tape drives to dynamically perform digital speed matching to adjust the drive's native data rate to the net host data rate (after data compressibility has been factored out) to allow slower hosts to stream the tape drive.
- Channel calibration for customization of each read/write data channel for optimum performance can enable compensation for variations in the recording channel transfer function, media characteristics, and read/write head characteristics. TS1160 tape drives are designed to automatically perform recalibration in the field if they detect degraded performance.
- High-resolution tape directory plus enhanced search speed enables TS1160 tape drives to maintain a tape directory structure with a high granularity of information about the physical position of data blocks on the media. Combined with increased search speed, this feature enables the TS1160 to have improved nominal and average access times for locate operations versus previous IBM tape drives when using legacy media.
- Streaming Lossless Data Compression (SLDC) algorithm is an implementation of a Lempel-Ziv class 1 (LZ-1) data compression algorithm. It is an extension to Adaptive Lossless Data Compression (ALDC) and is designed to offer an improvement over previous IBM lossless compression algorithms. TS1160 uses the same larger history buffer to find compression matches, delivering an improved compression ratio over TS1150 when tested against benchmark data files.

TS1160 tape drives also offer the following enhancements over other 3592 tape drives:

- Large 2 GB internal data buffer offers higher performance characteristics with automatic read-ahead to provide high-performance, random skip forward

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sequential (short hop) locate operations that are common in database search and tape software recycle operations.

- Offboard data string searching enables data content searching of host records for string matches offboard from the host server. The tape drives can perform this search at maximum data rate (400 MBps native/900 MBps compressed) while it would take much longer for a host server to read the data, buffer the data to disk, and then parse the actual data stream with host software routines.
- Enhanced logic to report LEOT is reported based on a combination of capacity-based and position-based LEOT indicators. TS1160 Model 60F monitors the total accumulated number of physical tape data sets written to the volume and will report LEOT based on this capacity-based LEOT value. This enables tape copies to complete without overflow a much higher percentage of the time.
- Recommended Access Order (RAO) enables the tape drive to properly order files after multiple recalls to reduce recall times. Improvement on access time on multiple file recalls can be up to 60%.

Also, the TS4500 will be introducing the following features:

- Export logs direct to IBM is a new action on the web where the library will collect library logs and send it in call home to IBM instead of needing to downloading them to the laptop or system.
- New intelligent PDU with three-phase (wye) or single-phase input to provide power to the local frame control assembly. This new PDU will offer power and environmental monitoring features in the future.

Product positioning

Storing data on tape in an age of easy-access, flash and cloud computing is still very popular and that is because of the reliability, durability, and low TCO that this technology delivers to its clients. Also, IBM Tape offers the most powerful data protection of all. Unlike other storage media, you can easily pull a tape cartridge offline and simply store it on a shelf, creating a physical barrier or "air gap" that hackers can't penetrate. The upsurge in tape usage demonstrates that ransomware and other cybersecurity concerns are prompting many organizations to put tape technology back in service as the ultimate line of defense for sensitive corporate data.

Massive data growth has led to new ways of handling and securing all that information, modern use cases like big data, cloud, or analytics sometimes require a hyperscale approach to be able to meet the business goals in a cost-effective manner. TS1160 is a perfect fit for these environments that achieve massive scale in computing as it delivers the lowest TCO.

Innovation keeps the highly successful 3592 Enterprise Drives ahead of other drive formats. For example, the new TS1160 provides a significant capacity and throughput increase over IBM TS1150 with the introduction of the new JE media. It also offers complete integration with IBM Spectrum™ software-defined storage to help improve data management and reduce storage costs.

The new TS1160 is designed for high-capacity computing environments where high reliability, capacity and performance are mandated. It should be considered in the following environments:

- Current enterprise tape drive applications in TS4500 environments where:
  - Cloud-based and large open computing environments require innovation for tape.
  - Space allocated to tape cartridges needs to be reduced within automation solutions or offline storage.
  - Backup windows are growing and there is a need for higher performance tape drives to back up larger amounts of data in less time. The new TS1160 now supports twice the capacity than the TS1150 to help improve storage space efficiency.

- A Fibre Channel-attached drive where native switched fabric capability is required. TS1160 offers 16 Gb FC support versus 8 Gb FC in the TS1155/TS1150.
- Other hyperscale tape environments, such as:
  - High-speed, data-save operations where backup windows are critical and large amounts of data are archived to tape.
  - Large-scale, automated tape installations where performance, capacity, reliability, and durability are requirements.
  - Hyperscale mass data archive applications where massive amounts of data need to be quickly saved to tape for storage and later recalled, such as the seismic industry, data warehousing, banking, cloud service providers, and record management applications.
  - Environments where both streaming and start/stop (access), large and small file workloads are required.
- Other customers looking for enhanced security and compliance, and encryption in medium to large enterprises in the financial sector, government and public sector, and other industries that must protect their customer tape data from loss, theft, or ransomware.

TS1160 Tape Drive Model 60F is supported in a wide range of environments, including IBM Power Systems, IBM System i, IBM System p, IBM System x, and other servers running AIX, Linux, Oracle Solaris, and Microsoft Windows operating system environments.

Reference information

For more information about the following products, see:

- Hardware Announcement ZG18-0139, dated November 20, 2018, for IBM TS1160 Tape Drive Model 60G
- Hardware Announcement ZG16-0059, dated May 10, 2016, for IBM TS1150 Tape Drive Rack mount kit
- Hardware Announcement ZG14-0272, dated October 6, 2014, for IBM TS1150 Tape Drive
- Hardware Announcement ZG14-0270, dated October 6, 2014, for IBM 3599 Tape Media models

Product number

The following are newly announced features and model on the specified model of the IBM System Storage(R) 3584 and 3592 machine types:

Description	Machine type	Model	Feature
IBM TS1160 Tape Drive Model 60F	3592	60F	
TAA Compliance	3592	60F	0983
Rack Mount Kit	3592	60F	4804
Rack Drive Accessories	3592	60F	4805
Drive Filler Panel	3592	60F	4806
Plant Install 3592 in a 3584 Frame	3592	60F	9677
3592 Field Install in 3584	3592	60F	9689
Install 1st Drive in a Rack Mnt Kit	3592	60F	9806
Install 2nd Drive in a Rack Mnt Kit	3592	60F	9807
Hardcopy Support Documentation	3592	60F	9905

Description	Machine type	Model	Feature
10 meter OM3 fiber Cable (LC)	3592	60F	AGK1
25 meter OM3 fiber Cable (LC)	3592	60F	AGK2
80 meter OM3 fiber Cable (LC)	3592	60F	AGK3
1st Quad Drive Mounting Kit	3584	D25	1531
2nd Quad Drive Mounting Kit	3584	D25	1532
3rd Quad Drive Mounting Kit	3584	D25	1533
4th Quad Drive Mounting Kit	3584	D25	1534
MMF Quad Drive-to-Patch Panel cables	3584	D25	1536
Intelligent PDUs	3584	D25	1952
3592 60F/60G Plant Install in 3584	3584	D25	9706
Direct Fiber - No Patch Panel Cables	3584	D25	9713
TS1160 Field Install Drive in 3584	3584	D25	9726
3 Phase Power Cord	3584	D25	9948
C20-C13 Power Cord for Spare outlets in the Intelligent PDU	3584	D25	9949
MMF Quad Drive-to-Patch Panel cables	3584	D55	1536
Intelligent PDUs	3584	D55	1952
3 Phase Power Cord	3584	D55	9948
C20-C13 Power Cord for Spare outlets in the Intelligent PDU	3584	D55	9949
1st Quad Drive Mounting Kit	3584	L25	1531
2nd Quad Drive Mounting Kit	3584	L25	1532
3rd Quad Drive Mounting Kit	3584	L25	1533
4th Quad Drive Mounting Kit	3584	L25	1534
MMF Quad Drive-to-Patch Panel cables	3584	L25	1536
Intelligent PDUs	3584	L25	1952
3592 60F/60G Plant Install in 3584	3584	L25	9706
Direct Fiber - No Patch Panel Cables	3584	L25	9713
TS1160 Field Install Drive in 3584	3584	L25	9726
3 Phase Power Cord	3584	L25	9948

Description	Machine type	Model	Feature
C20-C13 Power Cord for Spare outlets in the Intelligent PDU	3584	L25	9949
MMF Quad Drive-to-Patch Panel cables	3584	L55	1536
Intelligent PDUs	3584	L55	1952
3 Phase Power Cord	3584	L55	9948
C20-C13 Power Cord for Spare outlets in the Intelligent PDU	3584	L55	9949
Intelligent PDUs	3584	S25	1952
3 Phase Power Cord	3584	S25	9948
C20-C13 Power Cord for Spare outlets in the Intelligent PDU	3584	S25	9949
Intelligent PDUs	3584	S55	1952
3 Phase Power Cord	3584	S55	9948
C20-C13 Power Cord for Spare outlets in the Intelligent PDU	3584	S55	9949
Intelligent PDU	3584	TR1	1752
3 Phase Power Cord	3584	TR1	9948
C20-C13 Power Cord for Spare outlets in the Intelligent PDU	3584	TR1	9949

Model conversions

From machine type	From model	To machine type	To model	Conversion requirements
3592	EH8	3592	60F	-
3592	55F	3592	60F	-
3592	60G	3592	60F	-

Parts removed as a result of a model conversion become the property of IBM and must be returned.

Publications

The following publications are shipped with the product:

- TS4500 Tape Library Drives: None
- Rack install tape drives:
  - Installation Instructions for feature codes 4804/4805/4806/9806/9807 and RPQ 8B3658 on a 3592 EH7, EH8, 55F, or 60F tape drive
  - TS11xx Tape Drive Maintenance Manual
  - TS11xx Product Documentation CD
  - README -- A one-page pointer to the IBM TS11xx Tape Drive Customer in IBM Knowledge Center
- Model conversions:

- Installation instructions for 3592 tape drive model conversion
- TS11xx Tape Drive Maintenance Manual CD

IBM Knowledge Center provides you with a single point of reference 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 by going to IBM Knowledge Center for all your product information needs.

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For details on available services, contact your IBM representative or go to the IBM Global Technology Services[(R)] 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.

Technical information

Specified operating environment

Physical specifications

TS1160 Tape Drive Model 60F

- Width: 156 mm (6.1 in.)
- Depth, front of bezel to rear handle: 374 mm (14.7 in.)
- Height: 86 mm (3.4 in.)
- Weight: 3.97 Kg (8.75 lbs)

To assure installability and serviceability in non-IBM industry-standard racks, review the installation planning information for any product-specific installation requirements.

Operating environment

- Temperature: 16°C to 32°C (60.8°F to 89.6°F) in operation (media in use)
- Relative humidity: 20% to 80% noncondensing
- Drive electrical power (in canister): 57 W maximum and occurs during write operations at maximum velocity
- Noise level: 5.8 Bels operating

For more information and documentation, go to the IBM TS4500 documentation website in IBM Knowledge Center.

Hardware requirements

TS1160 Tape Drive

TS1160 tape drives feature tunnel magnetoresistance (TMR) read sensor head technology. The Fibre Channel version includes a dual-ported, switched fabric 16 Gbps Fibre Channel for attachment to multiple servers or a single server with redundancy. It can be attached to IBM Power Systems, IBM System i, IBM System p, IBM System x and other servers running AIX, Linux, Oracle Solaris, and Microsoft Windows operating system environments.

For the latest details on specific hardware, software, and Fibre Channel support for TS1160 Tape drive Model 60F, go to the IBM SSIC website.

The TS1160 Tape Drive is for installation in a TS4500 frame. For all installations, the tape drive comes enclosed in a canister.

Up to sixteen TS1160 drives can be installed in a TS4500 Model L25 or D25 frame (up to twelve in frame 1).

New Quad Drive Mounting Kit features are required for installing TS1160 Tape drives in a TS4500:

- #1531 -- 1st Quad Drive Mounting Kit
- #1532 -- 2nd Quad Drive Mounting Kit
- #1533 -- 3rd Quad Drive Mounting Kit
- #1534 -- 4th Quad Drive Mounting Kit

Note: Each TS1160, TS1155, TS1150 or TS1140 tape drive must be ordered separately, and is installed in a TS4500 frame with one of the following feature numbers:

- #9690 -- 3588/3592 Field Install
- #9692 -- 3592 E07/EH7 Plant Install
- #9699 -- 3592 E08/EH8 Plant Install
- #9704 -- 3592 55E Plant Install
- #9705 -- 3592 55F/55G Plant Install
- #9706 -- 3592 60F/60G Plant Install

Appropriate cables should be ordered for each tape drive. See the **Cables** section for a list of available cables.

Labeled or initialized cartridges for TS1160 Tape drives can be ordered using machine type 3599. See the **Supplies** section, for more information.

Cables

A fiber optic cable is required for attaching a TS1160 tape drive to host adapters or other storage area network components. The cable can be customer-supplied, ordered with the tape library, or ordered with the rackmount TS1160 tape drive in the lengths available. The attaching fiber cable must be 50.0/125 micrometers for distances up to 300 meters. The connector on the TS1160 tape drive is a Lucent Connector (LC) duplex connector type. The cables with LC duplex connectors can be ordered on the TS4500 tape library, or rackmount TS1160 tape drive in the lengths indicated with the following feature numbers:

- #AGK1 -- 10-meter OM3 fiber cable (LC)
- #AGK2 -- 25-meter OM3 fiber cable (LC)
- #AGK3 -- 80-meter OM3 fiber cable (LC)

Two new features that include all fiber cables required for a column of 4 drives, 8x LC-LC to the patch panel are now also available and can be ordered as an option. These Drive-to-Patch Panel cables can be either for Multimode Fiber (MMF) or for Single Mode Fiber (SMF) tape drives. The drive to patch panel cables can be ordered with the following feature numbers:

- #1536 -- MMF Quad Drive-to-Patch Panel cables
- #1537 -- SMF Quad Drive-to-Patch Panel cables*

*Model 3588-F8S needs to be in the order or exist in the library.

Patch panel usage is recommended. However, if the customer requires direct host or SAN connection to the tape drives, bypassing the patch panel, feature #9713 -- Direct Fiber - No Patch Panel Cables must be specified.

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

Fibre Channel switch attachment

The TS1160 Tape Drive is supported by a variety of Fibre Channel switches and Fibre Channel directors. The support is dependent on server, operating system, and host bus adapter that is being used.

Software requirements

For a current list of host software versions and release levels that support the TS1160, go to the IBM SSIC website.

IBM Spectrum Archive and other compatible software offerings can provide storage and tape management software for the TS1160. Supporting software and applications must be obtained separately from IBM, IBM Business Partners, or Independent Software Vendors (ISVs). A list of compatible software is available from your IBM representative or at the Independent Software Vendor Matrix (ISV) for IBM TotalStorage 3592 tape drives and LTO™ website.

IBM continues to work together with the ISVs to support the TS1160 Tape Drive. Individual application vendors should be contacted for specific information and availability dates.

IBM maintains the latest levels of System Storage[R] tape drive and library device drivers and documentation on the Internet. Utilize the IBM Fix Central download website.

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* for more information.

Encryption

Two modes of encryption management are supported:

- Library managed
- Application managed (for example, IBM Spectrum Protect)

Limitations

- Although multiple systems may be attached to a TS1160 tape drive, the systems cannot use the drive simultaneously. The TS1160 can only be varied online to one system at a time.
- TS1160 tape drives are not currently supported for attachment to an IBM TS7700 or an Enterprise Tape Control Unit.

Planning information

Client responsibilities

Physical planning is a customer responsibility.

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

Appropriate cables should be ordered for each tape drive. See the **Cables** section for a list of available cables.

Packaging

Product	Shipment group	Number of boxes
TS1160 Model 60F	Yes	1

Security, auditability, and control

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

The client 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.

Global Technology Services

Contact your IBM representative for the list of selected services available in your country, either as standard or customized offerings, for the efficient installation, implementation, and/or integration of this product.

Terms and conditions

Products - terms and conditions

Warranty period

Warranty and additional coverage options	Coverage summary[1]
Warranty period:	1 year[2]
Service level:	IBM On-Site, 24x7 Same Day
Service upgrade options	
Warranty Service Upgrade	IBM On-Site, 24x7 Same Day
Maintenance Services (Post-Warranty):	IBM On-Site Repair, 24x7 Same Day
IBM Hardware Maintenance Services - committed maintenance[3]:	Yes

[1] See complete coverage details below

[2] Known exception: Turkey (Warranty period: 2 years)

[3] Not offered in the US

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.

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. If applicable to your product, parts considered Customer Replaceable Units (CRUs) will be provided as part of the machine's standard warranty service.

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 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, 6 hour average, same day response.

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.

Service levels are:

• 24 hours per day, 7 days a week, 6 hour average, same day response.

Usage plan machine

No

IBM hourly service rate classification

Three

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.

Maintenance service offerings

This machine is eligible under terms and conditions of IBM ServiceElite, the IBM Enterprise Service Agreement (ESA), or the IBM Maintenance Agreement. Consult your IBM representative for details.

General terms and conditions

Field-installable features

No

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.

For planning information, see *3592 Introduction and Planning Guide*, GA32-0555.

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.

Prices

For all local charges, contact your IBM representative.

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Terms of use

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IBM Directory of worldwide contacts