

## IBM Half-high LTO Generation 4 SAS Tape Drive

### IBM System x at-a-glance guide

The IBM Half High LTO Generation 4 SAS Tape Drive is the fourth-generation Linear Tape-Open (LTO) offering introducing larger storage capacities, increased performance, and advanced security features to effectively meet the demanding backup, archival and regulatory compliance requirements of your System x environments.

The IBM Half High LTO Generation 4 SAS Tape Drive is an excellent tape storage solution for businesses requiring backup or low-cost, real-time archiving of their data within a small window of time. This fourth generation drive provides up to twice the storage capacity, up to 1.6 TB with 2:1 compression, and provides up to a 50% performance increase, up to 240 MBps (864 GB/hr) with 2:1 compression, over the preceding LTO 3 half height technology. This enterprise data protection offering is available in a 5.25-inch half-height internal form factor for integration into IBM System x tower servers and external IBM 1U rack-mount enclosures or a half-height external unit for stand-alone table top or rack shelf applications.

Figure 1 shows the IBM Internal Half-high LTO Generation 4 SAS Tape Drive.



Figure 1. IBM Internal Half-high LTO Generation 4 SAS Tape Drive

### Did You Know?

Data security is a growing requirement for businesses of all sizes today. The IBM Half-high LTO Generation 4 SAS Tape Drive delivers advanced security features to help ensure compliancy with data security, information disclosure, and privacy regulations for data at rest. Beyond WORM (Write-Once, Read-Many) cartridge support to preserve data in a non-erasable and non-rewritable format, LTO 4 technology also offers data encryption capabilities. LTO 4 hardware-based data encryption can assist in safeguarding against costly security breaches and exposure of proprietary data if a data cartridge is stolen or lost.

## Part number information

Table 1 lists the ordering part numbers and feature codes.

Table 1. Ordering part numbers and feature codes

Description	Part number	Feature code
IBM Internal Half-high LTO Generation 4 SAS Tape Drive	44E8895	5397
IBM External Half High LTO Gen 4 SAS Drive, with US line cord	3628L4X	None
IBM External Half High LTO Gen 4 SAS Drive, with no line cord	3628N4X	None
IBM LTO Generation 4 Media 5 Pack	46C5359	5701 (1 cartridge)
IBM LTO Ultrium 4 800GB WORM Data Cartridge without labels - 20 pack	95P4461*	Not available
IBM LTO Universal Cleaning Cartridge	49Y9893	5347

\* To order WORM cartridges, in United States and Canada, please call 1-888-IBM-MEDIA. For all other geographic locations, please select your country and distributor from <http://ibm.com/systems/storage/media/distributors/>.

The part number for the IBM Internal Half-high LTO Generation 4 SAS tape drive includes:

- LTO Generation 4 SAS tape drive assembly
- Mounting screws
- CD-ROM containing the User's Guide
- Cleaning cartridge
- Drive rails
- SAS cable for internal tape connectivity

The part numbers for the IBM External Half-high LTO Generation 4 SAS Tape Drive includes the following items:

- LTO Generation 4 SAS tape drive in an external enclosure
- CD-ROM containing the User's Guide
- Cleaning cartridge
- 3 meter external SAS cable
- 3628L4X also includes a 2.8 meter (9 ft) 10A / 125V US line cord

## Features

The features of the IBM Half-high LTO Generation 4 SAS Tape Drive has the features and benefits listed in Table 2:

Table 2. Features and benefits (Part 1)

Feature	Benefits
6 Gbps SAS host interface	<ul style="list-style-type: none"> <li>● Fast connection to the server</li> </ul>
Up to 240 MBps data transfer rate	<ul style="list-style-type: none"> <li>● Helps reduce the time required for backup</li> <li>● 50% transfer rate increase from current Half-high LTO Generation 3 drives</li> </ul>
Up to 1.6 TB cartridge capacity	<ul style="list-style-type: none"> <li>● Helps store greater amounts of data as your business grows</li> </ul>
Digital Speed Matching (DSM)	<ul style="list-style-type: none"> <li>● Supported on Ultrium 4 media in increments of 30 MBps to 120 MBps</li> <li>● Along with a larger buffer, helps to maximize drive performance when data rates are less than optimal</li> </ul>
256 MB buffer	<ul style="list-style-type: none"> <li>● Together with Digital Speed Matching, helps the drive mitigate fluctuations in data rates</li> </ul>
Adaptive Data Compression	<ul style="list-style-type: none"> <li>● With the 256 MB buffer, helps you achieve optimal performance and storage capacity</li> <li>● Helps improve data throughput and tape repositions</li> <li>● Helps support data integrity through synchronous, dynamic swapping of data compression scheme</li> </ul>
256 AES encryption	<ul style="list-style-type: none"> <li>● Helps keep the data on your tape media secure with encryption</li> <li>● Helps meet compliance requirements</li> <li>● Helps improve performance of your backup processes with dedicated encryption/decryption core</li> </ul>
16 channel head	<ul style="list-style-type: none"> <li>● Increases data throughput to support higher drive speeds</li> </ul>
Timing-based servo positioning	<ul style="list-style-type: none"> <li>● Patented technology that provides greater precision when writing data to tape</li> <li>● Enables the drive to support the use of narrower tracks</li> <li>● With the 16 channel head, linear density of the data is increased by 31% when compared to LTO Generation 3 drives</li> </ul>
Advanced tape loader and threader mechanism	<ul style="list-style-type: none"> <li>● Improves error recovery and provides greater reliability when loading threading and unloading tape cartridges</li> <li>● Independent loader and threader motors, coupled with positive pin retention helps retain the pin during a miss-pick and helps improve load &amp; thread reliability</li> <li>● Designed to improve drive and media reliability</li> </ul>
“On-the-fly” adaptive channel calibration	<ul style="list-style-type: none"> <li>● Allows the drive to adjust to variations in the media and head while calibrating the channel.</li> <li>● Helps improve data throughput rates and data integrity</li> </ul>
Copper based chips	<ul style="list-style-type: none"> <li>● Based on IBM copper chip technology, provides improved performance while providing lower overall power consumption over previous generations of LTO drives</li> </ul>
Superior power management	<ul style="list-style-type: none"> <li>● Enables the drive to operate in write mode and idle mode for when the drive is not in use</li> <li>● Improves heat dissipation and provides greater operational efficiency than previous-generation LTO drives</li> </ul>

Table 2. Features and benefits (Part 2)

Feature	Benefits
WORM support	<ul style="list-style-type: none"> <li>● WORM capable cartridges give you the option of storing vital data in a non-erasable, non-rewritable format, to meet strict regulatory requirements for data retention</li> <li>● Helps address evolving regulatory initiatives</li> </ul>
Flexible mounting alternatives	<ul style="list-style-type: none"> <li>● Half height external SAS tape drive for a low cost and space efficient table top or shelf unit alternative to mounting a drive internally in your server.</li> <li>● 5.25 in. half high internal SAS tape drive designed for internal installation in IBM System x tower servers or external IBM 1U rackmount enclosures</li> </ul>

## Specifications

The specifications for the Half-high LTO Generation 4 SAS tape drive are (when using Ultrium 4 cartridges):

- 6 Gbps SAS host interface
- Up to 800 GB native capacity and up to 1600 GB in compressed mode (2:1 compression ratio)
- 120 MBps native back-up rate and up to 240 MBps in compressed mode (2:1 compression ratio)
- Support for WORM (write once read many) on WORM cartridge types
- Burst data-transfer rate of 300 MBps for the SAS interface
- 256 MB read-and-write cache
- Read/Write compatibility with LTO Generation 3 cartridges. Read compatibility with LTO 2 and 3 cartridges
- Support for encryption of data on Ultrium 4 cartridges

## Key prerequisites

The IBM Half-high LTO Generation 4 SAS Tape Drive prerequisites are:

- SAS controller
- One or more LTO Generation 3 or LTO Generation 4 data cartridge (not supplied with drive option)
- For the internal drive, an available half-height drive bay or supported external tape enclosure.

## Physical specifications

The physical specifications of the IBM Internal Half-high LTO Generation 4 SAS Tape Drive are:

- Height: 43 mm (1.75 in.)
- Width: 149 mm (5.85 in.)
- Depth: 210 mm (8.40 in.)
- Weight: 1.5 kg (3 lb. 5 oz.)

The IBM External Half-high LTO Generation 4 SAS Tape Drive has the following physical specifications:

- Height: 58 mm (2.3 in)
- Width: 213 mm (8.4 in)
- Depth: 332 mm (13.1 in)
- Weight: 4.3 kg (9.5 lb)

Figure 2 shows the IBM External Half High LTO Generation 4 SAS Drive.



Figure 2. IBM External Half High LTO Generation 4 SAS Drive

## Operating environment

The IBM Half-high LTO Generation 4 SAS Tape Drive is supported in the following environment:

- Temperature:
  - Operating: 10° to 40° degrees C (50° to 104° degrees F)
  - Non-operating: -40° to 60°C (-40° to 140°F)
- Relative humidity:
  - Operating: 20% to 80% (non-condensing)
  - Non-operating: 10% to 90% (non-condensing)
- Maximum altitude:
  - Operating: 3048 m (10000 ft.)
  - Non-operating: 3048 m (10000 ft.)

## Warranty

The IBM Internal Half-high LTO Generation 4 SAS tape drive has a one-year limited warranty. When installed in a System x server, this tape drive assumes your system's base warranty and any IBM ServicePack upgrade. The IBM External Half-high LTO Generation 4 SAS Tape Drive has a three-year warranty.

## Supported servers

The IBM Half-high LTO Generation 4 SAS Tape Drive is supported in the IBM System x servers that we listed in Table 3.

Table 3. Supported System x servers (Part 1)

Adapter	x3100 M3	x3200 M2	x3200 M3	x3250 M2	x3250 M3	x3350	x3400	x3400 M2	x3400 M3	x3455	x3500	x3500 M2	x3500 M3
Internal LTO 4 SAS Tape Drive (installed internally to the server)	N	Y*	Y	N	N	N	Y	Y	Y	N	Y	Y	Y
Internal LTO 4 SAS Tape Drive (installed externally in an enclosure)	N	Y*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
External LTO 4 SAS Tape Drive	N	N	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y

\* The tape drive is supported in x3200 M2 machine types 4367 and 4368 only.

Table 3. Supported System x servers (Part 2)

Adapter	x3550 M2	x3550 M3	x3620 M3	x3630 M3	x3650	x3650 M2	x3650 M3	x3655	x3690 X5	x3755	x3755 M3	x3850 M2	x3950 M2	x3850 X5
Internal LTO 4 SAS Tape Drive (installed internally to the server)	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Internal LTO 4 SAS Tape Drive (installed externally in an enclosure)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
External LTO 4 SAS Tape Drive	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y

### Internal use

The following components are needed:

- A supported SAS host bus adapter installed in the server (see Table 3)
- An available 5.25-inch, half-height bay

### External use

If the internal tape drive is to be installed in an external enclosure, the following components are needed. We describe these enclosures and the enclosure adapter kit in the "Supported enclosures and enclosure kit" section.

- A supported SAS host bus adapter installed in the server (see Table 3)
- A supported external enclosure:
  - IBM 1U Rackmount Tape Enclosure
  - IBM 4U Rackmount Tape Enclosure (now withdrawn)
  - IBM Half High Tabletop Tape Enclosure
- An IBM SAS Enclosure Adapter Kit (40K2599)

If the external tape drive is to be used, the a supported SAS host bus adapter installed in the server is needed. The host bus adapters supported with the tape drive are listed in Table 4.

Table 4. Host Bus Adapters for use with the IBM Half-high LTO Generation 4 SAS Tape Drive

Description	Part number	Feature code
IBM SAS HBA Controller	25R8060	1681
IBM 3 Gb SAS HBA Controller v2	44E8700	3583
IBM 6Gb SAS HBA Controller	46M0907	3875

For the latest and most accurate compatibility information, visit our ServerProven Web site at: <http://ibm.com/servers/eserver/serverproven/compat/us/> or the IBM System x Configuration and Options Guide at: <http://www.ibm.com/systems/xbc/cog/>.

### Supported enclosures and enclosure kit

You can use the enclosures and enclosure kit shown in Table 5 with the internal tape drive when it is to be installed externally.

Table 5. Enclosures for use with the IBM Internal Half-high LTO Generation 4 SAS Tape Drive

Description	Part number	Feature code
IBM 1U Rack-mount Tape Enclosure	87651UX (AG)* 87651NX (AP and EMEA)†	8765HC1 fc 2290
IBM 4U Rack-mount Tape Enclosure (withdrawn)	87664UX (AG)* 8766NX (AP and EMEA)†	Not applicable
IBM Half High Tabletop Tape Enclosure	8767HHX (AG)* 8767HNX (AP and EMEA)†	8767HC1 fc 2287
IBM SAS Enclosure Adapter Kit‡	40K2599	5382

\* These models are for customers in the Americas Group (AG - Canada, U.S., and countries in South America). These models ship with a NEMA 5-15P line cord

† These models are for customers in the countries known collectively as Asia Pacific (AP) and Europe, Middle East, Africa (EMEA). These models do not ship with a line cord.

‡ One adapter kit is needed per drive

The following figure shows the IBM Half-high LTO Generation 4 SAS Tape Drive installed in the left most bay of the IBM 1U Rack-mount Tape Enclosure (87651UX).



Figure 3. The tape drive installed in the 1U Rack-mount Tape Enclosure

The IBM SAS Enclosure Adapter Kit, 40K2599, includes the following items:

- SAS adapter/connector
- 3M external SAS cable

## Popular configurations

In this section, we illustrate how you can use the IBM Half-high LTO Generation 4 SAS Tape Drive in configurations.

### Internal installation

The following figure shows the IBM Half-high LTO Generation 4 SAS Tape Drive installed internally in a tower server.

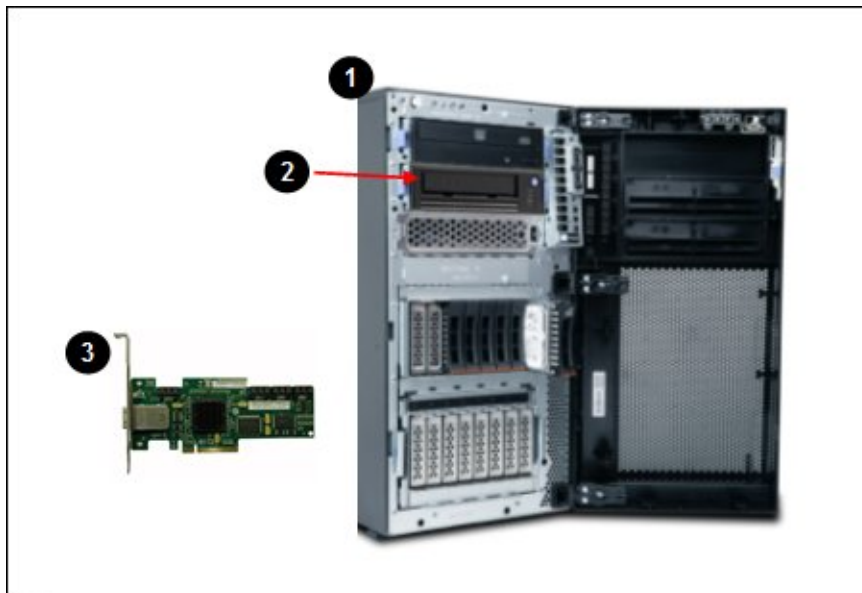


Figure 4. The IBM Half-high LTO Generation 4 SAS Tape Drive installed internally in a tower server

Table 6 lists the parts that are used.

Table 6. Components used when installing the IBM Half-high LTO Generation 4 SAS Tape Drive into an x3500 M2 server

Diagram reference	Part number/ machine type	Description	Quantity
1	Varies	Supported server	1
2	44E8895	IBM Half High LTO Generation 4 SAS Tape Drive (includes internal cable)	1
3	46M0907	IBM 6 Gb SAS HBA Controller	1



## Installation in a 1U external enclosure

The following figure shows the IBM Internal Half-high LTO Generation 4 SAS Tape Drive installed in an IBM 1U Tape Drive External Enclosure and connected to a System x server.



Figure 5. The tape drive installed in an IBM 1U Tape Drive External Enclosure and connected to a System x server

Table 7 lists the parts that are used.

Table 7. Components used when connecting the IBM Half-high LTO Generation 4 SAS Tape Drive installed in external tape drive enclosure to a supported System x server

Diagram reference	Part number/ machine type	Description	Quantity
1	Varies	Supported System x server	1
2	46M0907	IBM 6 Gb SAS HBA Controller	1
3	44E8895	IBM Half-high LTO Generation 4 SAS Tape Drive	1
4	87651UX	IBM 1U Tape Drive External Enclosure	1
Inside the enclosure	40K2599	IBM SAS Enclosure Adapter Kit (includes the internal cable, 3m external SAS cable)	1

The following figure shows an IBM 1U Tape Drive External Enclosure without the SAS Adapter Kit and after installing the SAS Adapter Kit.



Figure 6. The 1U Tape Drive Enclosure with and without the SAS Enclosure Adapter Kit

### Supported software products

The IBM Half-high LTO Generation 3 SAS Tape Drive supports the following software products:

- CA Brighstor
- Tivoli Storage Manager
- Symantec Backup Exec
- Symantec Net Backup

### Supported operating systems

The IBM Half-high LTO Generation 3 SAS Tape Drive supports the following operating systems:

- SUSE Linux
- Red Hat Linux
- Microsoft Windows 2003
- Microsoft Windows 2008

For the latest information about the specific versions and service packs that are supported, see IBM ServerProven at:

<http://ibm.com/servers/eserver/serverproven/compat/us/>

When you arrive at the IBM ServerProven site, select the blade server and then select the expansion card to see the supported operating systems.

## Related publications

For more information, refer to the following resources:

- IBM HH LTO Generation 4 SAS Tape Drive Installation and User Guide  
<http://www.ibm.com/support/docview.wss?uid=psg1MIGR-5074991>
- Installation Guide for IBM 1U Rackmount Tape Enclosure  
<http://www.ibm.com/support/docview.wss?uid=psg1MIGR-64787>
- Installation Guide for IBM 4U Rackmount Tape Enclosure  
<http://www.ibm.com/support/docview.wss?uid=psg1MIGR-64794>
- Installation Guide for IBM Half High Tabletop Tape Enclosure  
<http://www.ibm.com/support/docview.wss?uid=psg1MIGR-64792>
- IBM System x Configuration and Options Guide  
<http://www.ibm.com/systems/xbc/cog/>
- IBM US Announcement Letter for the IBM HH LTO Generation 4 SAS Tape Drive  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS108-272>

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