

All tape media is NOT created equal.
Spectra Certified Media is Superior!



Featuring LTO-9



Spectra Certified Media starts with...

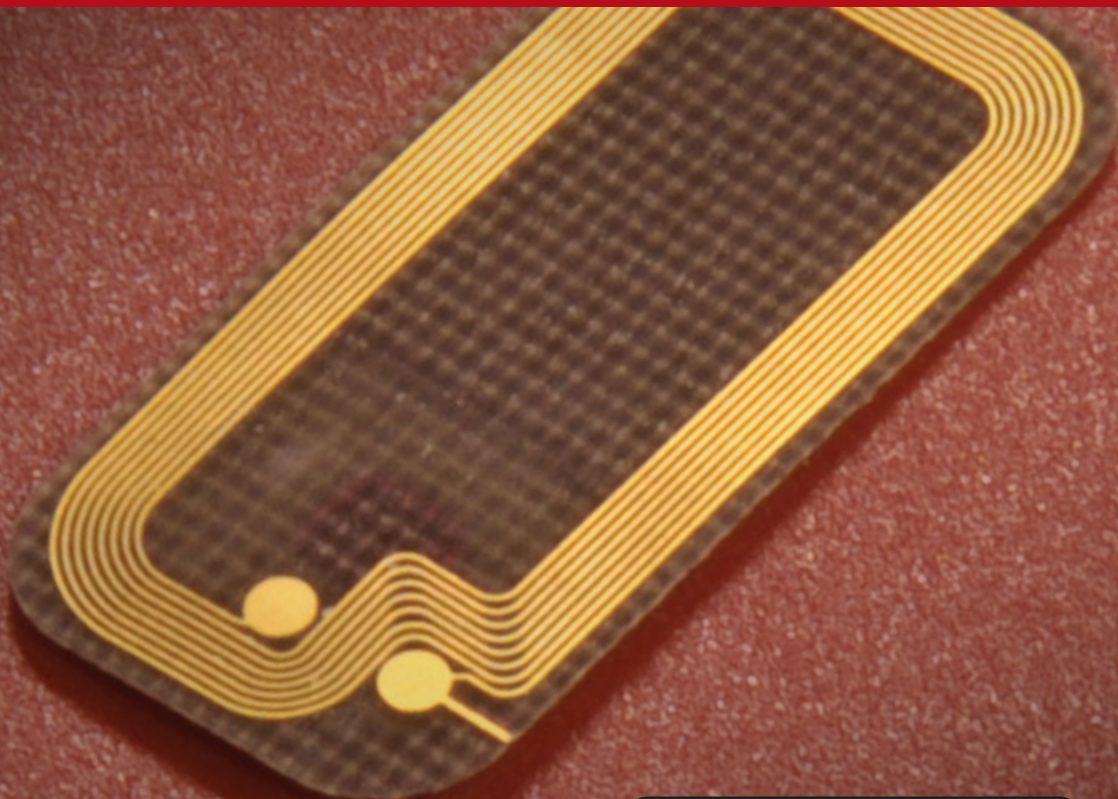
...using only the best media

Media quality is at the core of efficient, pain-free backup and archive. All manufactured tape is **not** the same, leaving your data to chance with suspect media. Only the highest quality media available on the market becomes **Spectra Certified Media**. This ensures you have the most reliable and worry-free data protection possible. From manufacturer selection to testing and customer shipment, every step of the Spectra Certified Media process is designed to ensure you have the most pain-free automated tape storage available. No other supplier places as much emphasis on continual enhancements and features that simplify all aspects of the media management process.



Features of Certified Media

Media Lifecycle Management is at the heart of...



Spectra programmed chip stored in each tape cartridge tracks over 40 parameters throughout the life of the tape.

Spectra Certified Media

Track Spectra tapes throughout their life.

With **Spectra Certified Media**, you'll never get caught by surprise again.

Certified Media combined with Media Lifecycle Management (MLM) reduces the most common media-related failures, and can only be found with Spectra tape libraries. MLM allows you to proactively manage your tape inventory through simple monitoring of over 40 health statistics and automatically identifies at-risk tapes ready for retirement.

Poor Health



Average Health



Good Health



Media Lifecycle Management Report

Partition: LT05 >> Go

Report: Media Health >> Go

Barcode	Media Health	Load Count
000072L5	Poor	6764
000074L5	Average	4886
000151L5*	Average	2916
000134L5	Good	2385
241844L4	Good	2800
000294L5	Good	1639

* = Spectra Certified Media * = CarbideClean™ Media

>> Save Report Find by Barcode: >> Find

MLM stoplight icons serve as easy visual diagnostics, recommending action based on the health status of a tape.

Features of Certified Media

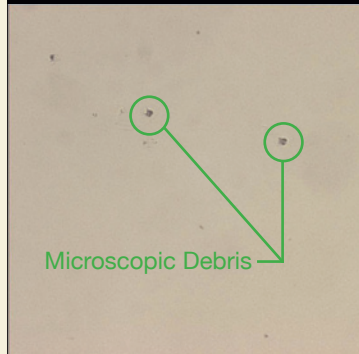
Spectra's CarbideClean® performance boost...

is unique to Spectra Certified Media

CarbideClean® extends tape life

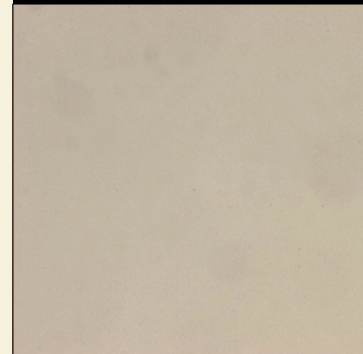
Spectra Certified Media performs better than competitors' media. The CarbideClean® process is a unique Spectra enhancement that extends the life of your tape drives and enhances the performance and capacity of your tapes. Spectra Certified Media with CarbideClean® ensures your media is debris-free, allowing your system to run at peak performance.

Tape Surface Before CarbideClean.



Microscopic Debris

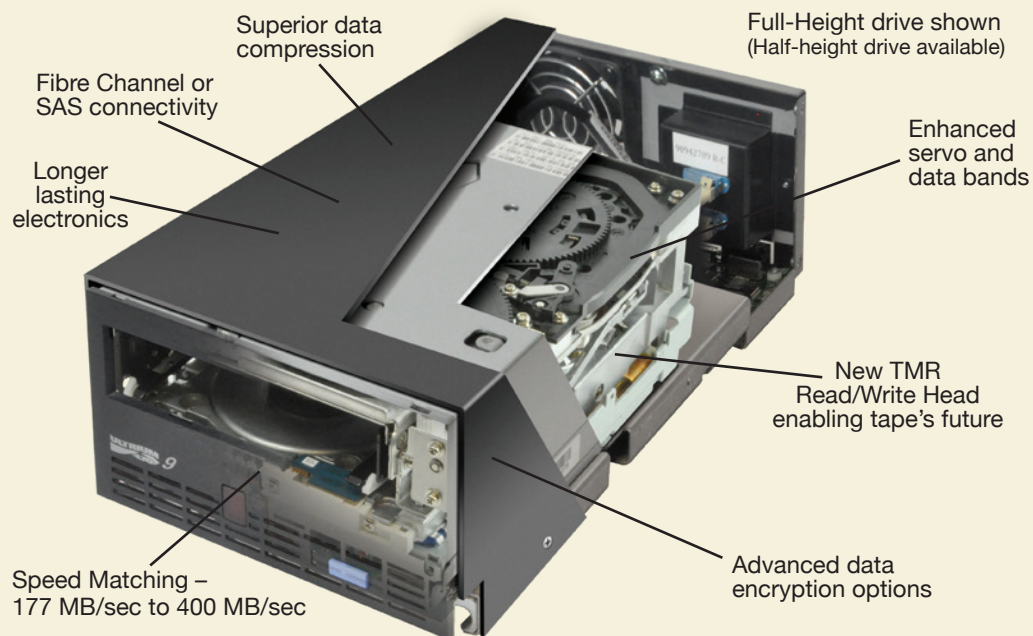
Tape Surface After CarbideClean.



LTO tape magnified at 1:5000. CarbideClean removes debris, maximizing the potential that every bit is written and read.

Features of Certified Media

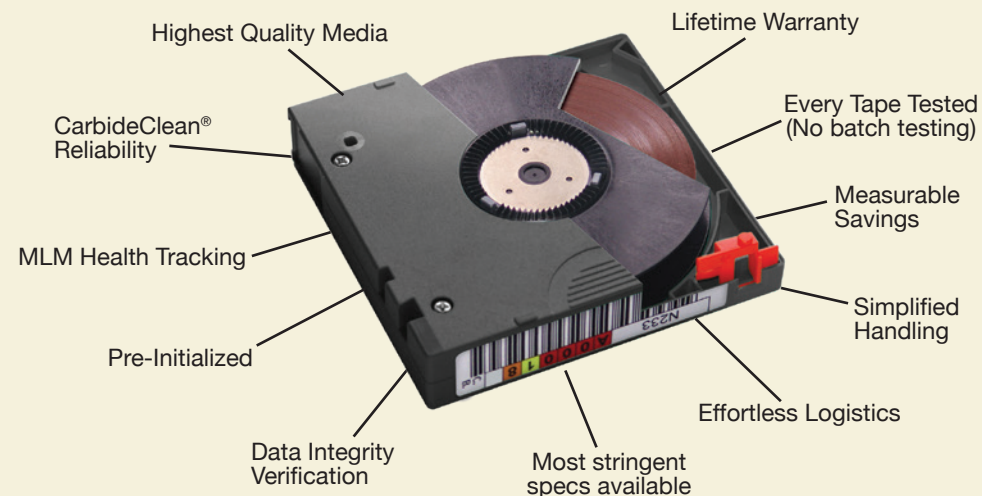
Spectra's Brand New LTO-9 Drive...



State-of-the-art LTO Ultrium Technology

Linear Tape Open (LTO) Ultrium is a high-capacity tape storage solution designed for dependability and cost efficiency. It's a powerful, scalable and adaptable tape format that helps address the exponential data growth and storage challenges facing organizations today.

Coupled with LTO-9 Certified Media



Spectra LTO-9 media is vastly superior.

Because of the **Spectra® Certified Media** process, every generation of LTO tape media, including LTO-9, is transformed into the most reliably functional and trouble-free tape media that exists in the industry.

LTO-9 Certified Tape Media

What's Different with LTO-9?

- Capacity 50% more than LTO-8 – 12TB to 18TB
- Performance increase – 360 to 400MB/sec native data transfer rate
- Reliability maintained – corrected bit error rate of 1.0×10^{-19}
- Backward Read/Write compatibility to LTO-8

Why the change?

- **The new Tunnel Magnetoresistance Recording (TMR) Head:**
 - Delivers more write tracks and greater density
 - Provides a multi-generational roadmap out to LTO-12
 - Enables doubling of capacity with each new generation

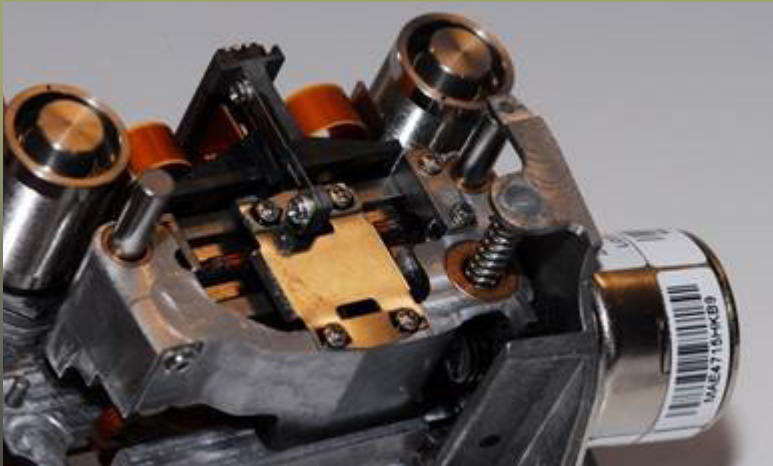
The Future of Storage - Available Now

LTO-8 versus the New LTO-9 Drive		
LTO-8		LTO-9
12 TB Native 30 TB Compressed	50% increase in capacity	18 TB Native 45 TB Compressed
360 MB/s Native* 750 MB/s Compressed	Increases native transfer speed	400 MB/s Native* 900 MB/s Compressed
Bit Error Rate = 1.0×10^{-19}	Same high level of data integrity	Bit Error Rate = 1.0×10^{-19}
32 Data Track Channels	Same number of channels	32 Data Track Channels
2.5 to 1	Compression ratio	2.5 to 1
Read/Write back to LTO-7 Type M and LTO-7	Backward compatible	Read/Write back to LTO-8

* Half-height drives up to 300MB/s

LTO-9 Certified Tape Media

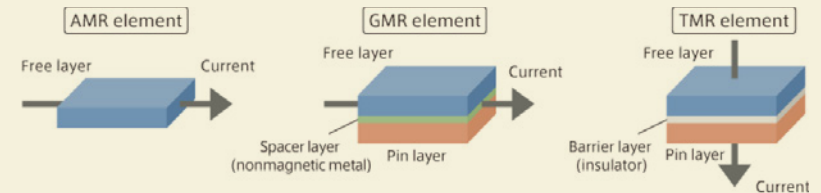
What makes LTO-9 possible? The TMR Head



LTO-9 Advantages with TMR heads:

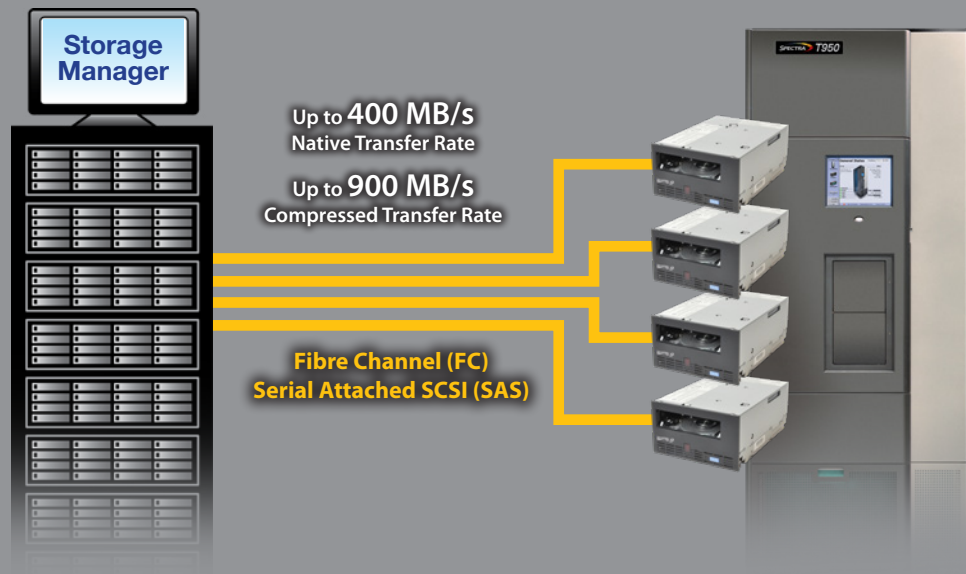
- Increases the number of Read/Write tracks
- Cooler operation
- Increased capacity
- Higher throughput

...and how it's different



- **In a GMR element** the current flows horizontally to the film surface, while it flows perpendicular to the film surface in a TMR element providing a better and more accurate data detection, and delivering a technology that can provide increased data density for generations to come.
- **As with any storage technology**, a plateau is eventually reached where further investment in the current technology only results in small density improvements and it becomes time to switch to a newer technology allowing order of magnitude growth.
- **Tunneling Magnetoresistance [TMR]** heads allow significantly more bit density on the tape and allow for more and more tightly spaced tracks.

LTO-9: The highest read/write speeds for tape



Automatic speed-matching ensures
an uninterrupted, serial data stream
regardless of the server's capabilities.

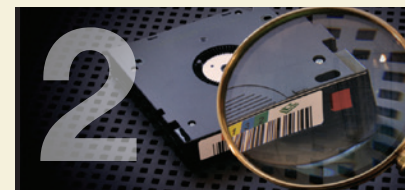


... and Reliability 1 - 2 - 3

Tape Medium	Hard Error Rate
LTO-8	1×10^{19} bits
LTO-7	1×10^{19} bits
TS1155	1×10^{20} bits

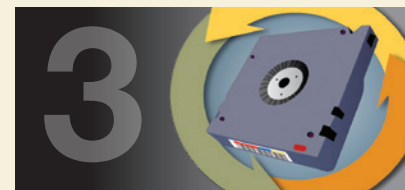
Enterprise grade bit-error-rate

LTO-9 has been designed and tested to show a 1.0×10^{-19} bit error rate.



Spectra Certified Media

Lengthens drive and media life by removing harmful debris in our exclusive process called CarbideClean.®



Media Lifecycle Management

Uses embedded RFID memory chip to track 40 different aspects of media reliability.

LTO-9 Certified Tape Media

New for LTO-9: Initialization must happen.

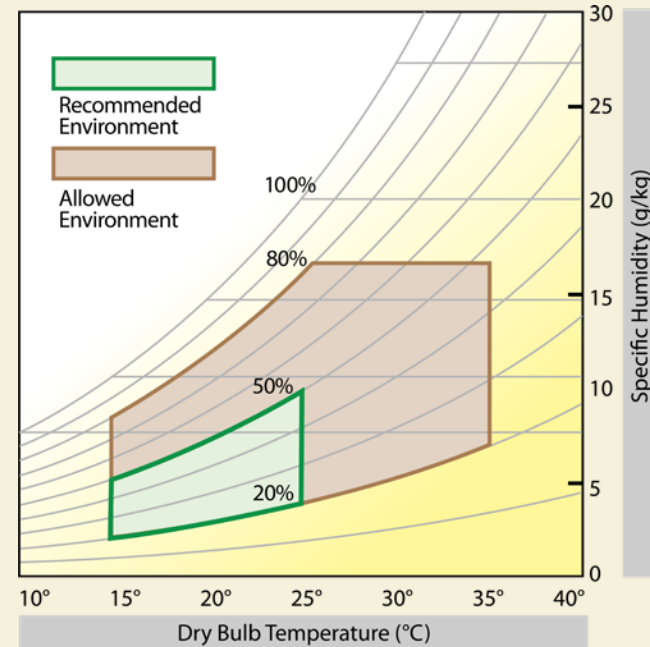
LTO-9 tape media requires optimization before use in a tape library.

LTO-9 requires a new initialization process that is used to optimize each new cartridge before it is used for writing data. Greater precision is required due to the increased number of tracks used to write data on an LTO-9 tape to achieve its higher capacity.

The media optimization creates a referenced calibration for each cartridge that enables the tape drive's intelligent alignment to optimize data placement. This optimization automatically happens on the first loading of a brand new LTO-9 tape into an LTO-9 tape drive and typically takes one hour, but can range between 40 and 120 minutes before the tape is ready to be used for the first time.

Spectra does it for you.

Every Spectra LTO-9 Certified Media tape has been optimized so you don't have to.



Spectra's LTO-9 optimized media is acclimated for a minimum of 24 hours in the ideal environment for LTO-9 optimization prior to being loaded into any drives. During the optimization process, temperature and absolute humidity are controlled to ensure Spectra LTO-9 media will perform within all areas in the allowable environmental specification range. Once optimized, each Spectra LTO-9 cartridge is now ready to write data on initial load in a customer environment without any initialization time penalty.

Turbo-charge your Spectra libraries with LTO-9

Native and Compressed Capacity by LTO Generation

Library	LTO-6	LTO-7	LTO-7 Type M	LTO-8	LTO-9
Stack Single Module	200TB 500TB	480TB 1.2PB	720TB 1.8PB	960TB 2.4PB	1.44PB 3.6PB
Stack All 7 Modules	1.4PB 3.5PB	3.3PB 8.4PB	5.0PB 12.6PB	6.7PB 16.8PB	10.1PB 25.2PB
T380	950TB 2.4PB	2.3PB 5.7PB	3.42PB 8.55PB	4.5PB 11.4PB	6.8PB 17.1PB
T680	1.7PB 4.2PB	4PB 10PB	6.03PB 15.07PB	8PB 20PB	12PB 36.1PB
T950 (single frame)	2.5PB 6.3PB	5.5PB 13.8PB	8.28PB 20.7PB	11PB 27.6PB	16.5PB 41.4PB
TFinity ExaScale (3-frame)	4.5PB 11.25PB	10.8PB 27PB	16.2PB 40.5PB	21.6PB 54PB	32.46PB 81PB
TFinity ExaScale (45-frame)	133PB 334PB	320PB 801PB	481PB 1.2EB	641PB 1.6EB	1.0EB 2.5EB

Chart Above: Bolded numbers are native capacity and non-bolded numbers are compressed capacity

More Capacity = Less Space

An existing Spectra Stack library control module with LTO-8 media holds **960TB** of data and up to **2.4PB** if compression is enabled and data is compressible.



1.44PB
(LTO-9 native capacity)

That same Stack, when upgraded to LTO-9, holds 50% more data – **up to 3.6PB of compressed data!**

On the high end, a 45-frame TFinity® ExaScale Tape Library can now hold up to **2.53 EB** of data with compression.



LTO-9 Certified Tape Media

When you should buy LTO-9

When to add LTO-9 drives?

- Install LTO-9 drives as soon as your ISV passes Spectra's LTO-9 certification.

When to add LTO-9 media?

- Depending on media pricing and business requirements you can immediately start using LTO-9 and LTO-8 media.
- Depending on LTO-9 media pricing and whether your library is running out of physical space, you could start using LTO-8 media now and change to LTO-9 media when it reaches a lower cost per GB.

Contact Spectra to implement a customized migration plan:
sales@spectralogic.com



Options to consider when upgrading

Media purchase and usage:

- Purchase LTO-8 until the price per GB of LTO-9 media is less than the price per GB of LTO-8 media.
- Consider using costs savings achieved with increased capacity media (of LTO-8) to fund the purchase of new LTO-9 drives.

Do I need to MIGRATE? Maybe... maybe not...

Reasons WHY

1) Space constraints **2)** Out of drive slots **3)** Critical archival data on older media **4)** Always want to walk your data forward to keep it all current

Reasons WHY NOT

1) You want the lowest cost option - leave your existing drives and media as-is. Install LTO-9 drives in open drive slots and start using LTO-8 media moving forward.

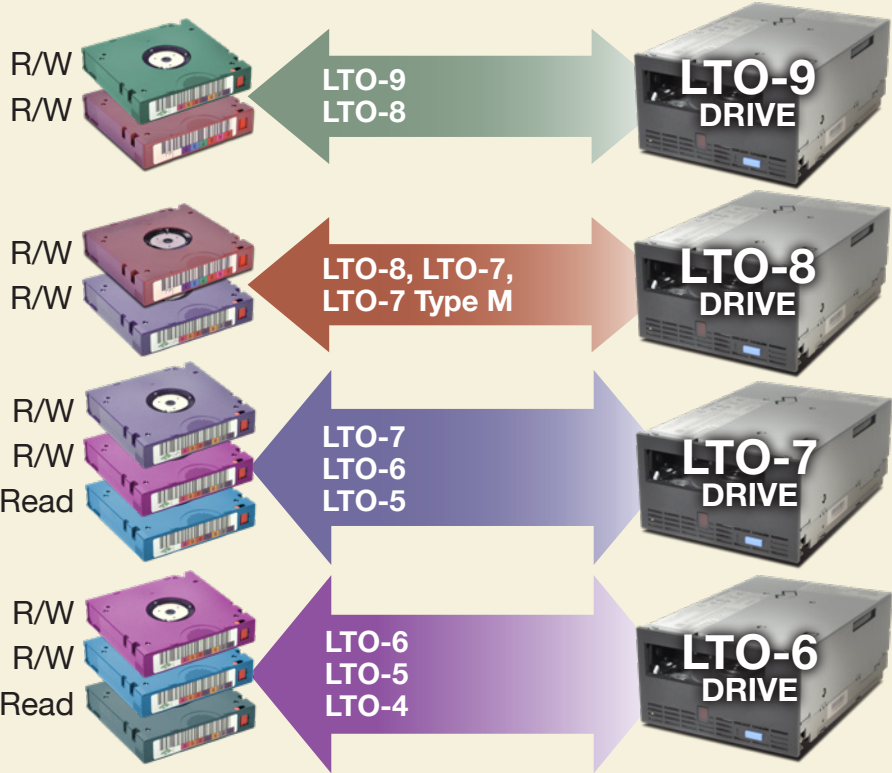
LTO Tape and Drive Compatibility



Media Cartridge Type		Drive Type and What it Can Read or Write To			
Cartridge Type	Cartridge Capacity	LTO-9	LTO-8	LTO-7	LTO-6
		FH/HH (MB/s)	FH/HH (MB/s)	FH/HH (MB/s)	FH/HH (MB/s)
LTO-9	18 TB	R/W (400 / 300)			
LTO-9 WORM	18 TB	R/W (400 / 300)			
LTO-8	12 TB	R/W (360 / 300)	R/W (360 / 300)	-	-
LTO-8 WORM	12 TB	R/W (360 / 300)	R/W (360 / 300)	-	-
LTO-7 Type M	9 TB		R/W (300 / 300)		
LTO-7	6 TB		R/W (300 / 300)	R/W (300 / 300)	-
LTO-7 WORM	6 TB		R/W (300 / 300)	R/W (300 / 300)	-
LTO-6	2.5 TB		-	R/W	R/W
LTO-6 WORM	2.5 TB		-	R/W	R/W
LTO-5	1.5 TB		-	Read only	R/W
LTO-5 WORM	1.5 TB		-	Read only	R/W

FH = Full-Height Drive HH = Half-Height Drive WORM = Write Once Read Many

Drive & Media Compatibility Snapshot



LTO-9 Certified Tape Media

Spectra Exclusive MigrationPass*

Spectra's MigrationPassSM Service:

An innovative way to preserve your drive and media investment



Spectra Stack Tape Library

MigrationPass takes advantage of one of the most scalable libraries with the most partitions on the market – Spectra Stack.

With up to 20 partitions available within a single library solution, Spectra Stack allows users to mix multiple generations of media, multiple applications and multiple use cases to create a flexible storage solution.

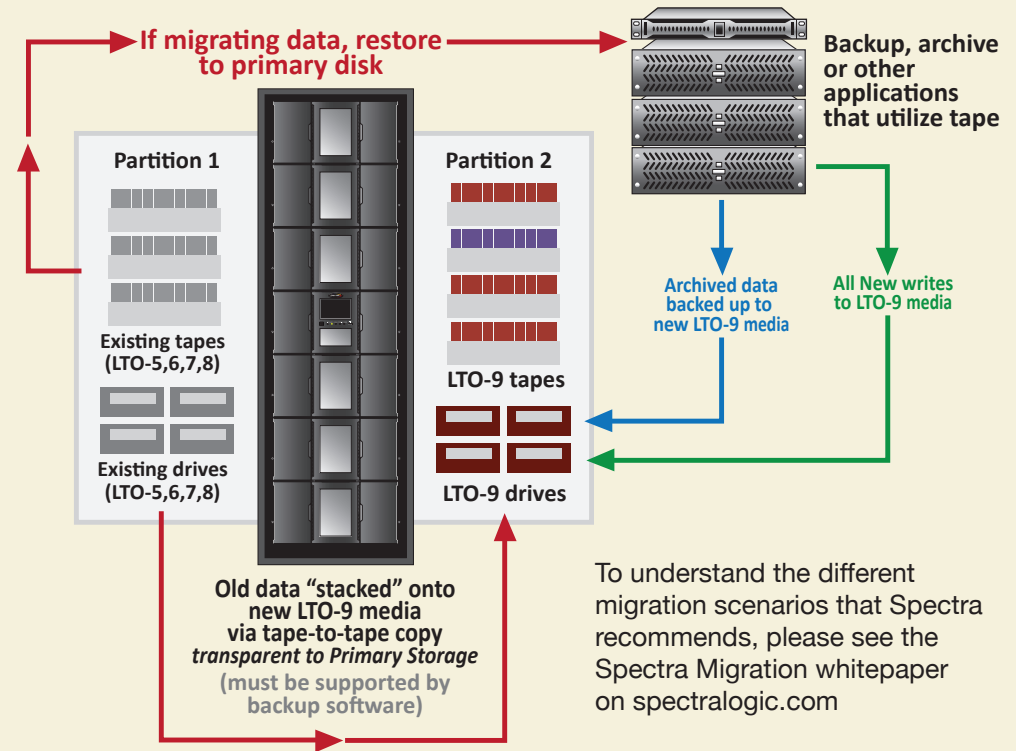
Spectra Logic's MigrationPass includes:

- Free SLS license to enable separate partitions
- Free two-hour migration consultation – Spectra Professional Services will remotely help you through the step-by-step hard migration process to make sure it goes smoothly
- Ability to use existing LTO drives (LTO-5 and newer) in a new Spectra Stack library
- Ability to use existing LTO media (LTO-3 and newer) in a new Spectra Stack library



* With a minimum LTO-9 drive and media purchase.

LTO-9 Spectra Migration Example



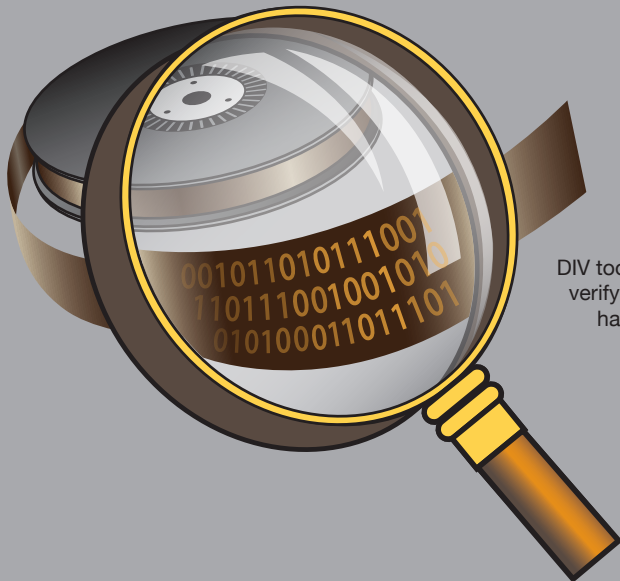
LTO-9 Certified Tape Media

Data Integrity Assurance

Verify that your data is there with DIV.

With **Spectra Certified Media**, you'll be confident that your data is there when you need it. Certified Media assures data integrity using an integrated, intelligent and comprehensive set of Data Integrity Verification (DIV) tools when integrated with Spectra tape libraries. PreScan verifies your tapes are safe prior to usage and QuickScan and FullScan verify your data has been properly written to tape.

Available in Spectra T50e, T120, T200, T380, T680, T950, T950v, and TFinity ExaScale Tape Libraries.

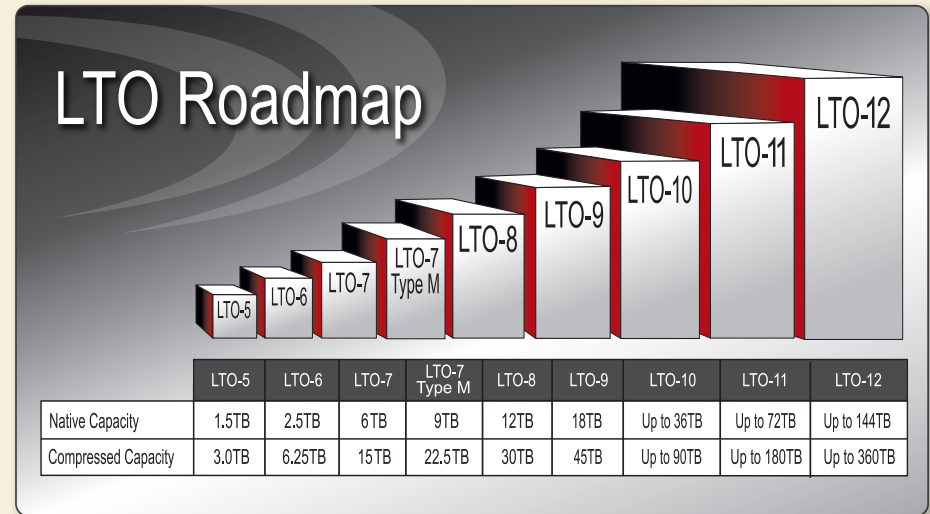


DIV tools scan a tape prior to usage to verify writability and confirm all data has been laid down error-free.

Spectra and LTO will stick with you...

... far, far into the future.

LTO (Linear Tape-Open) Ultrium Technology is optimized for high capacity and performance with exceptional reliability. Spectra's trust in this technology for backup, deep storage and archive applications is demonstrated in our long-term commitment to LTO's current and future advancements. LTO technology will meet the needs of the enterprise with a roadmap and migration path that extends far into the future.



Spectra Certified Media

Beyond LTO-9, Spectra offers IBM® Technology

Spectra also can provide enterprise tape technology in its libraries...

IBM® TS1160 Tape Technology

IBM® TS is still an excellent option for demanding, high performance applications

- Industry's most reliable
- Refined and tested electronics
- 20TB native per tape and 50TB compressed
- 400 MB/s native transfer rate; 900 MB/s compressed

IBM® TS Provides:

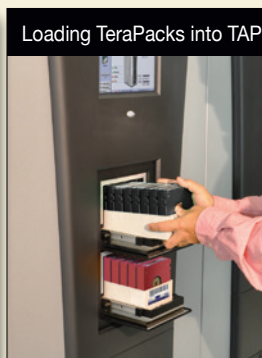
Investment protection that has the ability to reformat USED TS media and still gain additional capacity. TS can be written in LTFS – non-proprietary format to avoid vendor lock-in. It enables more efficient use of media – getting more out of your media through better ability to handle stopping and starting of writes. Enhanced ability to back-hitch and not lose space or capacity on each tape.



LTO or TS: Spectra TeraPacks

TeraPacks simplify media handling.

Your **Spectra Certified Media, LTO or IBM® TS**, arrives on your doorstep, with pre-applied barcode labels and bundled in TeraPack® containers, ready for bulk loading into your Spectra tape library. When it's time to export them from the library, the TeraPacks can be covered and protected as they are stored onsite or offsite.



For even greater efficiency, our TeraPack Access Port can load up to 10 tapes at a time and our bulk-load option allows you to import and export up to 140 tapes at once. Spectra also offers a myriad of choices for your tape requirements. No minimum order, custom or predefined barcode labels, and TeraPacks with and without dust covers.

Spectra Certified Media

All Certified Media is warrantied for life.

We've got you covered. **Spectra's Certified Media** Lifetime Guarantee warrants our tapes to be free from defects in materials and workmanship for the life of the media. We'll exchange any defective tape free of charge.



Measurable Cost Savings with LTO-9

- ✓ Lower risk of data loss (\$\$\$\$\$)
- ✓ Floor space savings (\$\$\$\$)
- ✓ Lower management costs (\$\$\$\$)
- ✓ Reduced staffing costs (\$\$\$\$)
- ✓ Reduced media failure downtime (\$\$\$)
- ✓ Faster problem resolution (\$\$\$)
- ✓ Fewer drive replacements (\$\$\$)
- ✓ Longer useful media lifespan (\$\$\$)
- ✓ More efficient tape operations (\$\$\$)
- ✓ Higher media capacity (\$\$\$)
- ✓ Zero staff time to label media (\$\$\$)
- ✓ Efficient bulk-tape loading/unloading (\$\$\$)
- ✓ Tape import and export efficiency (\$\$)
- ✓ Enhanced offsite tape processing (\$\$)
- ✓ Fewer drive failure related service calls (\$\$)
- ✓ Higher data transfer rate (\$\$)
- ✓ Greater staff efficiency (\$\$)
- ✓ Lower write error rates (\$\$)
- ✓ Fewer cleaning cartridges consumed (\$)
- ✓ No duplicate barcode labels (\$)
- ✓ Fewer media warranty claims (\$)
- ✓ Encryption moniker tracker (\$)
- ✓ Lower read error rates (\$)
- ✓ Easier ordering (\$)
- ✓ Easier storage (\$)

More than pays for itself.

Because **Spectra Certified Media** provides many significant time and management efficiency benefits, it lowers your tape-related operational expenses and allows your staff to focus on high-value tasks.



Certified Media Guarantee

Media Lifecycle Management Tracking Statistics

Only available with **Spectra Certified Media** and Spectra libraries, Media Lifecycle Management monitors, tracks and reports on all facets of tape usage and health status to reduce tape-related errors, eliminate unscheduled downtime and increase the reliability of your backup and archive operations.

- | | |
|------------------------------|---|
| 1. Media health | 22. Media efficiency |
| 2. Barcode | 23. Drive status (last four) |
| 3. Load count | 24. Last four load device s/n's |
| 4. Loaded | 25. Last four load device efficiency |
| 5. Born on date | 26. Media s/n |
| 6. Write protected | 27. Compression ratio |
| 7. Encryption and moniker | 28. Exported |
| 8. Encryption key expiration | 29. Export user |
| 9. Media type | 30. Export time |
| 10. Cleans remaining | 31. Current partition |
| 11. First write partition | 32. Manufacturer |
| 12. First write library | 33. Manufacturer data |
| 13. Last write partition | 34. Tape generation |
| 14. Last write library | 35. Number of cleans |
| 15. Remaining capacity | 36. Date of first CarbideClean® |
| 16. Maximum capacity | 37. Drive s/n of first CarbideClean |
| 17. Soft write errors | 38. Temperature of first CarbideClean |
| 18. Soft read errors | 39. Humidity of first CarbideClean |
| 19. Remaining MAM capacity | 40. Date of most recent CarbideClean |
| 20. Current drive display | 41. Drive s/n of most recent CarbideClean |
| 21. Drive efficiency | |



spectralogic.com/spectra-tape-media

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