

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



Featuring drive and media information
for LTO (Linear Tape Open), and TS
enterprise jaguar media

SPECTRA

Spectra Certified Media starts with...

...using only the best media

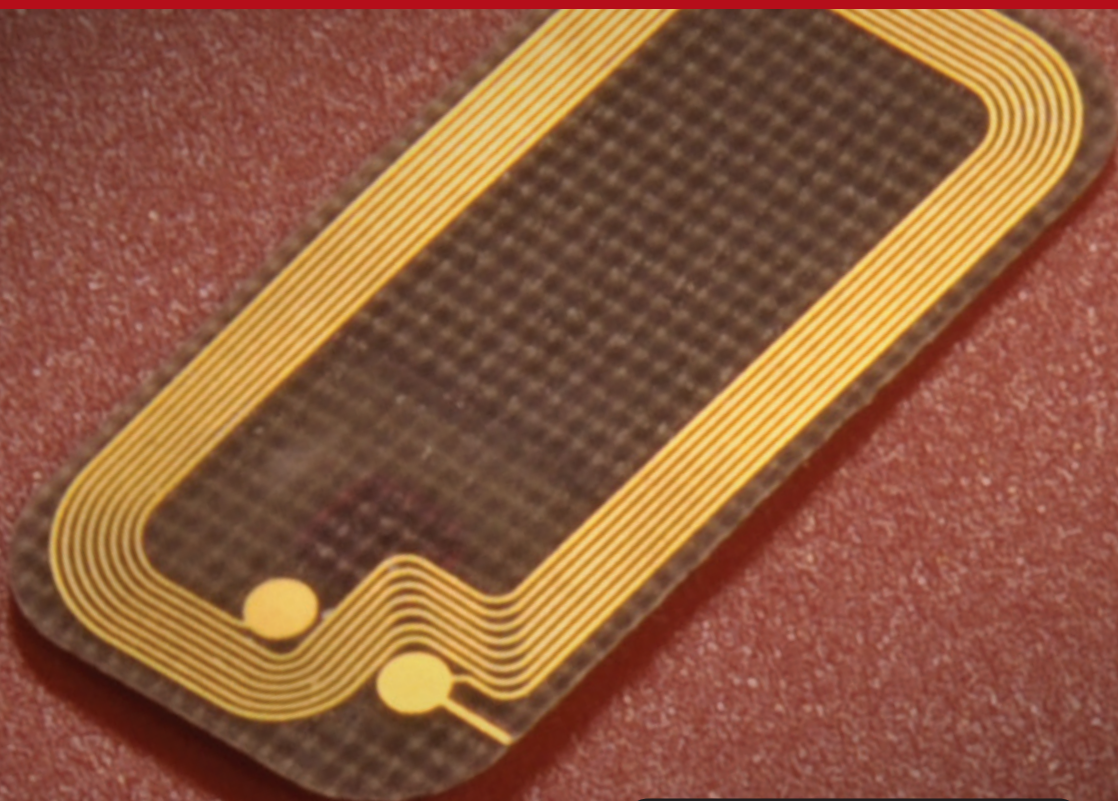
Media quality is at the core of efficient, pain-free backup and archive. All manufactured tape is not the same, leaving your data to chance with suspect media. Only the highest quality media available on the market becomes **Spectra Certified Media**. This ensures you have the most reliable and worry-free data protection possible with all LTO and TS media.

LTO-9 media from the factory now **requires pre-calibration** before use, which can take up to an hour per tape. Spectra does it for you as part of our Certified Media process for any LTO-9 tape so you don't have to.



Certified Tape Media Features

Media Lifecycle Management is at the heart of...



Spectra programmed chip stored in each LTO and TS 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**, for LTO and TS 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 LTO and TS tape inventory through simple monitoring of over 40 health statistics and automatically identifies at-risk tapes ready for retirement.

Spectra Certified Cleaning Media is also tracked providing users with the number of clean cycles used, as well as the number of cleaning cycles remaining.

Poor Health



Average Health



Good Health



Media Lifecycle Management Report

Partition: LTO5 >> 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

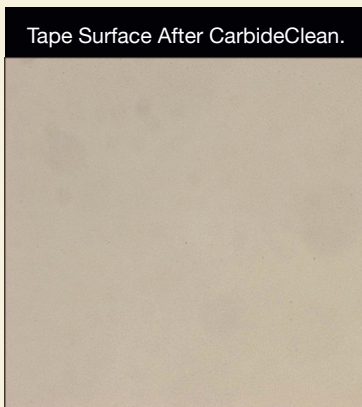
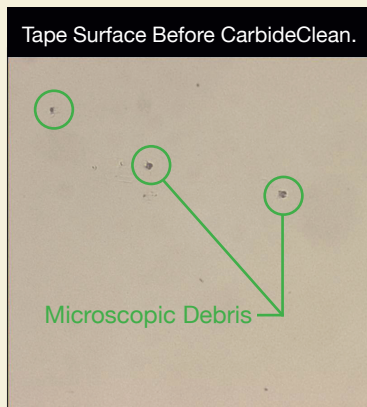
MLM stoplight icons serve as easy visual diagnostics, recommending action based on the health status of a tape.

Certified Tape Media Features

Spectra's CarbideClean® performance boost...

CarbideClean® extends tape life

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

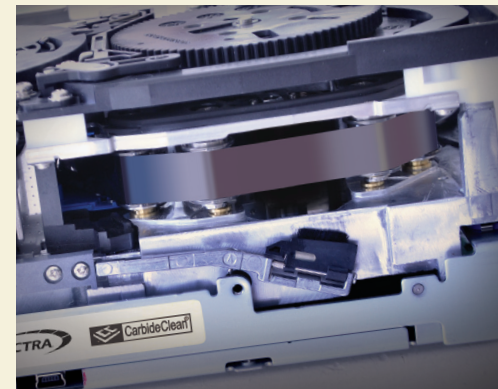
is unique to Spectra Certified Media

Every tape verified at Spectra

After Spectra completes the CarbideClean process there is a full write/read verify pass down the entire length of the tape. During the verification pass there are multiple metrics that are collected that ensures the tape meets Spectra's standard for certified media. This also guarantees that there are no areas on the tape that have higher retries or error rates.

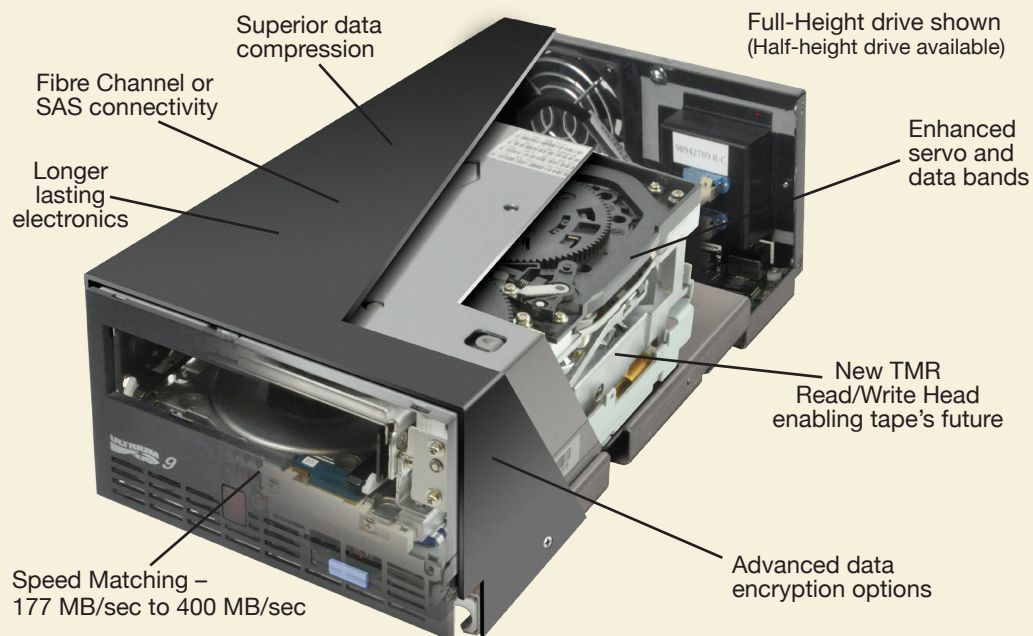
No other media is verified prior to being put into production meaning that when the tape is first loaded into your drive, it is the first time the tape is ever moved across a tape drive head.

Spectra's process reduces the average rewrite rate of the tape drive, improving the overall write performance of a system and reducing wear on your tape drives.



Certified Tape Media Features

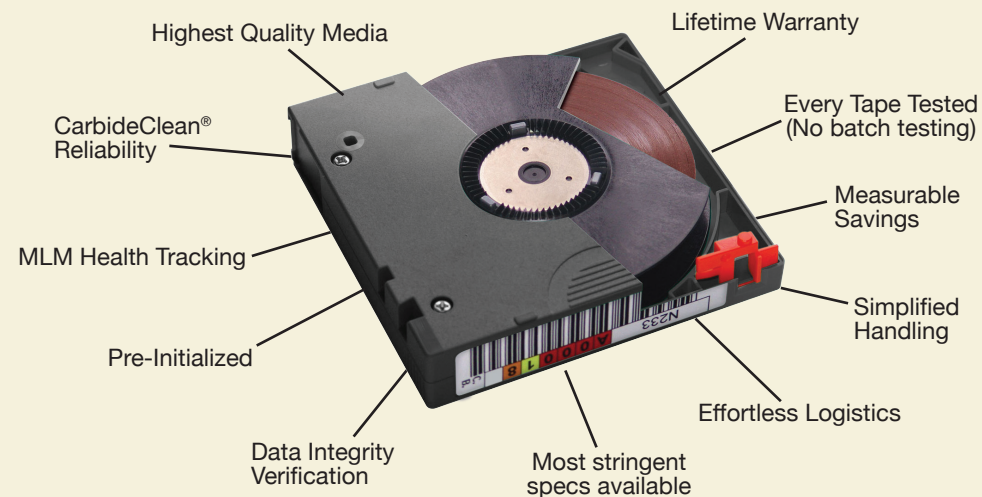
LTO and TS Drive Technology



State-of-the-art Tape Drive Technology

Spectra Logic LTO and TS tape storage solutions are designed for dependability and cost efficiency. Both drives are powerful, scalable and utilize an adaptable tape format that helps address the exponential data growth and storage challenges facing organizations today.

Coupled with LTO and TS Certified Media



Spectra Certified media is vastly superior.

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

Certified Tape Media Features

What's Different with TS1170?

- Capacity 2.5 times more than TS1160 – 20TB to 50TB
- Performance maintained – stays at 400MB/sec native data transfer rate
- Reliability maintained – corrected bit error rate of 1.0×10^{-21}
- No Backward Read/Write compatibility only used with JF media
- New Strontium Ferrite media

Why the change?

- **Getting the highest capacity possible**
 - Delivers greater density in the same footprint compared to other generations
 - 150% increase in capacity over JE media
 - Continued reliability from enterprise drive technology

The Future of Storage - Available Now

TS1160 versus the New TS1170 Drive		
TS1160		TS1170
20 TB Native 50 TB Compressed	150% increase in capacity	50 TB Native 125 TB Compressed
400 MB/s Native 900 MB/s Compressed	Same high speed performance	400 MB/s Native 900 MB/s Compressed
Bit Error Rate = 1.0×10^{-21}	Same high level of data integrity	Bit Error Rate = 1.0×10^{-21}
32 Data Track Channels	Same number of channels	32 Data Track Channels
2.5 to 1	Compression ratio	2.5 to 1
Reformat JC and JD R/W J4, J5, J6 formats	Backward compatible	Only compatible with JF media

Certified Tape Media Features

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 improved – corrected bit error rate of 1.0×10^{-20}
- Backward Read/Write compatibility to LTO-8
- Requires pre initialization of media prior to usage in library

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-14
 - 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}	Increased level of data integrity	Bit Error Rate = 1.0×10^{-20}
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

Certified Tape Media Features

New for LTO-9: Calibration is required

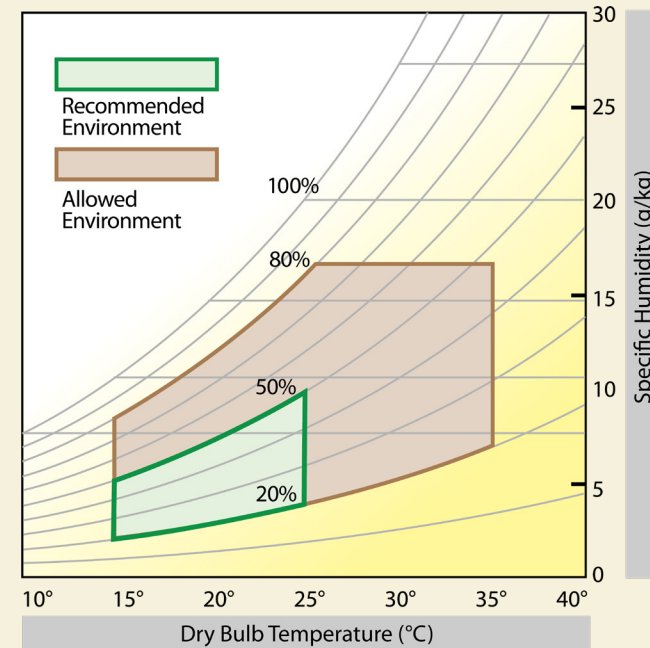
LTO-9 tape media requires optimization before use in a tape library.

LTO-9 requires a new calibration 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.

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.

Spectra Pre-Calibration Media



Spectra does it for you.

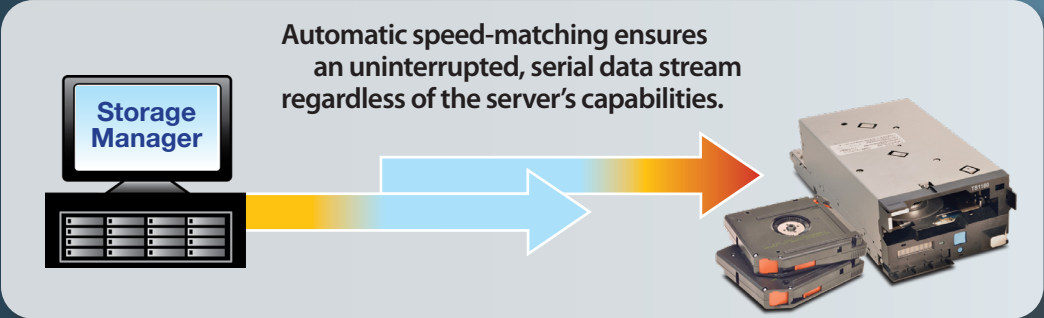
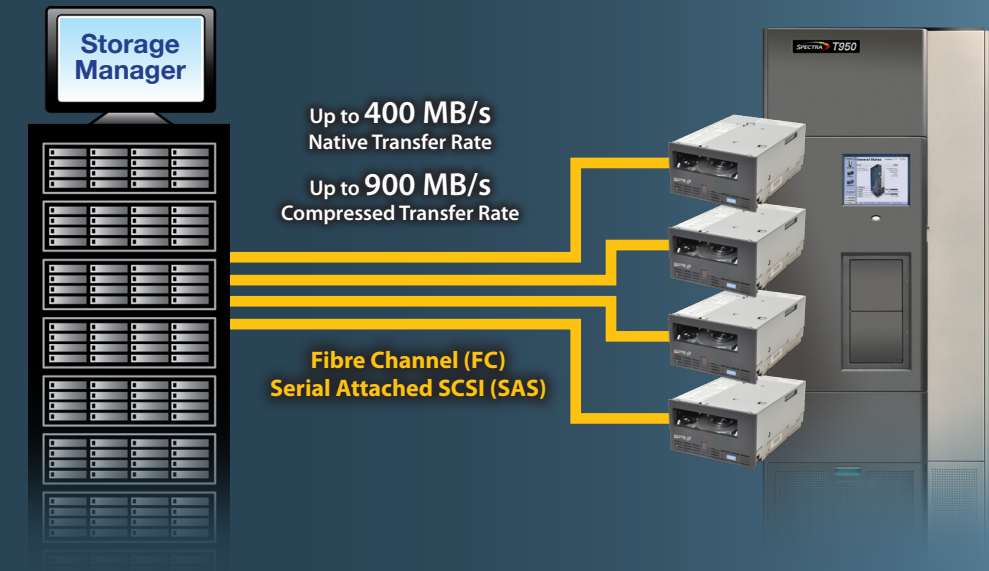
Pre-Calibration media can save time and money by having LTO-9 media ready to use upon arrival

Although the calibration of LTO-9 media occurs only once, it can be quite time consuming. The process typically takes between 20 and 40 minutes, but can take up to 2 hours. To enable customers to immediately use their LTO-9 cartridges, Spectra Logic provides LTO-9 Certified Media, which is pre-initialized during the certification process.

Spectra LTO-9 Certified Media can save hundreds or even thousands of hours of drive usage for customers. With Spectra LTO-9 Certified Media, customers can begin reading and writing data immediately instead of initializing new cartridges.

TS 1170 and LTO-9: Highest read/write speeds for tape

... and Reliability 1 - 2 - 3



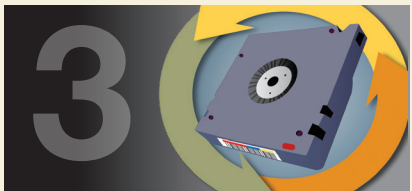
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Tape Medium	Hard Error Rate
LTO-8	1×10^{E19} bits
LTO-7	1×10^{E19} bits
TS1155	1×10^{E20} bits

Enterprise grade bit-error-rate
Currently tape has been designed and tested to show a 1.0×10^{-20} 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.

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 1.69EB	1.0EB 2.5EB

Chart Above: Bolded numbers are native capacity and non-bolded numbers are compressed capacity
Also applies to Spectra T50e, T120, and T200 automated tape libraries

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.



Certified Tape Media Features

Turbo-charge your Spectra libraries with TS1170

Library	TS1150	TS1155	TS1160	TS1170
T950 (single frame)	6.8PB 17.1PB	10.2PB 25.6PB	13.6PB 34.2PB	34.2PB 85.5PB
TFinity ExaScale (3-frame)	13.5PB 33.75PB	20.25PB 50.62PB	27PB 67.6PB	67.5PB 168.75PB
TFinity ExaScale (45-frame)	429.3PB 1.05EB	643.95PB 1.6EB	858.6PB 2.14EB	2.14EB 5.36EB

More Capacity = Less Space

An existing single frame T950 library with TS1160 media holds **13.6PB** of data and up to **34.2PB** if compression is enabled and data is compressible.



34.2PB

TS1170 native capacity

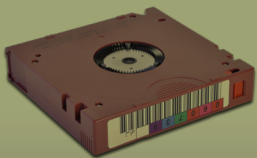
That same T950, when upgraded to TS1170, holds over 150% more data – **up to 85.5PB of compressed data!**

On the high end, a 45-frame TFinity® ExaScale Tape Library can now hold up to **5.36EB** of data with compression.



Certified Tape Media Features

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-8	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-6	2.5 TB		-	R/W	R/W
LTO-5	1.5 TB		-	Read only	R/W

FH = Full-Height Drive HH = Half-Height Drive

TS Compatibility and Reformatting



Media Cartridge Type	Drive Type and What it Can Read or Write To			
Cartridge Type	TS1150	TS1155	TS1160	TS1170
	Allowed Operation	Allowed Operation	Allowed Operation	Allowed Operation
3592 Type C (JC)	Read / Write	R/O (J4) - R/W (J5)	R/O (J4) - R/W (J5)	-
3592 Type D (JD)	Read / Write	Read / Write	Read / Write	-
3592 Type E (JE)	-	-	Read / Write	-
9352 Type F (JF)	-	-	-	Read / Write

Cartridge Type	Reformatted Capacity in Newer Generation Drives			
	Drive Type with Max Capacity Format			
	TS1150	TS1155	TS1160	TS1170
3592 Type C (JC)	7 TB	7 TB	7TB	-
3592 Type D (JD)	10TB	15TB	15TB	-
3592 Type E (JE)	-	-	20TB	-
9352 Type F (JF)	-	-	-	50TB

Certified Tape Media Features

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.

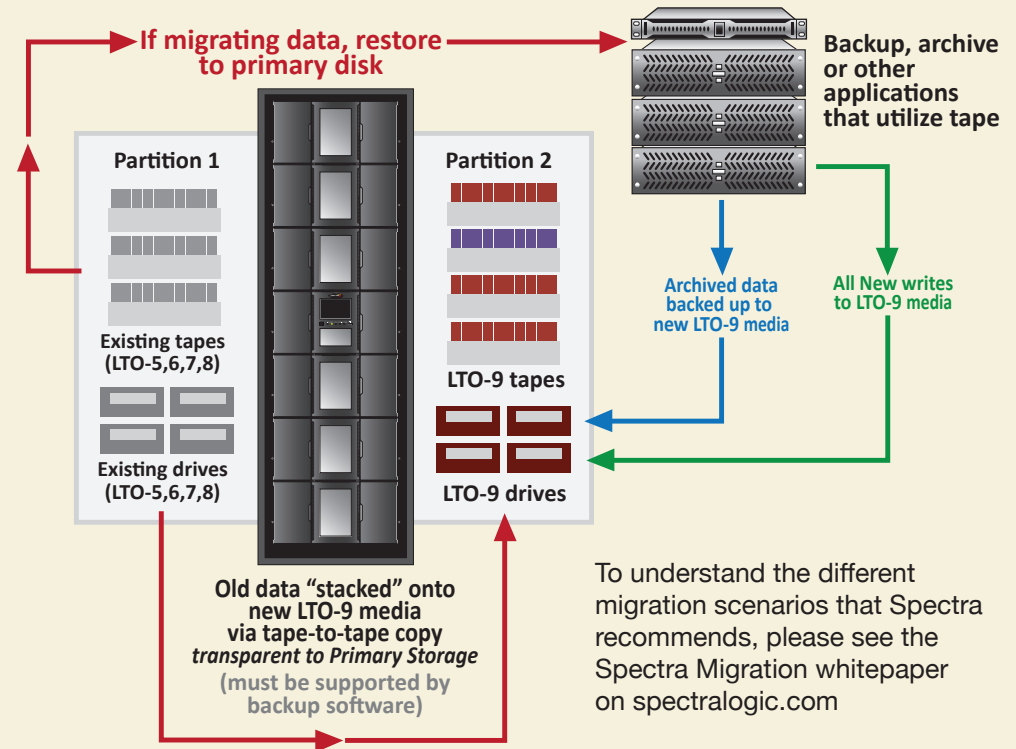
Spectra Logic's MigrationPass includes:

- 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

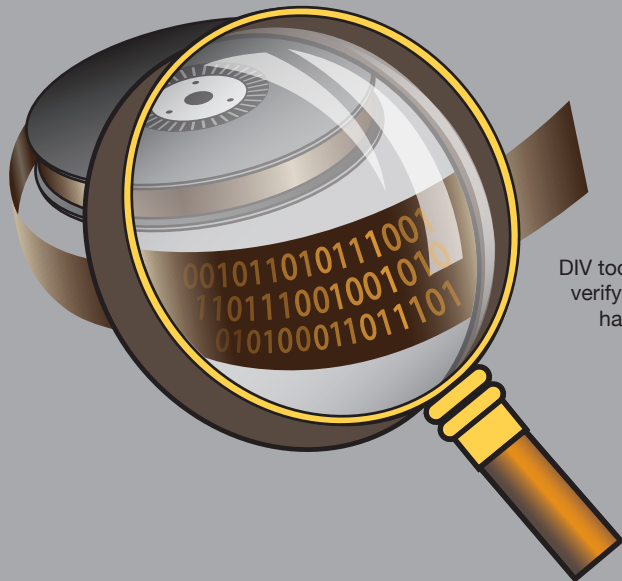


Certified Tape Media Features

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. LTO and TS 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.

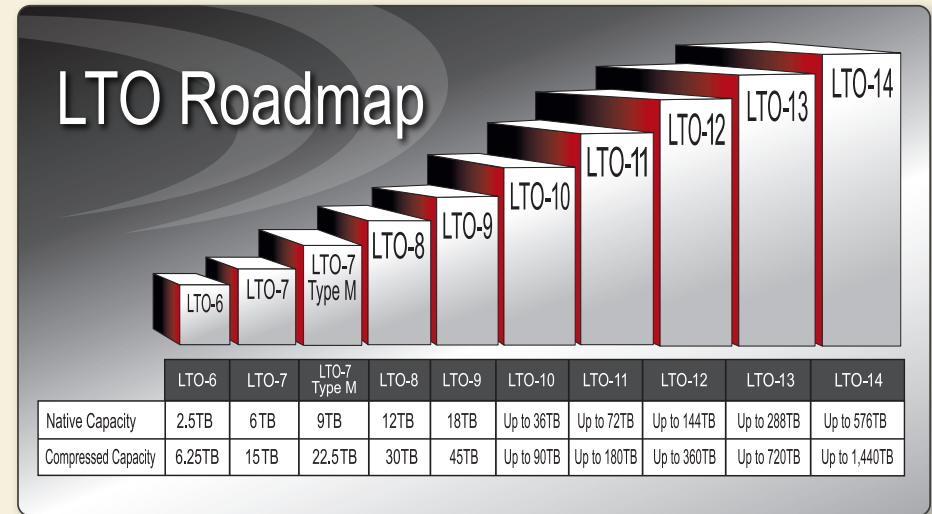


DIV tools scan a tape prior to usage to verify writability and confirm all data has been laid down error-free.

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® TS1170 Tape Technology with JF Media

IBM® TS1170 with JF media is still an excellent option for demanding, high performance applications

- Industry's most reliable
- Refined and tested electronics
- JF media delivers 50TB native per tape and 125TB compressed
- 400 MB/s native transfer rate; 900 MB/s compressed

IBM® TS Provides:

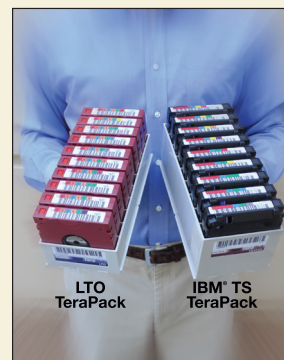
The highest capacity tape cartridge on the market today with an amazing 50TB per cartridge. TS can be written in LTFS – non-proprietary format to avoid vendor lock-in. It enables more efficient use of media – through better ability to handle stopping and starting of writes and back-hitch ability to not 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. LTO and TS types of **Spectra's Certified Media** have a Lifetime Guarantee ensures 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.



Cost Savings with Certified Media

- ✓ 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 | |



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