Storage tapes: Secure your data with Fujifilm's technical hotline.

What is the role a tape storage technical hotline ?

Fujifilm's technical hotline can ....

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...help you save money,

We have often noticed that a misdiagnosis or too much inaccuracy in diagnosing an incident during the backup and archiving process to tape, can generate additional interventions by the drive manufacturer or the service provider. It is essential to practice proper diagnosis before requesting intervention in order to prevent from possible overcharging by the supplier of the drive.

This type of phenomenon occurs for example when a cartridge is stuck in the library. We have also seen cases of overheating temperature in an autoloader that does not necessarily require external intervention (see page 12). Another example of intervention that was not necessary: a user who was under the impression that his tape cartridges were affected by dust, spent a fortune to verify their integrity , while we could have helped him avoid such an extra expense.

...provide you with regular info and updates about data storage on tape technology,

We deal with a large number of questions on storage tapes. Experience has taught us that a significant number of incidents are due to misunderstanding or lack of information: the conditions of conservation of the cartridge, the passage of the tape in the drive, the firmware's eventual upgrades etc ... are all much needed information that we send to our partners.

Working with our technical hotline also provides access to cases and success stories that other users have experienced: the anticipation of different events that can affect the process of backup and archiving is a decisive factor in the smooth functioning of your storage tape solution.

Why a hotline on tape storage?

...and help you secure your data,

Running data storage on tape technology is more cost effective and efficient than on Hard Disk. By cons, it is a complex process. However, it is not always easy to access to all information, tips and advice needed in order to practice safe backup and archiving on tapes. Two examples of questions we have had recently :

1- A large French bank recently met serious problems with some defective LTO5 tapes. After discussion, we realized that they had performed more than 257 complete cycles of recordings on the tape (257 full file passes). Although manufacturers claim a maximum number of full file pass of 300 can be performed with LTO5 tapes, we know from experience that one should not exceed 220 cycles. Moreover, regarding the new LTO6 tapes, we recommend no more than 160 full cycles.

2- Another case : we are being often inquired about which anti-fire protection is the most secure as far as it concerns data security. We recommend the use of specific gas such as the Novec 1230 (Keytone). The first quality of such a Gas is that it allows the IT manager to stay in the room while launching fire protection system :it does not exclude the presence of oxygen. In other cases, one must evacuate the room as the extinguishing system will reduce the oxygen in the air in order to smother the fire. Also, any use of product-based powder (such as nebulizers that turns the liquid into a cloud of fine particles) is dangerous because the powder can end up on the tapes, especially when they are not stored in plastic box. Such a gas can also damage the drives.

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How does this hotline work ?

We can segment this service in two parts :

a. We perform ''healing'' interventions such as disaster recovery, data migration, data destruction in accordance with European laws or Enterprise tapes initializing etc...

b. We have a "preventive" support & Technical follow-up: the most common types of interventions reside in communicating information, either by phone or directly on site if needed, in order to give the right advice to users or resellers. They key idea of this hotline is that the diagnosis made by tapes experts is always complementary and sometime greater than the one provided by hardware specialists in the sense that, unlike for hard disk, the main ''theater'' for security, performance and reliability in the archiving process is being transposed from the hardware to the tape cartridge after one or two years of using the tape storage system.

Can we analyze the tape even if the user does not want to send the cartridge ?

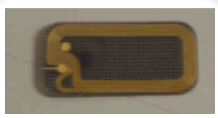
Yes, in the case the user is not willing to send the tape cartridge, we can still analyze the tape's use through the Chip Memory contained in the cartridge and that holds the memory of all interventions and backups performed on it:

Take the 4 screws out & After that please turn around the cartridge upside down.

Brake the welded part near to the shutter (please lift up the upper half)

Take off the upper shell

Once the analyze is achieved, we will send the chip back and the user can re-use the cartridge in a normal way.



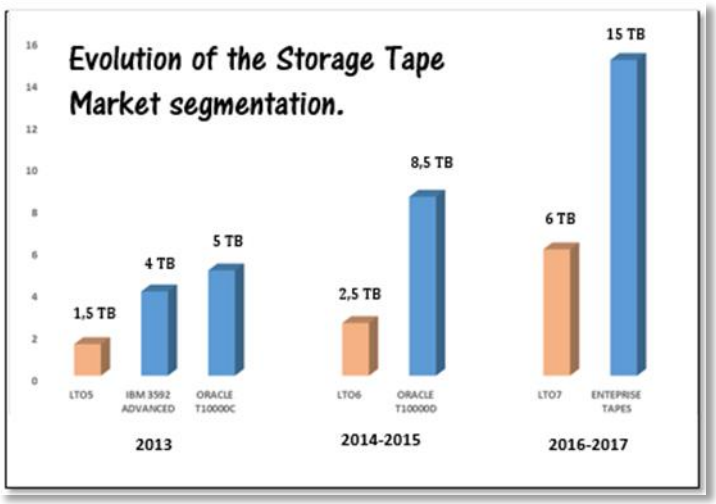
FUJIFILM

Where does the storage tape market stand ?

The new market segmentation,

What is new in tape technology ? Its new segmentation. Indeed, LTO, as the best known existing tape technology, is only the tip of the iceberg. LTO is an ideal tape for minor needs in terms of capacity. When the user requires larger storage capacity, Enterprise tapes comes as the obvious solution.

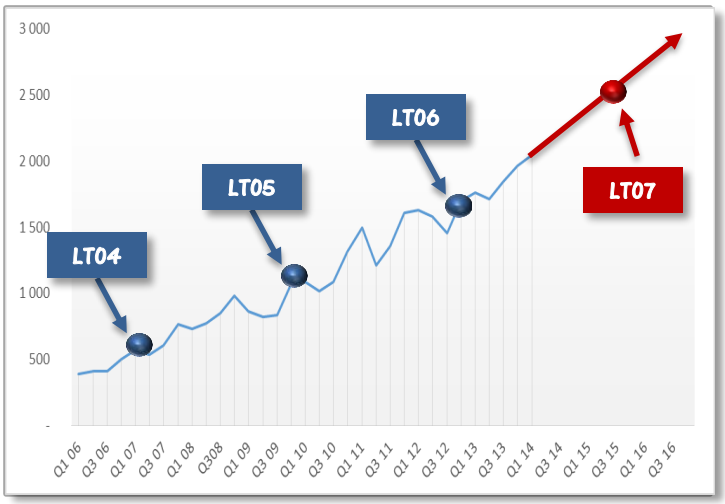
While LTO technology offers a maximum native capacity of 2.5TB, Oracle's T2 tapes, used in T10000D drives, provide with 8.5TB capacity. Users such as the scientific environment, banks and insurance companies, Media and entertainment, government agencies, hospitals and universities, are, for instance, types of users who are fond of such tapes.



A new IBM drive offering 10TB capacity for the end of the year!

The next tape drive to be launched in Europe is the new IBM 3592, named ''JD'', which will set a new record in terms of capacity since there is a good chance that it will reach the record level of 10TB capacity. Another record that will be broken in tape technology is the transfer rate: for the first time, a tape drive will offer a transfer rate greater than 300MB/s.

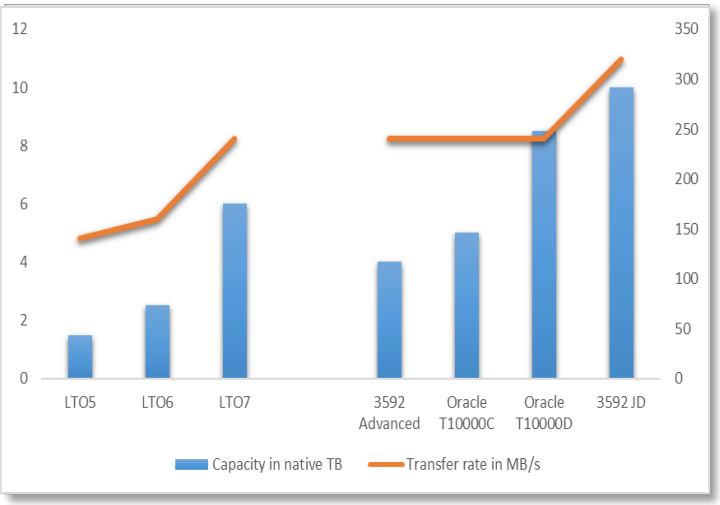
The launch of this new drive is planned for end of 2014.



What about 2016 ?

We know that the future developments in the area of storage tapes are already underway, starting with the future LTO7. Capacity, initially scheduled around 6TB seems to be confirmed and transfer rate will be above 200MB/s. Launch date : probably in Q4 2015, since LTO6 drive/tape is still in the growing process. The question about LTO7 being : how many tape manufacturers will be able to produce 6TB native on a single tape cartridge, knowing that, for the moment, only Fujifilm's Barium Ferrite can achieve such a performance.

As for Enterprise tapes, we know that Oracle's migration path has planned a T10000E drive, which was initially supposed to reach 15TB capacity. The information has yet to be confirmed. To be followed....



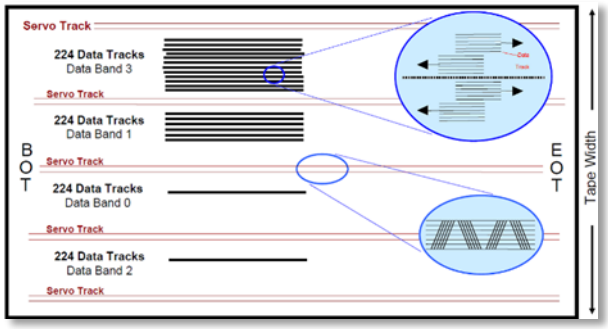
Tape surface vs head / firmware vs tape's capacity

The right information at the right time may resolve critical questions about a tape storage system's performance.

1st case - quality of the read/write head and quality of the tape surface:

A company was accustomed to using Fujifilm branded LTO3 tapes on an HP LTO3 drive. They went on with such a system for several years, without meeting any problem. However, the last delivery of Fujifilm LTO3 tapes does not pass: it is impossible for the drive to recognize the tapes. The user can still read and write his old LTO3 tapes, though. You should know, indeed, that the LTO3 drive being an old drive, there is a strong chance that the drive head is facing a slight erosion in quality. ''Older'' tapes come with a slightly softer surface while ''new'' tapes, that had just been delivered, have a rougher one, and might therefore become incompatible with the head of an aging drive. The user must, therefore, call the supplier of the drive in order to perform the head maintenance and get everything back to normal. If the maintenance contract is no longer valid, there are still independent maintainers who can practice this type of intervention.

This problem can have several causes: the confusion between measurement systems of the decimal capacity (typically used for recording media, hard drives etc ...) and binary (used by hardware and software), the wrong backup software settings in terms of size of data blocks or the activation of the reduction of the capacity of the tape with it .... in this case, we identified a misinterpretation of LPOS (Longitunal Position) by the drive. This phenomenon could be corrected by updating the firmware.



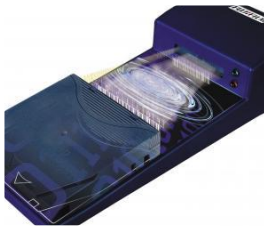
The LPOS indicate the position of the data on a tape. They are included on the servo track and give the information that the drive needs in order to judge the correct calibration of the tape in the drive. There are several LPOS points that define different stages of the read/write process. Few examples as follows :

1. LP2 indicates the start point of the tape calibration.
2. LP3 indicates the position from which the data starts to be recorded.
3. LP7 indicates the end of the tape.

2nd case - impact of firmware on the real write capacity of the tape:

Following the integration of LTO6 drives in his library, a user could not reach full capacity of the LTO5 tapes he continued to use in his new drive. He could reach 1.3TB written data instead of the 1.5TB native data specified by the Consortium (as a reminder, an LTO5 tape can be used in an LTO6 drive. Native capacity of this LTO5 tape cartridge remains 1.5TB no matter what is the drive it is being used with).

HP LTO STAND ALONE DRIVE



FUJIFILM DC-ANALYZER

Abnormal temperatures and power failure consequences

3rd Case: a user noted an abnormal temperature in the Autoloader during its use.

If you feel there's overheating or overheating, it is not normal. It exists within libraries or Autoloader system fan is supposed to refresh the internal temperature Hard (see photos against):
This fan is managed by the library. So if there's overheating it, a warning message is automatically sent to the user.
If this message does not happen, a likely path would be: it happens that users stick library against the wall and block the rear exit of hot air generated in the Hard. In this case, it is normal that the temperature rises / check then.

Fan's hot air rear exit

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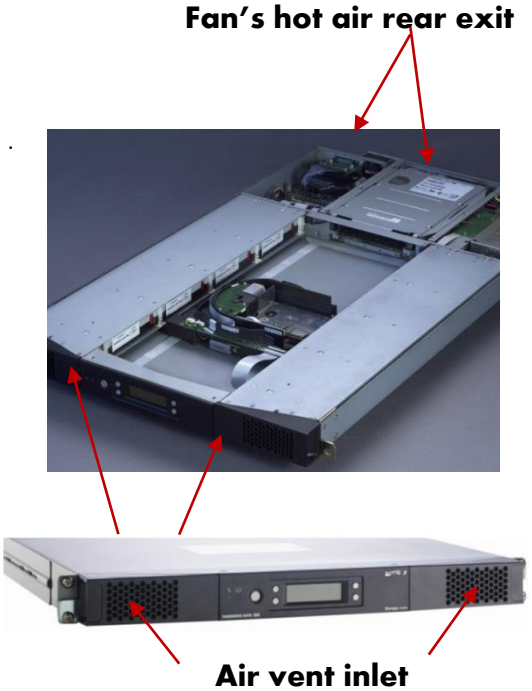


Air vent inlet

4thCase: a power failure raised the IT room's temperature above normal operating and storage conditions.

A user in scientific area has undergone a power failure, causing an interruption of the cooling system of the IT room. Concretely the temperature of the data storage room had increased up to 60 °C for an estimated of 48h.

Hundreds of LTO3 cartridges, that were being stored in this room, have, been exposed to such a temperature, which may cause serious and permanent damage to the tapes, given the standard environmental conditions recommended for the use and storage tapes are below what experienced through this accident .

Indeed, when it comes to short-term exposure, namely what we recommend for the transportation of such cartridges (2 to 3 days), tape cartridges may experience a little more extreme conditions than during the standard storage and archiving process.

It can as well occur the cartridges experience these extreme conditions without any damage, that is to say: a temperature ranging from - 23 °C to 49 °C, relative humidity 5% to 80% and a maximum wet bulb temperature of 26 ° C . Wet bulb temperature or WBGT is measured with a Psychrometer. This measuring instrument is used to find the energy characteristics of the moist air, there must not be any condensation inside or even on the cartridge (for instance, the air pressure is higher in an environment with air conditioning, which also increases condensation).

A temperature exceeding 52 ° C can cause permanent damage to the LTO3 cartridges for the following reasons:
a-If the temperature is too high, the tape may loosen from the coil, letting air flow between the layers of tape and, consequently, slightly change the positioning of the tape on the coil. The consequence would be in eventual contacts between the edges of the tapes and the wall of the coil.
b-Also, during the cooling process of the tape (temperature of the cartridge decreasing back to normal), the tape can harden and shrink.
In such case, it can definitely disturb the launching process of the tape into the drive.

In both cases, the lifespan of the cartridge will be reduced due to the deformation of the tape.
Therefore, if the temperature reaches 60 ° C or more, it is likely that the cartridges have suffered damage that could affect their data integrity, their functioning system or even their long-term archiving capabilities.
It is possible to check the integrity of the cartridges by measuring the error rate during backup : you would need to check the number of attempts to read or write on the same mounts (or use) and if the number exceeds a dozen attempts, the cartridge is damaged.

LTFS

5th case – Using a Backup software together with LTFS system

A company using Quantum LTO 6 drive started archiving video files with using the Retrospect backup software. After saving the data on few tapes, they decided to waive the software and use the open LTFS (Linear Tape File System). However, the IT staff could not use the "drag and drop" function of LTFS system for the files they had previously saved with the Retrospect software. Retrospect software is a proprietary format. We have therefore advised him to,

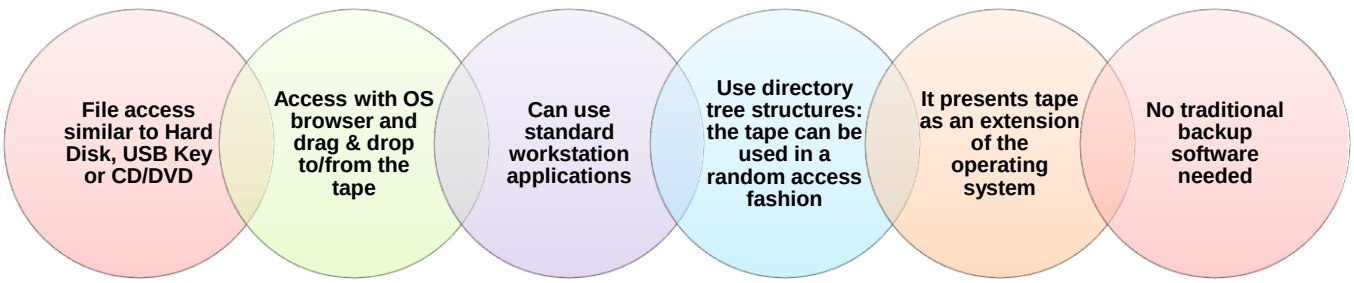
1. firstly, restore the files on the server,
2. fully empty the tape cartridge,
3. then reformat the cartridge into LTFS, which would only take few seconds and
4. resave the data on the newly formatted cartridge.

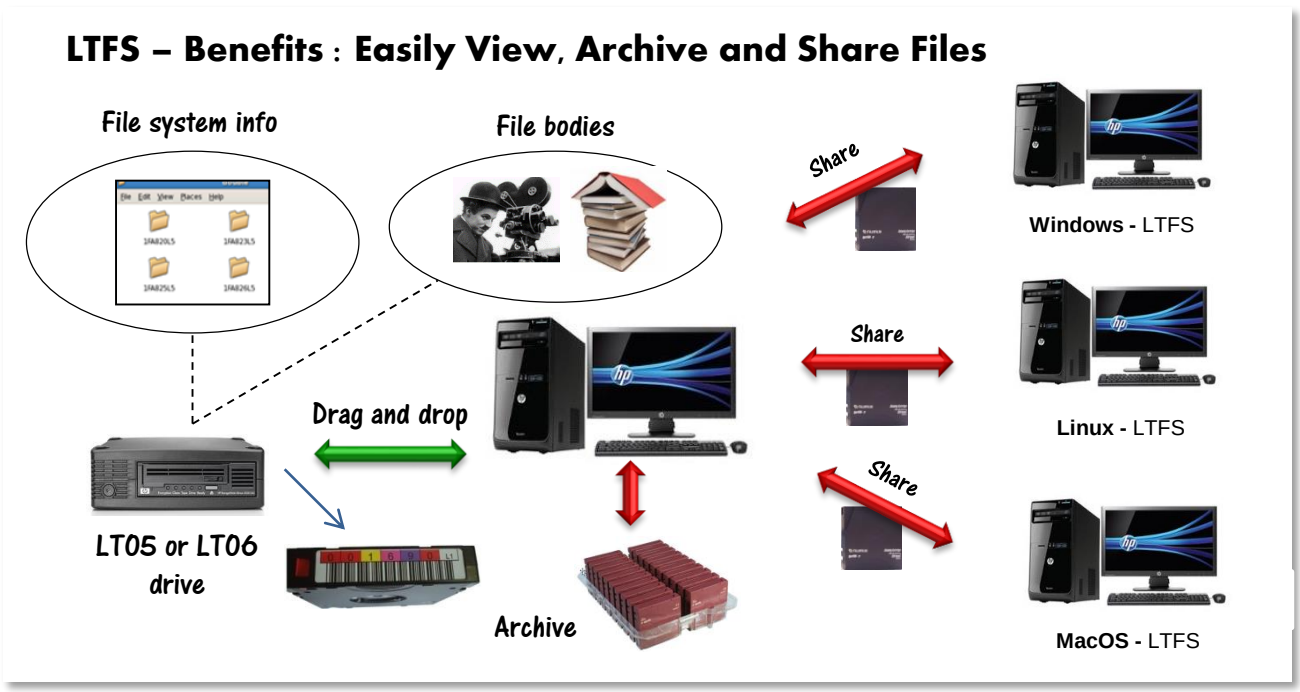
The LTFS system, available from the LTO5, consists in the partitioning of the tape throughout its length, the "partition 0 " being used for indexing files. The other partitions or the rest of room available on the tape being simply used for recording Data. Of course, one of the main features of LTFS is to offer quicker access to data since it is providing LTO tape technology, with comparable visibility on the data file organization, than with any other device such as HDD or USB key.

It also may be noted that the capacity allocated to the "0" partition, therefore, the index, is up to 37.5GB which is minimal compared to the total capacity of an LTO tape 6 2.5TB native.

By opting for LTFS, the user chose to go for a simple and friendly interface of with files being organized following a similar HDD tree and easy-to-use, thanks to the "drag and drop" feature, that allows the file on the server and upload it to the tape with a simple drag of the mouse causing a real gain of time.

6 fundamental informations about LTFS.





What Media for 4K video recording format ?

6th case - what Media can support the best, new video recording formats such as 4K.

A question that we often get . 4K is a high definition picture format: each image comes with 4096x2160 pixels size in the film industry. The 3840 x 2160 pixels resolution was adopted in October 2012 by the CEA (Consumer Electronics Association) for consumer televisions. It also happens this format is being called 4K UHD or HD. In the meantime, the 2K format, still largely used for broadcasting, comes with 2048x1080 pixels images.
If TV channels are not yet fully broadcasting their entire programs in 4K, a majority of movie filming, allowing high resolution are already being using such high resolution format. 4K can indeed help reaching a quality pretty much close to Argentique. We can also notice a growing use of 4K for shooting movie for TV. Not only do they prepare for the future (for instance NHK in Japan is already Broadcasting on 4K), but also because shooting with 4K and, then, converting to 2K images for Broadcasting provides better image quality and accuracy in the details than directly shooting with 2K.

If we consider that a movie contains 24 images per second and that 4096 pixels "weigh" 4 Kibioctets in decimal unit of measurement, (4 bytes x1024 in binary measure unit), a 10mm movie in 4K corresponds more or less to 120GB native capacity. The question of which storage solution to chose for such movies arises, especially in terms of capacity, since the maximum capacity of Compact Flash cards, or the SxS card is 128GB so far. We, therefore, can not record more than 10 minutes of 4K uncompressed images on such memory cards. This is probably why such technologies are declining gradually in favor of SSD. SSD can offer 512GB, which is about 40 minutes of shooting in 4K.

The constantly increasing file sizes necessary induct we have to rethink the monitoring of workflow in terms of media and connectivity. Thus, some camera manufacturers are offering new recording speed at 450MB/sec, it is important not to hurt data flow with using a storage tool that offers lower speed than the Camera's: SSD , with a transfer rate up to 550MB/s is, there again, the ideal solution for high speed usage. The absolute best would be to add a Thunderbolt connection, that allows a maximum throughput of 10 GB/sec. This would also facilitate data transfer, rather than USB connection that offers 60MB/s for USB 2.0 and 200 MB/s tested USB 3.0.

We also strongly recommend to transfer all contents from SSD to the server and re-use the SSD, as long as its TCO (Cost per GB) remains as expensive as it is today. Therefore, the traditional work can be performed as usual on the server : post-production, calibrating , editing etc ...

However, we also recommend, for security purpose, to archive critical data on LTO tapes :

1. movie rushes
2. the various stages of the post-production process
3. and, of, course, the final result.

According to an ESG study, the error rate met on LTO tapes is 100 times less on Hard Disk. It is, moreover, still 100 times less on Enterprise tape formats such as Oracle's T10K or IBM' 3592. On top this, we all know that Hard Disk usually does not exceed 3 - 4 years before it crashes ... while LTO6 Barium Ferrite's archive life goes beyond 30 years if storage conditions are being respected (storage and operating temperature conditions, number of full file passes, number of loading and unloading of the tape etc…)

ORACLE T10000D DRIVE

IBM 3592 ADVANCED TAPES

ENTREPRISE TAPES ARE THE IDEAL STORAGE SOLUTION FOR THE BROADCAST ENVIRONMENT.

- Enterprise tapes offer higher transfer rates and capacity than LTO tapes.
- Access to data is much easier and faster than for LTO technology (decisive factor for the Broadcast industry).
- TCO : the capacity proposed by such tapes is so much higher than LTO6 tapes, that from 2PB worth of archive, TCO can become lower than for LTO tapes.
- Would you need to have a presentation of Oracle's T10000D or IBM's 3592, please don't hesitate to contact us or refer to IBM or Oracle's internet sites :

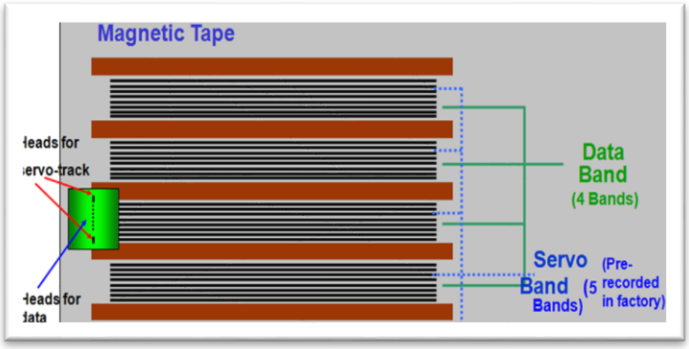
IBM : https://www.bluestoragemedia.com
Oracle : www.oracle.com/us/corporate/press/2008766

Cases of blockage of tapes in a library

7th case - what are the cases of blockage of one or many tape cartridges in a library

We find, in general, three types of cartridge cases of blockages in the LTO tape library.

a) Where a single cartridge is stuck in the library: if one cartridge is stuck in the library, it means that there is probably a damage on the tape cartridge from the beginning of the manufacturing process of this cartridge.
Generally, in such a case, it may be noted that the incident occurs after the use of 50% of the capacity of this tape.
Indeed, most of the physical damage to occur on a tape happens on the outer parts of the tape.
An LTO tape is segmented into four bands called'' Data Band''.
See below :



The writing process is done by the two data bands in the first medium, and continues thereafter on the outer portions of the tape. This outer part of the tape is substantially the fragile portion of the tape.
In short, when a cartridge is blocked for a reason related to his physical integrity, it generates a write error, which indicates the automatic shutdown of the writing process, since the system can not read the '' LPOS'' points. We call this a case of EOD3 (EOD = End Of Data).

In such a case, the user can perform a test to generate a definitive diagnosis on the issue: there is, in fact, a function known as'' Recycling'' that can restore the mechanism of reading the LPOS points of a tape. If the user initiates this process and that the tape still does not work, we can definitely conclude that there is substantial damage due to this tape.
We recommend, however, to send in emergency some of the tapes concerned by this accident, so that we can analyze the exact source of the blocking or the stopping of the writing process.
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b) When several tapes are blocked in the library - 1st type of incident : it is related to the tape library charger.
We noticed that sometimes the charger from the library encounters this phenomenon of blocking the cartridge.
Indeed, it may happen that the act of pushing on the spring, that is integrated in these chargers, can sharpen the edge of the mentioned spring. In this case, it is possible that the edge of the spring is so sharp that it enters the plastics material constituting the tape cartridge and, consequently blocks the cartridge by holding it.
In this case, the library manufacturer will just have to lightly grind the edge of the spring in order to make it smoother.
See photo below :
:

c) When several tapes are blocked in the library - other cases. We also see two other possibilities. We also see two other possibilities :
• If multiple tape cartridges have the same problem as mentioned in the first point, that is to say, an EOD3 type of problem, then there are chances that there is a mechanical malfunction on the tape pass (the belt that helps the tape crossing into the drive). This mechanical malfunction would damage the edges of most tapes passing through the drive.
• If this is an interface problem (software, transfer, speed, connectivity etc ...), then a message named EOD2 will be indicated, implying that the problem is not related to the cartridge but to the system.

IMPORTANT

In case of doubt on the real problem generated in the drive, we advise you to send us a copy or copies of the cartridge so that we can give you an accurate diagnosis. The worst thing is to trigger a technical intervention without really being able to define precisely the reason for the incident.

FAQ : degaussing / shoe-shining / low transfer rate

Can we degauss an LTO tape and use it again afterwards ?

Degaussing a tape means: delete all data, the formatting, and the track control information of a tape, in order to restore optimal theoretical conditions for reuse or destruction of the cartridge. The operation is to demagnetize the cartridge by passing the tape through a magnetic field, which removes all the magnetic patterns of the tape. This will consequently have the effect of eliminating the data recorded on the cartridge.

FUJIFILM's DEGAUSSER

What is the ''shoe-shining effect'' and does this may cause eventual damage to the tape drive or tape cartridge ?

If the data flow between the server and the drive (or PC and the Drive) is too slow or too weak, so if you regularly experience interruptions in the data stream, forcing the tape to be constantly repositioned on the drive heads, the system causes what is called a ''shoe-shining'' phenomenon. This accident is due to a slow system performance.
Indeed, in order to record a high quality signal on the tape, the recording head must move rather quickly on the tape. This is why tape drives have a minimum speed. If the stream of data sent by the server is too slow, the tape drive must constantly stop the writing process, wait, reposition and resume writing.

The end user who will have to invest on LTO5 drives or LTO6 offering transfer rates of 140MB/s for one and a 160MB/s for the other, must ensure that the end user is working with a server that is up-to-date with new technology demands , and which is adapted to the speed of data flow that is required by the drive. There is a rational relationship between TB capacity that a drive can provide and reasonable transfer rate to be achieved so that the data stream can be held consistently and reliably. We note, for example, cases of'' shoe-shining'' even on smaller scales of use: for example, end-users who have Autoloaders and might think that the so-said ''entry-level'' drive they're using would allow them to continue to use an old unsuitable server, run the risk of creating shoe-shining and , therefore, definitely hurt the physical mechanism of the drive.

What explanation can you give when the level of transfer rate indicated by the drive is no longer achieved operationally?

1. This may be due to the presence of debris or contaminants on the drive head, in which case the drive will automatically run a cleaning procedure of the head. (See also page 6 about cleaning cartridges).

2. The shoe-shining effect may be another explanation.

3. The SNR (Signal-to-Noise Ratio) can be a third explanation. The difference between the output signal and noise pollution defines the performance of the tape. We call this Signal to Noise Ratio (SNR). A high SNR contributes to high capacity storage and also higher reliability and stability. If any wear phenomenon hits a drive, and if the cartridges are stored on that same drive as the rate of SNR goes down, the signals recorded on the tape cartridge are stored at a very low level. When this cartridge is being read on a new drive, even if the technical specifications of the drive are optimal, the drive will significantly slow its transfer speed down, in order to ''take the time it takes'' to capture the playback signals from the tape in order to be able to restore the data properly.

FAQ : cases of data loss / 30 years of archive life

What are the most common cases of data loss we have noticed so far ?

1. Loss of data due to mechanical problems related to the drive and mainly during the passage of the tape : the orientation of the tape through the drive is a sensitive moment during the writing process. If the drive has suffered from any form of wear and if the maintenance has not been done properly or on time, the edges of the tape may come in contact with the belt (or sometimes wall) inside the drive : it can definitely cause data loss

2. The second case is related to physical accidents that can damage the media (such as dropping the tape cartridge). If the fall was severe enough, the tape may be damaged and no longer provide for its original function optimally.

3. The third case comes from any conditions of extreme conservation in terms of temperature: If the tape cartridge is maintained at too low temperature for too long, the tape will harden, shrink and the launching of the use of the cartridge can be difficult. If the storing temperature is too high, the tape may come loose from the reel , let an overflow of air between the layers of the tape and create a bad positioning of the tape inside the reel. The main consequence would be a contact between the edges of the tape and the reel flange. Also, any incidental contact during the manufacturing of the tape can generate a data loss , since this would be altering the physical integrity of the tape.

What is the archive life of an LTO tape ? Can we really reach 30 years of archive life ?

The archive life of an LTO tape is 30 years. The arrival of the new LTO6 has even changed the terms of this expression, since we can say that for older generations of LTO (up to the LTO5), one could say that the archive life was going up to 30 years. Regarding the new LTO6 Barium Ferrite, we can say that the archive life of this tape goes beyond 30 years.
But please bear in mind that in order to obtain this exceptional length of life, it is vital to properly define the core mission of LTO tapes and follow some basic conditions in order to properly preserve these tapes :

1. Number of full file passes on an LTO tape : on most LTO5 datasheets, it is stated that the number of full passes allowed is 300X. Full file pass equals to writing/reading the entire tape . However, we recommend not to exceed 230 full file asses,250 at worst : it is not in the nature of LTO tape to perform such an operation. Regarding the new LTO6, we strongly advise not to exceed 180 cycles. In addition, the number of full file passes of full use of the tape affects the lifetime of the storage tape cartridge: it is estimated that performing a complete file pass per week reduces the life of the cartridge down to six years, and that completing a full file pass per month reduces the life of the cartridge down to 25 years only.

2. Maximum number of loading and unloading of the cartridge into a drive or tape library: the maximum recommended number is 20 000 loading / unloading of the tape cartridge.

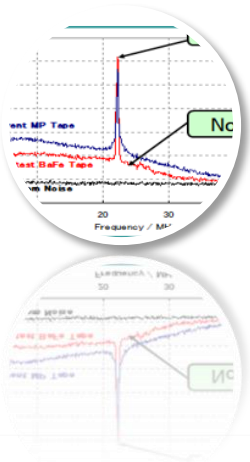
3. Environmental conditions of the tape cartridge: It is advisable to stay in decent ranges, ie, 10° to 45° C in temperature and 10% to 80% in terms of humidity.

4. Storage conditions of the tape cartridge: It is recommended in the case of the first five generations of tapes (LTO1 to LTO5) to comply with the following ranges: 10° to 32° C for temperature and 20% to 80% regarding humidity. In the case of LTO6, the conditions are somewhat more sensitive : 16° to 25° C temperature and 20% at 50% humidity.

In case of conservation of the tape cartridge under abnormal temperature conditions, you must leave an acclimatization time to the tape before use. Ex: if the cartridge was outside for 4h → wait 4h. A day out → wait half a day

FAQ : SNR / Cleaning cartridge

Is Fujifilm's Barium Ferrite SNR higher than MP's SNR ?

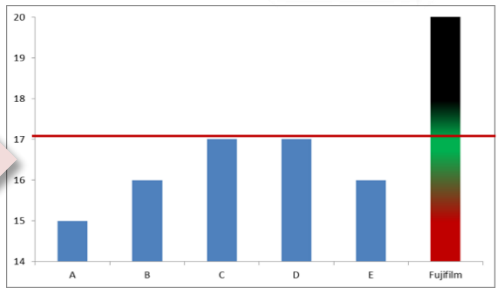


Yes, SNR is a fundamental criteria to test the different levels of performance offered by LTO tapes. The novelty in the manufacturing process of the tape is that, Fujifilm, although the world's leading manufacturer of LTO tapes with more than 50% of manufactured tapes, stands out from its competitors considering that, even though MP (Metal Particle) technology is good enough for manufacturing LTO5 tapes, it is not suited for the production of next-generations of LTO tapes.

The new technology developed for LTO6, which is, by the way, also the one used for the manufacturing of Enterprise tapes such as 3592 or T10 000, is called Barium Ferrite (BaFe).
Barium Ferrite offers higher levels of performance than MP in many extents :

- BaFe offers a higher areal density (the ability to store a lot of data on a given tape surface),
- BaFe offers a longer archive life (more intense magnetic field which compensates the wear of the head + MP cells oxidation , nonexistent in BaFe) ...

SNR, that is to say, the ability to generate strong and clear signal in order to run the writing process in optimal conditions is one more key factor : please find on right graph the results of tests we have performed about the levels of SNR of Fujifilm branded LTO6 tapes compared to several competing tapes (All figures in dB):



How frequently shall we use a cleaning cartridge ?

The cleaning process, in normal circumstances is being required from time to time by the system. There is no real frequency recommended. However, it may happen that the system requires a fast intervention of the cleaning cartridge.
For example, it may happen that the system notices a sudden transfer rate decrease and that this decrease is caused, as it often happens, by contamination of the drive head by small debris. If the drive manages to properly identify the problem, the cleaning will be automatically required. For example, a yellow screen that lights up on HP drives and the C letter for IBM drives. In general, the drive measures values and signals from the head . If these values change dramatically, the cleaning process will be automatically applied.

LTO CLEANING CARTRIDGE

Why could a cleaning cartridge be immediately ejected after being loaded into the drive ?

Just because the cartridge has exhausted the number of cleaning cycles or passages it can run. The universal Fujifilm cleaning cartridge allows up to 50 cleaning cycles. The words '' up to'' matter here, as all drives cannot reach this maximum number of cycles: for example, some older generations of drives or some specific drives can not reach the maximum number of 50 cleaning passes. A tip for those who use '' stand alone'' type of drives or Autoloaders : there is a label in the cartridge case and that you can stick on the cartridge in order to be able to mark on it for each time you have fully achieved a cleaning cycle. This can help you run a precise control of the number of passes available on the cleaning cartridge you are using.

FAQ : Worm / Encryption

What is a Worm LTO tape cartridge ?

A Worm LTO tape is a non-rewritable tape. The initials forming the name Worm summarize the identity of this tape : Write Once Read Many. This Worm system was particularly popular in the magneto-optical technology (for both 5.25'' and 12'' optical discs), offering even then the ablative or permanent Worm function, which proposed to alter definitely the surface of storage media to ensure a total inability to go back and find ways to re-write optical discs.

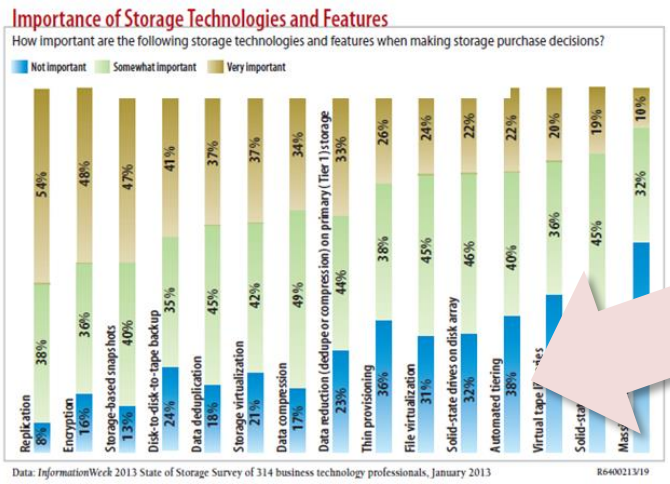
Regarding LTO tapes, some security applications, or internal regulations require Worm storage tapes. Although the demand for specific cartridges do not represent 1% of the total demand for LTO, they do exist and are sold with their own part numbers and descriptions.

IBM ABLATIVE WORM OPTICAL

A Worm tape cartridge, specially formatted, is therefore necessary, since the rewritable cartridges are incompatible with Worm function. Each WORM cartridge has a unique identification in the world named WWCID. This identifier consists of a chip called CM (Cartridge Memory) and a serial number for each cartridge . This CM chip is configured for a unique single writing on the tape.

What is Encryption and why is its important in the storage habits of the IT managers ?

Encryption is the conversion of data into a formula, or cryptogram, which access becomes virtually impossible for unauthorized individuals. The opposite phenomenon, named Decryption is to convert the data in their original forms.



Safety has become a major concern for a large number of end users. You can find on chart as follows the result of a survey conducted by InformationWeek with IT Managers from various countries. Amongst other questions in this survey, the following question came up : how important are the following storage technologies and features when making storage purchase decisions ? Encryption came up as second most important issue. Coming back to LTO : LTO4, LTO5 & LTO6 tapes allow Encryption of data. Please note that all tape drives do not support this feature. It is therefore necessary to check beforehand that this function does exist on your LTO tape drive. LTO4, LTO5 & LTO6 Worm tapes can also be encrypted, which makes sense given the nature of these tapes.

1. If you try to use an encrypted cartridge on a drive that does not have the encryption system, the drive can not recognize the cartridge: it will be ejected.

2. The encryption does not affect the performance of the drive: according to the LTO consortium, the impact of encryption on the drive performance should not exceed 1%.

3. An LTO6 tape drive can decrypt an LTO5 tape, when the drive has the capacity to handle the Encryption system. As against, an LTO4 tape drive cannot decrypt an LTO3 cartridge since LTO3 is not compatible with the Encryption process.

4. It is technically possible to encrypt ''just'' a limited number of files on a tape cartridge and leave the other files accessible to all users. In reality, since the encryption is a specific procedure which requires a specific intervention (informing the launch of the Encryption software etc ...), IT managers have grown accustomed to entirely ''encrypt'' a cartridge in order to avoid a laborious manipulation that could take too long.

Some technical interventions we can perform

What is the real, crucial advantage of choosing a FUJIFILM solution that is perfectly tailored to your company's needs and spans everything from data media to data service?

FUJIFILM, as a leading manufacturer, knows everything there is to know about data media. We know how they can be protected. We know how data can be recovered, repaired, secured, how it can be definitively deleted, archived and also how it can be prepared.

This not only gives your IT specialists peace of mind, but it also saves them considerable amounts of time, which they can use more efficiently. Please see as follows a special portfolio of services for back-up solutions that FUJIFILM can offer in tailor-made packages, via the FUJIFILM TECHNICAL SERVICE CENTER.

Data Recovery

Mechanical damage, humidity, smoke and other catastrophes both big and small can lead to a total loss of data.
If the worst happens, our highly-qualified FUJIFILM Service Team can help, with data recovery services. The recovered data is copied to new data media, so that it can once again be accessed without any problem.

Data Conversion

Secure archiving can often be a major problem, especially if the data is to be merged from various types of storage media, data structures and formats and transferred onto a new backup system. This is where our data conversion service comes in – the ideal way of avoiding precisely these problems. We read data, transfer it from one platform to another, convert it, structure it and process it so that it can ultimately be archived on a single plat- form. This means that our customers have ultra-fast access to all of their data at all times.

Labelling & Initializing

Time-consuming, laborious labelling and initializing is part of many highly-trained IT specialists' daily routine. But it isn't actually part of their job.
That's why FUJIFILM provides high-quality data cartridges and an appropriate labelling and initialization service, in accordance with the customer's wishes. The result is that the tape you need is ready when you want it to be, without any delay.

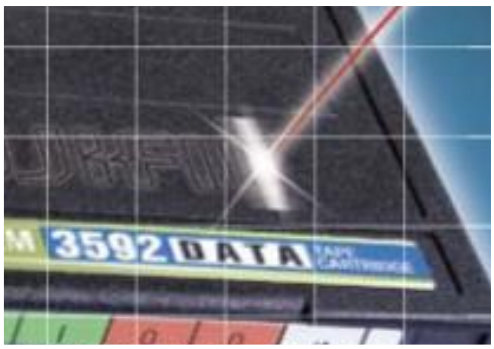
Some technical interventions we can perform (II)

Data Migration

The transfer of extensive volumes of data from older systems to new ones is a process that is experiencing increasing demand. These moves are sometimes necessary to safeguard compatibility or to harness the considerable advantages that a new system offers.
But these laborious transfers cost companies untold amounts of time, in many cases interrupt internal workflows and not least tie up staff who could be deployed more efficiently elsewhere.
All of these are problems that can be avoided with our data migration service.

Data Disposal

To ensure that all of the data that is relevant to your company has been irrevocably destroyed when data media are being disposed of, FUJIFILM will take care of the controlled and certified destruction of your data media.
The data media is ''unmounted'' and definitively destroyed, in accordance with the prevailing legal guidelines. For particularly critical data, this destruction process can also be carried out in close agreement with the customer.



Laser etching

There are many reasons why data media need to be identifiable. Labelled cartridges, for example, facilitate unique assignment and registration. FUJIFILM can label the cartridges using a laser with your name, company logo or sequential numbering. The maximum label size is 100 x 100 mm.
This information is thus burned permanently onto the media and cannot be removed. Alternatively, we also offer a service whereby the information can be printed onto the cartridges themselves.

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Our value-added proposition for LTO tapes

Distribution of data storage tapes.

Technical hotline support.

Technical interventions

8 good reasons to buy Fujifilm branded LTO tapes

1-Fujifilm is Worldwide N°1 manufacturer for LTO tapes.

More than 50% of LTO tapes sold worldwide come from Fujifilm factories. Fujifilm's share for the two latest generations of tapes (LTO5 & LTO6) is even higher and exceeds.

3- Fujifilm can already produce 154TB of native capacity on an LTO tape.

While the ability of MP technology (Metal Particle) used by most manufacturers of tape can not meet, in its current state, the future specifications of the future LTO7 tape, Barium Ferrite (BaFe), a Fujifilm exclusive tape coating technology, has established a record in partnership with IBM by bringing tape' storage capacity up to 154TB on a single tape cartridge!

4 - SNR (Signal-to-noise ratio) of Barium Ferrite is higher than competing technology's (see Page 11)

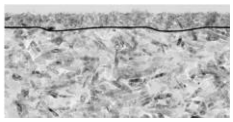
5 - The archive life of Fujifilm branded LTO6 tapes is longer than the one produced with MP (metal particle) technology.

Barium Ferrite is mainly an oxide compound, so it will not lose its magnetic properties during the oxidation phenomenon, which is specific to any use of tapes. MP is mainly composed of iron (Fe), so it will go through an oxidation stage after a certain time, which will deteriorate its magnetic properties. There is, therefore, a phenomenon of loss of data in time with the MP technology, through this oxidation process, that does not exist with Barium Ferrite technology.

6 – A great advantage of Barium Ferrite : its particles can increase the storage capacity of a tape and increase its magnetic properties in the same time.

You can observ on below pictures, the difference in size between BaFe and MP particles. You can also notice the better dispersion of the Barium Ferrite particles on the tape layer, differences that confer superior properties: the output power is increased. The performance of the tape is, thus, simply higher. (Also, we will have less disturbance between opposing magnetic forces, less amplitude, so less noise : all this also means less likely to generate a self-erase process).

LTO5 with MP

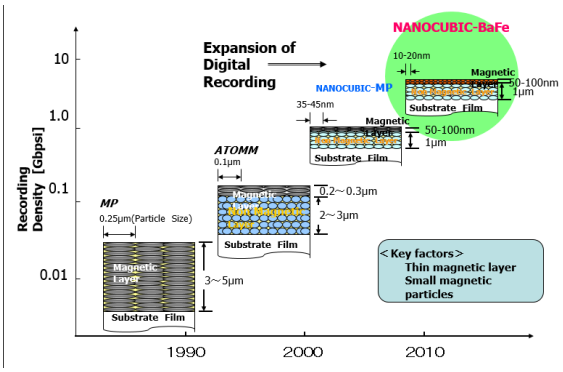


LTO6 with BaFe

Smoother surface

2 - Fujifilm is the only manufacturer to develop new tape coating technologies in the data storage field.

After ATOMM technology used for the first generation of LTO tapes , NANOCUBIC technology that contributed to the success of LTO4 and LTO5 tapes, Fujifilm have launched a revolutionary new technology, Barium Ferrite, used for manufacturing LTO6 tapes. See on graph as below :



7 - There are critical points of reliability on an LTO tape cartridge :

On that matter, FUJIFILM owns a number of licenses and rights related to the development of technologies related to the cartridge. This patterns are a logical result of researches in finding new improvements in order to ensure optimum safety in the use of a tape cartridge : Strengthened Reel with High Precision Mechanical Parts, tapered Reel Flange , precision of Tape Reel Rotation, unique Flange for Air Flow Control, unique Leader-Pin Holder, welded cartridges, simple Door Spring, just to name a few …as much details that could be taken as secondary but which are vital in the use of tape technology. See below the simple door spring.

The FUJIFILM door spring allows the cartridge to be mounted more than 25 000 times (5 times a day for 20 years).

8- Fujifilm can provide you, through its Technical Service Center with a quantity of technical interventions on storage tapes.

Table of content

MACOMP KFT.
Magyar Computer

Macomp is Fujifilm's Number°1 distributor in Hungary

MACOMP KFT - Lovasi Bernadett
Közvetlen telefon: +36 (1) 436-0734
Mobil: +36 20 934-4848
Fax: +36 (1) 436-0731
Web: www.macomp.hu

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