

ULTRIUM
LTO **4**



Built to Last.

How HP tape storage media ensures your data will survive for years to come





HP LTO Ultrium media users can be more confident than most that their precious company data will be safely restored.

Built to Last.

The tapes exhibited excellent performance with low stable read error rates throughout, even after 8 weeks of storage in the accelerated environment (equivalent to 32 years storage at ambient conditions).

Such results help demonstrate that HP Ultrium tapes have outstanding archival properties. No one can predict the future but HP LTO Ultrium media users can be more confident than most that their precious company data will be safely restored even after years in a vault or archive.

Of course, the success of any long term storage strategy will depend heavily on ensuring controlled and ambient conditions throughout the archival period.

Variations in climate and humidity play a significant part in maintaining the stability and performance of tape media. Periodically loading and unloading the cartridge to maintain reel tension is a sensible precaution and for permanent storage, between 30 and 100 years for example, magneto optical, Ultra Density Optical and holographic storage solutions are recommended.

“Cheaper is not always better. We’ve tried other brands of storage media and we’ve been disappointed in the reliability of some of the tape cartridges. NetBank’s experience is that HP’s technology actually does work better together. It provides superior quality and reliability across the entire disk and tape storage line. We are comfortable that HP tape media has a strong future for many years to come.”

Todd Warnock,
Director of Technology Services,
NetBank Internet



Protect your data now and in the future with HP media

It's a fact of life and human nature that no one likes to dwell upon the future. Who knows what might happen tomorrow, let alone five, ten or thirty years from now?

For IT managers and their organisations, however, the future is very much a factor in present day decisions as a growing amount of compliance legislation lays down strict requirements for data security and retention.

This legislation is re-defining the way we store and manage data. Since most new data is now in digital format, governmental and regulatory agencies have begun enacting new laws and guidelines regarding the methods for storing electronic records.

Depending on the legislation applicable to your company, generally speaking, legal compliance puts the onus on directors, board members, and company executive officers to ensure that organizations take all reasonable steps to protect electronic records, to ensure only authorized access, and to ensure that audit procedures are available for inspection by the relevant authorities. Individual technologies such as write once, read many (WORM) tape storage can be used to enhance protection and audit standards.

Compliance and Archiving

This document will not attempt to cover broad compliance requirements in depth. It's a comprehensive topic and many other resources are widely available, from HP as well as other vendors and regulatory bodies.

One aspect of the compliance discussion that is very relevant to your choice of storage media is longevity and archival stability.

Simply put, if you place a tape into an archive and a legal officer requests you produce it in ten years time, how can you be confident that your data will be preserved, as good as it was the day you created it?

The effects of aging

One of the difficulties in assessing the potential longevity of tape is that no one can predict the future. Engineers may be confident that products will perform to the required standard but they don't possess a crystal ball that will allow them to step forward in time.

So first of all, let's consider some of the threats that your tapes may face in a long term archival storage facility. Tapes do not get wrinkles or grey hairs but they are vulnerable in other ways.

Particulate media (e.g. DDS and Ultrium) incorporate a binder system to hold the magnetic particles in place and attach them to the substrate. Early binder systems could suffer from hydrolysis (i.e. the binder could absorb moisture and eventually degrade leading to debris).



HP media incorporates an extremely effective armour coating

However, today's advanced binder systems used in HP LTO Ultrium products are far more tolerant to high humidity conditions, and as such, binder hydrolysis should no longer pose any risk.

Signal degradation is another factor that could affect the archival properties of tape media. Historically, signal loss would occur due to oxidation of the magnetic particles (i.e. a chemical reaction would reduce the magnetic strength of each particle and as a result, the read back signal strength would diminish). This has potentially serious consequences for restoring all of the data.

But there have been several improvements to metal particle technology in recent years and the magnetic particles used in all HP media incorporate an extremely effective "armour coating". This 'passivation layer', as it is termed, surrounds and protects the magnetic particles, effectively eliminating the oxidation process completely. Hence, there is no significant signal reduction during the restore process, even after prolonged periods of archiving.

"HP LTO Ultrium has more than paid for itself within the last three months with off-the-chart performance and reliability..."

Vijay Santi,

Chief Technical Officer,
ANALYTICi

HP LTO media also utilises high coercivity particles and hence the cartridges are far less susceptible to stray magnetic fields (again helping to ensure ongoing data integrity and restore reliability). This is important because any loss of magnetisation would result in a reduced signal, and hence poorer error rate. This could ultimately compromise the integrity of the data back-up.

In conclusion, it is essential that tapes are designed to resist the effects of both particle oxidation and binder hydrolysis. But how can we measure this?

Time Present and Time Future

At Hewlett-Packard we think we have the closest thing to a time machine. It is called the HP Brand Specification for HP LTO Ultrium media and it is the means by which we can say with confidence that our media will last for at least its thirty year warranty life.

A real time machine would be a true miracle but even a tape time machine requires enormous scientific resources. At HP, we have over twenty environmental chambers that we use for testing the HP brand specification, performing over 170,000 tests lasting over 1 million test hours per annum. In conjunction with the thousands of tape drives we use in our test procedures, it's an investment that few, if any, company in the world can match.

In order to demonstrate archive life, it is necessary to conduct accelerated aging tests. Only this kind of highly specialised test can reveal how the magnetisation will degrade over an extended period of time, and whether hydrolysis is likely to occur.

HP WORM Archival Testing

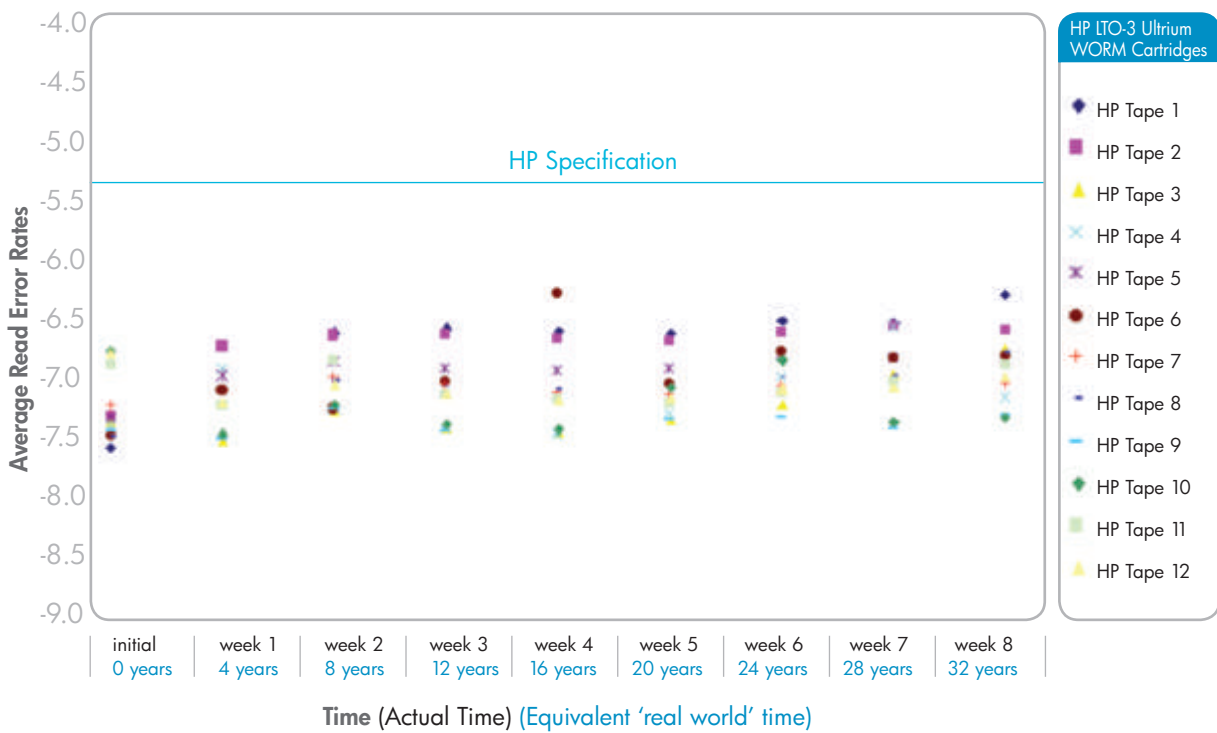
Previous research¹ has shown that storing tapes at a constant environment of 60 °C, 90% relative humidity for 7 days is approximately equivalent to storing the same tapes at 25 °C, 60% relative humidity for a period of 4 years.

To verify the archival properties of HP media, 12 x HP LTO-3 Ultrium WORM cartridges were stored in an environmental chamber under these elevated temperature and relative humidity conditions.

¹ Yamamoto et al, "Study of Corrosion Stability in Metal Particulate Media", IEEE Transactions on Magnetics, Vol. 26, No. 5 1990



The hottest climactic temperature ever recorded on Earth was a 'mere' 56 °C at Death Valley, California in 1917. We test our media at a constant 60 °C



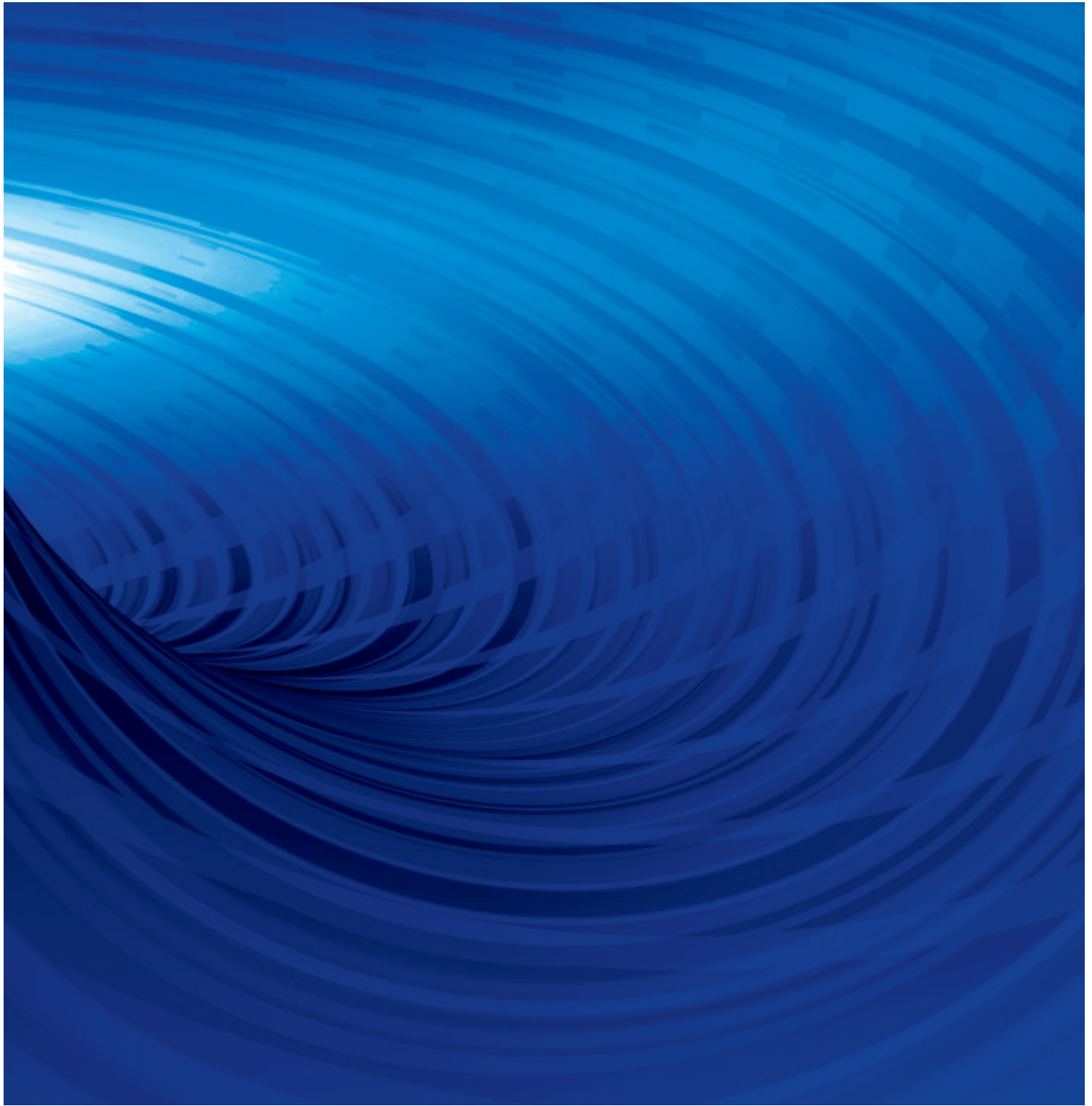
These torturous conditions are extremely unusual and well outside the normal recommended operating environments for tape media. Bear in mind the hottest climactic temperature ever recorded on Earth was a 'mere' 56 °C at Death Valley, California in 1917.

WORM tapes were chosen because these are the most likely medium for long term archival or compliance procedures but in terms of its physical characteristics, the tape inside HP WORM cartridges is identical to that of the RW equivalent. Data was initially written to (and read from) each tape to obtain a series of "initial" read error rates. The cartridges were then stored in an environmental chamber at 60 °C, 90% RH for 7 days,

after which the data was re-read, and the cartridges returned to the chamber for a further 7 days of storage at 60 °C, 90% RH.

This sequence was repeated until the cartridges had been stored for a total of 8 weeks at the elevated temperature and relative humidity conditions. If one week in these harsh environments is equivalent to 4 years, then our HP WORM tapes endured 32 years in the tape time machine in the HP media laboratories.

The chart above shows the average read error rates for the 12 x HP LTO-3 Ultrium WORM cartridges, at each stage of the archival storage test.



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