Erasing 9840 and 9940 tapes

Erasing data tapes was fairly simple in the past. Bulk erasers, also known as “degausers”, did a good job of demagnetizing the tapes and erasing all data.

With newer tapes, such as 9940, 9840, LTO, and others, erasing has become more complicated. There are several reasons for this. As the data density increases, the strength of the erasing magnetic field must also increase. If it is too low, some of the data signals can remain on the tape. Sophisticated recovery houses can still read these remaining data bits and, in some cases, even recover the “erased” data. Conversely, if the erasing magnetic field is too strong it may reduce the quality of the tape.

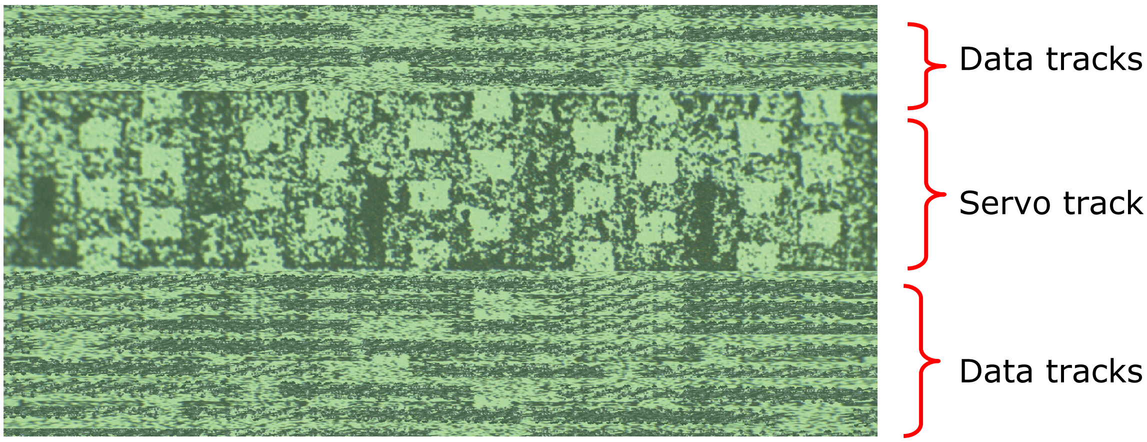
9940 data cartridge

The servo tracks present another problem. All of the above-mentioned tapes contain magnetic reference tracks which are pre-written by the media manufacturer. Without these servo tracks the tape drive cannot function correctly. Bulk erasing a 9940 data cartridge will erase all of the servo tracks, and make the cartridge completely unusable.

1233 Sherman Drive, Longmont, CO 80501-6133
303-774-6361 303-651-6371 (fax)
www.MPTapes.com

Erasing the data tracks, but not the servo tracks

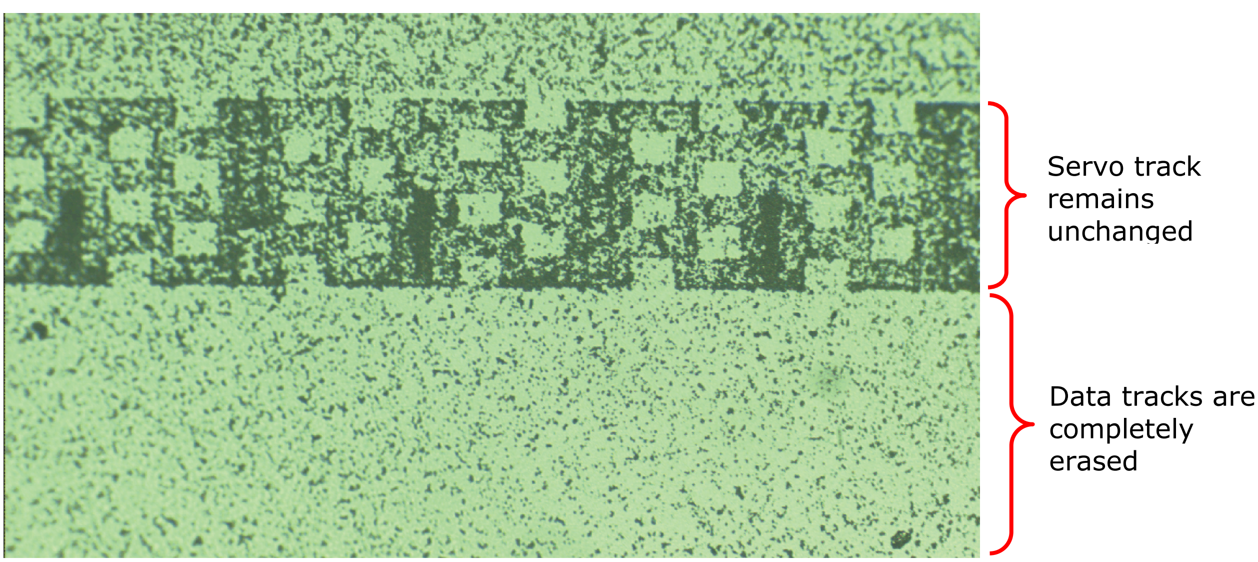
The goal in erasing tape, therefore, is to eliminate the data, but not the servo tracks. To make the tracks on tape visible, liquids containing tiny magnetic particles can be used as highlighters. A small section of a tape is shown above. The checkered pattern servo track is surrounded by data tracks.



9940 tape showing the servo track in the middle and data tracks on both sides of the servo track.

There are several servo tracks on a tape, with the data tracks between the servo tracks. A correctly designed erase head erases all the data tracks but none of the servo tracks.

The custom erase head in the MP-9940 covers the entire width of the tape and has small gaps where the servo tracks are located. All data tracks are erased in a single pass, but the servo tracks are left untouched. The picture below shows a section of an erased tape. After erasure all data tracks have been removed but the servo tracks remain.

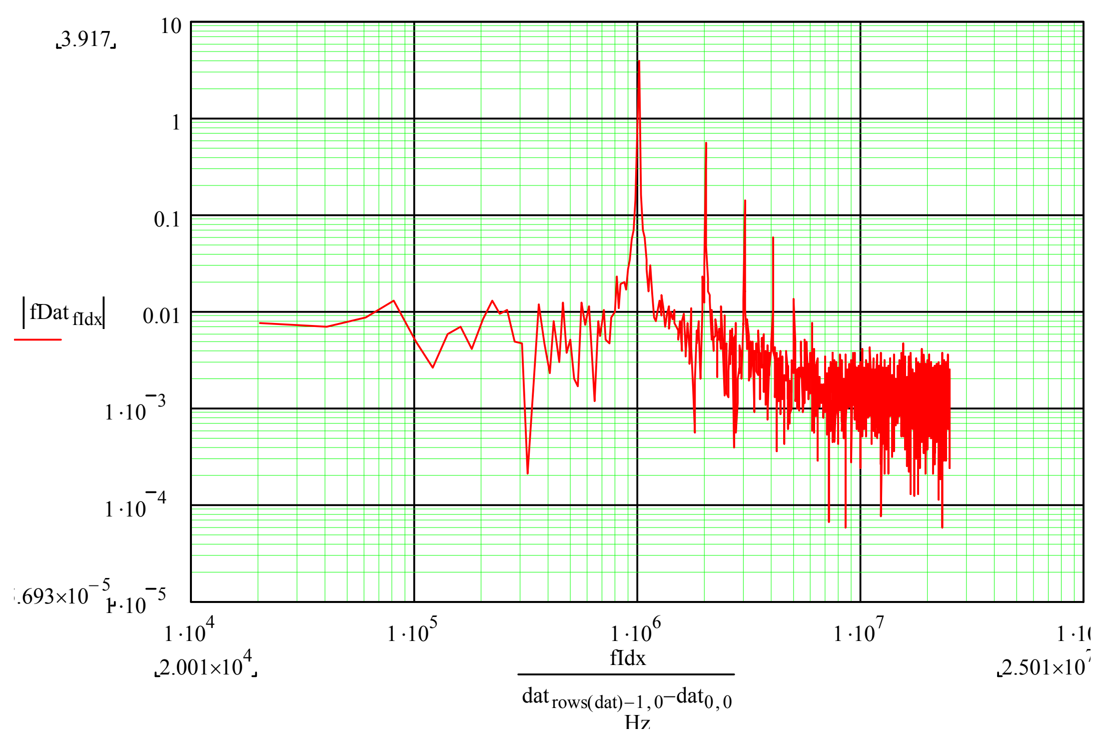


Erased 9940 tape. The data tracks have been removed, but the servo track remains intact.

Erasing the data entirely

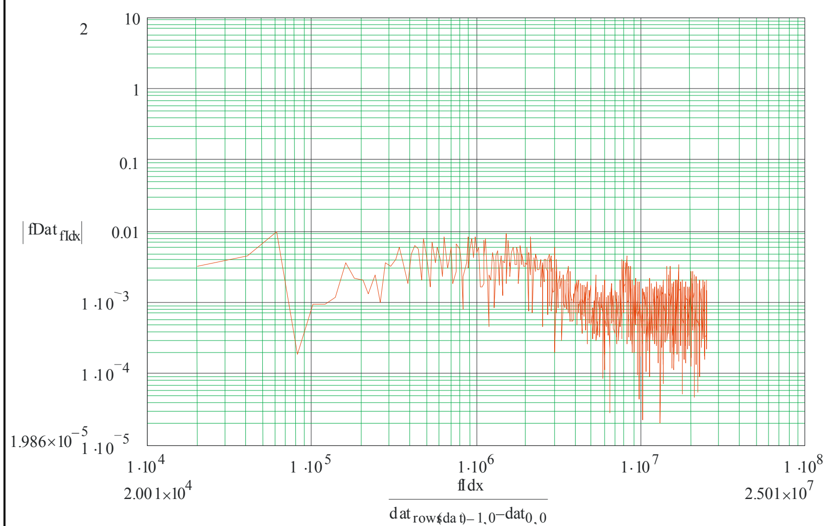
Data recovery centers have become quite sophisticated. In many instances they are able to recover data that has been accidentally, or in some cases intentionally, overwritten or erased. Even when data have been erased to a point where the tape drive cannot recover it, a recovery center may still be able to read the tape data.

Most users want their “erased” data to be entirely unrecoverable. To test our ability to erase the data we wrote a constant signal on tape, one which is easy to detect during a subsequent read operation. The peak in the middle of the graph (below) is clearly visible, showing the constant signal that was written. The horizontal scale at the bottom of the graph shows this peak at $1*10^6$ Hz, or at 1 MHz. The smaller peaks to the right at 2, 3, 4, and 5 MHz are harmonics of the first peak. The scale of the graph is logarithmic, so the peaks appear much smaller than they would be if they were shown on a linear scale.



Data recovered from tape. The previously recorded test signal of 1 10^6 Hz is clearly visible in the center of the graph. The smaller peaks at the right are harmonics of the recorded signal.

Using the MP-9940 eraser, the test data are erased in a single pass in the same manner used to erase user data. Since a known signal was written, it is now possible to specifically search for this signal.



Signals recovered from the erased tape. The previously recorded signal of 1 MHz is not detectable. The remaining small peaks are caused by random noise.

The read operation of the erased tape shows that the previously recorded test signal of 1 MHz is not detectable. The amplitude of several random noise peaks exceeds the amplitude of any signal at 1 MHz. This means that the data are entirely erased and not recoverable even with the most sophisticated methods. In fact, when reading a new tape that has never been recorded the results are identical to the above graph. A tape erased by the MP-9940 Eraser is indistinguishable from a new tape.

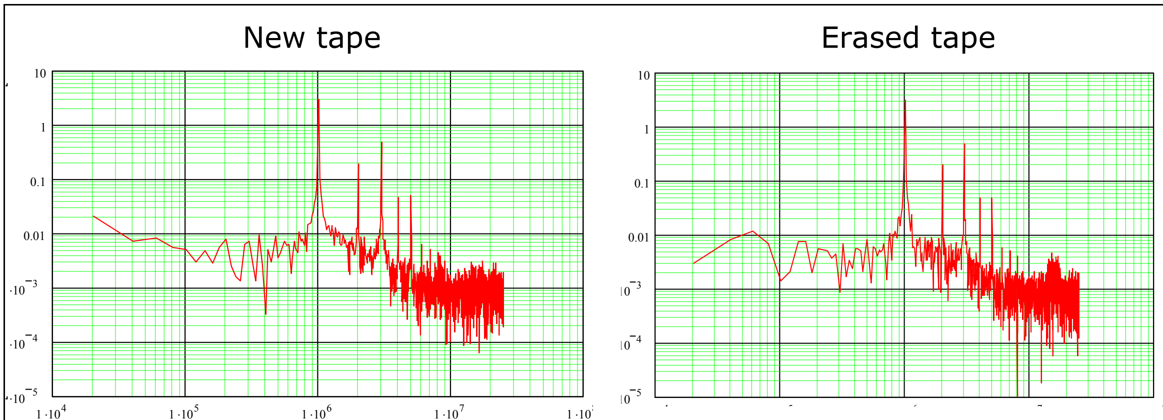
As good as new

It is important to erase the data with a high strength magnetic field, but this does not mean that this field should be as strong as possible. An overly strong or otherwise incorrect erase field can alter the characteristics of the tape. Sophisticated tape drives may still write on these tapes without reporting any write errors. However, the probability of a write or read failure increases with changes in the tape characteristics. Unless the failure rate is extremely high a data center may not even notice this increased failure rate. It would take a controlled and long-lasting test to detect a statistically relevant difference in the failure rates between new and erased tapes.

Any increase of the failure rate, however slight, is still undesirable. The erased tapes must carry the identical characteristics as new tapes. Fortunately there is a reliable method to guarantee that erased and new tapes are identical without having to test thousands of tapes: a signal with a constant frequency is written on tape. When the tape is read, the amplitude of this fundamental signal and the amplitudes of the harmonics of the signal are measured. The ratio of the amplitudes is known as “harmonic distortion.”

A change in the harmonic distortion of the tape after erasing it would indicate a change of the tape characteristics, and therefore would imply a reduction in the quality of the erased tape.

The graph below shows a side-by-side comparison of the harmonics of a new tape and an erased tape. The amplitudes of the fundamental frequency and of the harmonics are identical, showing that the harmonic distortion remains unchanged.



Comparison between a new tape on the left and an erased tape on the right. The harmonic distortion for both tapes is identical, demonstrating that the erasure has not altered the characteristics of the tape.

Conclusion

Erasing a tape involves more than distorting the recorded data in order to prevent a tape drive from recovering the data. We need to be sure that the data—and only the data—are entirely removed, leaving the servo tracks untouched. We also need to be confident that the tape characteristics remain unchanged by the erasing process.

When done properly, no data should be recoverable from the erased tapes. The servo tracks should remain intact and the tape characteristics remain unchanged.

MP Tapes 9940 Eraser