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TECHNICAL INFORMATION
NEWS and DEVELOPMENTS
NEW PRODUCTS and PROCEDURES

VOLUME 1, NUMBER 1

PLEASE ROUTE

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Chief Eng.
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Video Eng.

Return to:

This bulletin inaugurates a new series of publications provided as a service to the television industry. Many subjects of mutual interest to video tape engineers, operating personnel, sales and administrative staffs will be discussed in these pages... information we feel will be of benefit to those contributing to the progress of this fast moving industry. Your questions and suggestions for topics to be discussed are most welcome. Write to: "Playback", 3M Company, St. Paul, Minnesota.

in this issue...

A CASE IN POINT...

Splicing Care Extends Head Life

It's the exception and not the rule, but should you encounter an operating condition where an extraordinary number of splices are made in a tape, head deterioration can result if proper splicing techniques are not used. Here is a true case history from the 3M Laboratory files that illustrates this point.

PROBLEM...

A chief engineer in the southwest reported they were encountering abnormal wear of video heads. They were operating with a recorder that had been installed for only four months, and since that time had replaced seven heads. The seven heads had an average operating time of 23 hours before failure.

(Continued on Page 2)

Splicing Care

(Continued from Page 1)

(One head failed at 6 hours while the best head lasted 50 hours.) A preliminary analysis of the heads indicated abrasion not normally seen in heads of 200 hours service, and at this point it was suspicioned that the tape was at fault.

Several tape samples were sent to the 3M laboratory for analysis and upon examination it became apparent that some of the splices were abnormal in that an overlap splice was being used instead of the normal butt splice. One sample roll containing 18 splices showed 8 varying degrees of overlap splices (5-10 mils).

The operation of this station was unique in that the VTR was used almost exclusively for spot announcements, news flashes, etc. The chief engineer explained that when they started operations they immediately cut their tape into 1 minute 40 second lengths for spot announcements. Since that time they had decided to splice these segments back together to provide a minimum of 6 minutes recording time.

News was recorded from network broadcasts, then after the local newsman previewed the tape, several 15-20 second portions were cut out and spliced together. These segments were in turn separated by 5 or 10 seconds of black to make up a news tape for daily news programs. This procedure was repeated daily until in one hour's time up to 200 splices were being run through the machine.

Thorough examination of the tape and splices proved that approximately 50% of the splices were abnormal. Some were overlapped completely while others were overlapped on one edge and gapped at the other edge. Although pecularities had been experienced with the splicer, bad splices heretofore had not been considered as the problem.

SOLUTION...

An overlap splice can cause head damage from an impact point of view. The head pole pieces are normally subjected to tremendous pressure as the tape passes over them, and an overlap splice more than doubles this pressure. In the instant of contact with the pole tips an improper splice of this type acts exactly like a hammer which batters the pole piece, and tends to transfer the pole piece metal into the gap resulting in a closure of the gap.

As a demonstration of the solution to this problem, one of the reject heads which showed one channel banding was run-in with deep penetration over unspliced tape for approximately 20 minutes (near stalling speed of the drum motor at about 4-6 mils penetration). The polishing afforded by this unspliced tape "cleaned" the gaps and normal output was obtained on all four heads.

To assure continued good results the station immediately began an examination of its entire tape stock, remaking all splices that were abnormal. After this, the head was again used on tape with butt splices properly made. Result--head life extended to normal.

PROGNOSIS...

We could mark this case closed, but reference to "normal" head wear brings up one last consideration. The fact is a common misconception exists as to what normal or average head wear should be.

It must be realistically concluded that head life is a VARIABLE dependent upon several primary factors including: The number of splices in a tape and their condition, tape handling and storage conditions, tip penetration and the condition of the tape transport itself, i.e., tensions, guide alignments, etc.

So called normal head wear could vary anywhere from less than 100 hours to 500 hours and be entirely satisfactory consistent with conditions described above.

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SMPTE Recommended Practice RP 11

This Recommended Practice originated in the Video Tape Recording Committee. The proposal, approved by the initiating committee and the Standards Committee, was published for trial and comment in the October 1961 Journal. The recommendation received final approval by the Society's Board of Governors on February 16, 1962.

Tape Vacuum Guide Radius and Position for Recording Standard Video Records on 2-in. Magnetic Tape

1. *Scope*

This recommended practice specifies the tape vacuum guide radius and position for recording standard video records on 2-in. magnetic tape.

2. *Mechanical Dimensions*

2.1 The radius of the tape vacuum guide shall be 1.0334, +0.0000, −0.0005 in. (26.248, +0.000, −0.013mm).

2.2 The position of the vacuum guide shall be set so that the eccentricity of its center of curvature with respect to the axis of rotation of the video heads is as indicated in the table. The eccentricity shall be such that the extension of a line joining the center of curvature of the vacuum guide and the axis of rotation of the heads intersects the tape at the midpoint of its width. The center of curvature of the vacuum guide shall lie between the axis of rotation of the heads and the vacuum guide.

Vacuum Guide Radius		Eccentricity	
Inches	Millimeters	Inches	Millimeters
1.0334	26.248	0.0000	0.000
1.0333	26.246	0.0001	0.003
1.0332	26.243	0.0002	0.005
1.0331	26.241	0.0003	0.008
1.0330	26.238	0.0004	0.010
1.0329	26.236	0.0005	0.013

Note: These dimensions are based on a nominal tape thickness of 0.0014 inch (0.0356mm) and a radius of rotation of the magnetic head pole tips of 1.0329 inch min. to 1.0356 inch max.

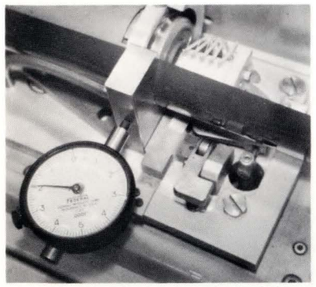
APPENDIX

The achievement of tape playback interchangeability requires, among other things, that means be provided to accommodate variations of (a) the radius of rotation of the magnetic head pole tips, (b) the radius of the vacuum guide and (c) tape thickness. These effects are compensated by the stretching of the tape into a slot cavity in the vacuum guide by virtue of the radius of rotation of the magnetic head pole tips projecting beyond the unstretched oxide surface of the tape as held in the vacuum guide. Over the limits normally encountered, the stretching provides automatic compensation if the vacuum guide is positioned to give the minimum geometric distortion in the reproduced picture.

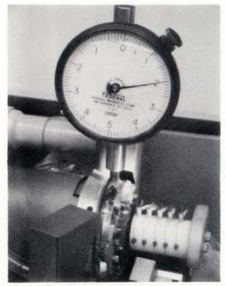
Reprinted from the March 1962 Journal of the SMPTE, Volume 71

'What Tip Penetration Are You Using?'

From a practical point of view the above Recommended Practice provides for a tip penetration equal to tip projection. In other words, if the vacuum guide is adjusted to minimize skewing when playing back the standard alignment tape, the penetration of the video tips into the tape (tip penetration) will be equal to the video tip projection.

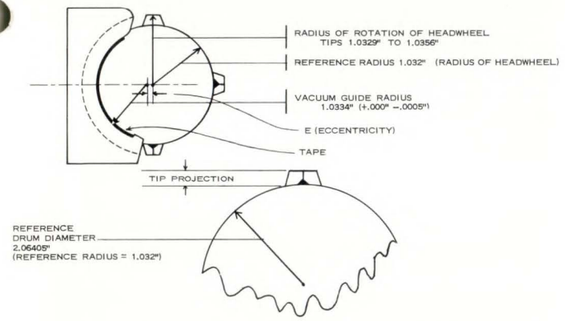


Measurement of Tip PENETRATION



Measurement of Tip PROJECTION

It should be noted that this recommended practice applies to a radius of rotation of the magnetic head pole tips of 1.0329" minimum to 1.0356" maximum. The video head drum diameter, on the other hand, is specified by one manufacturer to be 2.06405" (1.032" radius).* It therefore follows that this recommended practice applies to tip projections between 0.9 mils (1.0329" - 1.032") and 3.6 mils (1.0356" - 1.032").



Perhaps the most unique property of this specification is that of providing tape playback interchangeability and interspliceability with minimum skewing and scalloping regardless of actual tip projection. The vacuum guide location is specified with respect to the axis of rotation of the video heads ONLY. This location is INDEPENDENT of tip projection, within those limits as outlined above, and theoretically would require only the initial adjustment at the time the video head assembly is installed. In other words, the vacuum guide once properly adjusted with the standard alignment tape (Ampex No. 50262-05, RCA No. MI 40771-B and MI 40793) is fixed and except for the necessity of disengagement during fast forward and rewind, the guide could be permanently attached to the video head assembly plate.

Tip penetration then is of minor consequence in the application of this recommended practice. It becomes an important factor, however, when considering head and tape wear, and dropout activity.

The degree of conformance of the tape to the head depends directly on the pressure exerted by the head tips on the tape. The tip projection then determines this pressure and in general most tapes exhibit less dropouts at higher head to tape contact pressure.

Why is this true? A dropout is a loss of signal that results when the oxide of the tape is separated from the head gap. This separation, in a majority of cases, is due to a microscopic dirt particle or oxide nodule either partially imbeded into the oxide or pressed onto the oxide surface of the tape.

If this defect, or separation resulting from the defect, is small in comparison to the video track width sufficient signal is recovered after limiting so that no detectable flash occurs on the monitor screen.

In the majority of cases the projection of the defect above the oxide surface, rather than the affected surface area, is the determining factor in dropouts. It follows then, that the tip penetration or localized stretching of the tape around the pole tips determine the amount of signal transfer from tape to head (or vice versa in the record mode). Because of this the deeper the penetration the less likely are the chances of detecting any objectionable dropout.

In addition to minimizing a defect, "deep" penetration also serves to remove partially embeded particles. It must be noted, however, that if the offending particle is removed by the head during the recording pass, the disturbed magnetic pattern remains and reproduces as such during playback. A future recording will be necessary to ascertain the advantages of this preconditioning technique.

Since RP 11 standardizes the Vacuum Guide Radius and provides for a penetration equivalent to tip projection, any consideration of dropout occurrence or frequency must include information on tip projection. The phrase "Standard Tip Penetration" is meaningless in discussing dropouts unless the actual head height or tip projection is included.

In order to obtain data correlation over long periods of time our quality control checks are referenced to 2 mils tip penetration. In other words, all dropout data is independent of tip penetration. (Naturally, because the major portion of a head's life occurs at less then 2 mils projection, recordings are commonly being made with penetrations of less than 2 mils.) In the EVALUATION of No. 379 Video Tape one of the three following procedures is recommended in order to maintain correlation between 3M and the user:

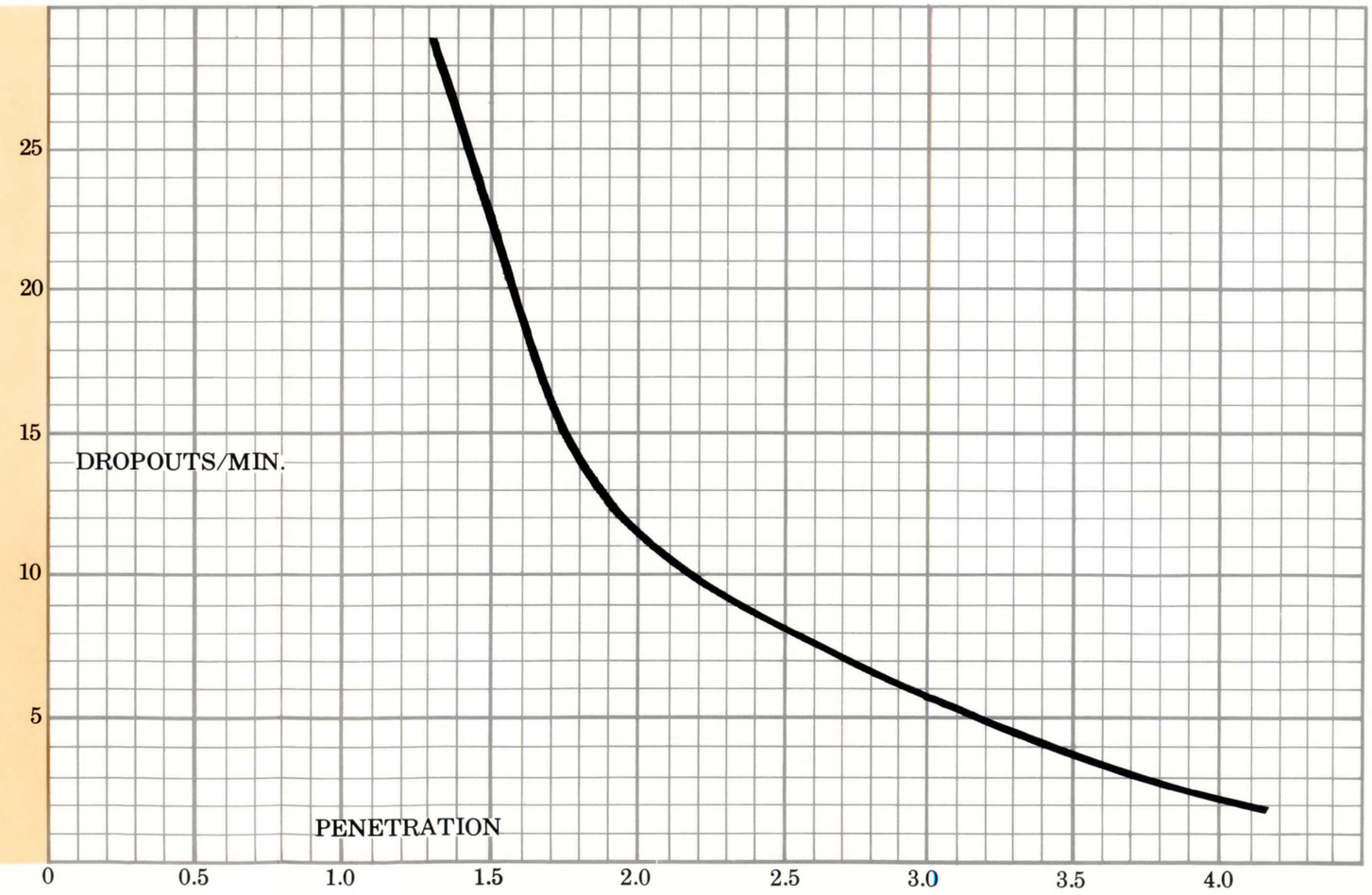
(1) The video tip projection should be a minimum of 2 mils.
(2) If the tips are worn below 2 mils, the vacuum guide should be advanced toward the head wheel an amount equal to the difference in the measured tip projection and 2 mils. This recommendation applies to an EVALUATION PROCEDURE only--and is referred to as a simulated 2 mil penetration.
(3) If the tip projection is less than 2 mils and the simulated 2 mil penetration recommendation is not applicable, then an increase in the frequency of dropouts must be expected. With few exceptions, the dropouts exhibited as a function of tip penetration is shown by the Graph.

NOTE:

The dial indicator mounting block used for tip penetration measurement is available from Cortemp Enterprises, Inc., Highway 88, P. O. Brick Town, Laurelton, N. J. In addition to machine manufacturers, Cortemp also offers a variety of services to VTR users including modifications and rebuilding of VTR assemblies.

*"Tape, Tips and Standards" by John King and Charles E. Anderson, Ampex Corporation.

DROPOUTS VS. PENETRATION



The Tape Warranty . . .

A tape warranty is important and it exists because 3M is desirous of providing the best possible service to its customers. Our current warranty period of 60 days is actually designed to make your job, as well as ours, easier. Happily, the reject ratio has improved markedly over the past years and we have received many favorable comments regarding the consistent high quality of "SCOTCH" Video Tape.

If a problem should arise, invoices now carry tape control numbers and can quickly be identified against a specific order. This speeds handling of complaints and also simplifies your bookkeeping.

The 60 day period permits a quick analysis of problems that do occur and still allows adequate time for you to determine if the tape is usable. The overall effect of this policy has been one of insuring a consistently better product for consistently reliable results.

For More Information refer to . . .

TIP PENETRATION - "A Standard for Positioning the Vacuum Guide on Transverse Track Video Tape Recorders" by A. H. Lind, RCA, "Journal of the SMPTE", Vol. 70, No. 7, July, 1961.

"Video Tape Recording Interchangeability Requirements" by K. B. Benson, CBS-TV Network, "Journal of the SMPTE", Vol. 69, No. 12, December, 1960.

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Post Emphasis . . .

Some of the features to appear in the next issue of PLAYBACK.

STATIC BUILD-UP ON VIDEO TAPE--What do you do with it?

TAPE CONSTANTS--Recording times and tape lengths.

SMPTE STANDARD--an editorial.

Let us know if you have a subject you would like discussed.

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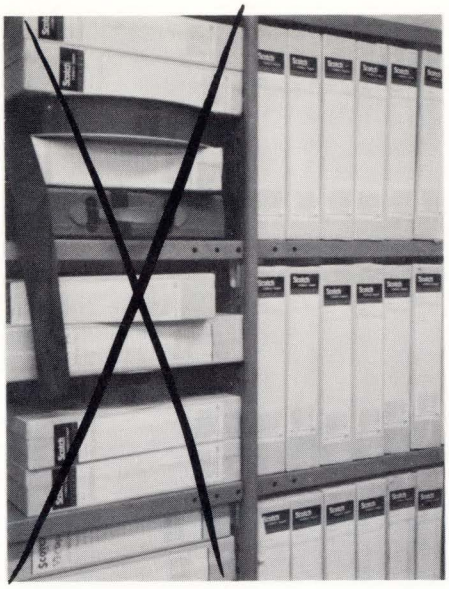
STORE VIDEO TAPE VERTICALLY!



Tape should be stored "on edge" rather than horizontally in a stack. Basically, the reasons for this evolve around two considerations: Convenience and protection against damage to tape.

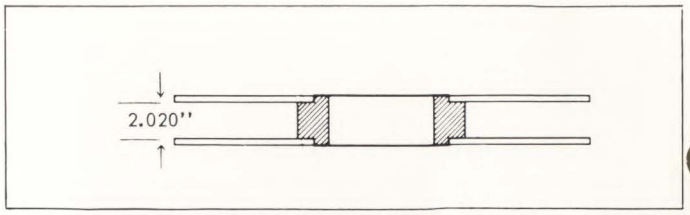
Libraries store books on end to make them easily accessible. (Invariably the book/tape you want from a stack has found its way to the bottom if in a pile.) Another good reason for vertical storage is economy in shelf layout.

Under recommended storage conditions it is the hub that supports the weight of the tape and not the flanges.

A special retainer board has been inserted into the package designed to utilize the reel hub for tape support.

Horizontal stacking concentrates the weight of the tape on the flanges and consequently the tape itself. The 90 mil flange thickness is not intended as a support structure, but as a constraint for guiding the tape onto the hub and to provide more than adequate protection in normal use.

As the diagram illustrates, the traverse width of the hub is 2.020 inches allowing a very adequate 10 mils of space on either side for tape clearance.

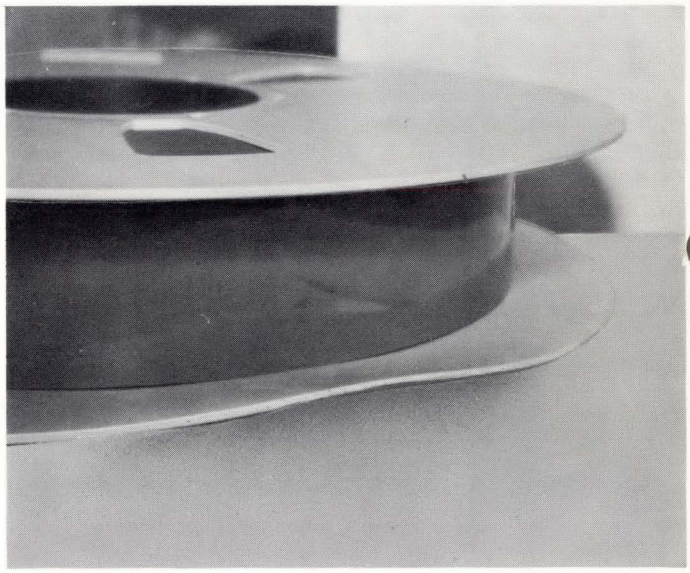


Under excessive pressure anything less than a perfect wind can result in edge damage to the tape with permanent audio and control track dropout.

In comparison to film, tape has a very tight wind and is, of course, a much thinner medium (about 1/4 the thickness of film). A roll of film has a loose wind and it is a good practice to store film horizontally so each edge will be self-supporting and prevent the film from taking a set or "teardropping" with respect to the hub.

Because tape is thinner, the edges are more easily damaged. Also, from a performance point of view, the edge of the tape is much more critical than the film edge.

Partially filled reels should be stored with even greater care. In addition to tape damage, there is



the possibility flanges may be bent beyond their elastic limits and become permanently distorted.

In general it can be said that video tape deserves a rugged but precision reel to protect it, and reasonable care in handling and storage to make sure tape does not become damaged. Following these recommendations will give you added assurance of trouble-free recording.

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