VLBA ACQUISITION MEMO #131

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

HAYSTACK OBSERVATORY

WESTFORD, MASSACHUSETTS 01886

13 March 1989

Area Code 508
692-4764

To: VLBA Recording Group

From: Alan E.E. Rogers

Subject: Friction at the Tape Entry and Exit Points

The dominant source of friction encountered by the tape as it passes through the transport is at the fixed input/output posts (MKIIIA configuration). These posts replace the original equipment rollers. The utility of this modification is controversial and at this time I am not sure of their overall effect. They have no immediate effect on the tape path (tracking) as they are well decoupled via the loop in the vacuum column. Their presence does however produce substantial friction as tape backing (not the oxide side) passes over them with a large and variable wrap angle (≈135 deg). The friction force at about 30% humidity and 0.5 lbs vacuum tension (≈10" water) was measured and found to be 0.5 lbs dropping to half this value at 135 IPS and to one tenth this value at 360 IPS. These values were obtained by measuring the stalling torque on a roller. The value for static friction was also measured by observing the change in reel current needed to change the direction for the tape across the fixed post and found to be about 0.5 lbs. Some of the present concern about the posts are -

1] The added friction - especially under high humidity conditions or during the prepass of a tape which has undergone some hydrolysis (see Jorgenson, pg 647).

2] The effect of the friction on the reel pack - this may be good or bad. [A computer model for tape packing is under development.]

3] The problem of preventing the edge of the tape from wearing the precision plate in the post region.

and some concerns about the rollers are -

1] Can the roller flanges damage the tape?

2] Some rollers have been poorly adjusted in the past (possibly because of the lack of knowledge of how to adjust them) and have forced the tape to wear the precision plate.

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27 February 1989

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To: Honeywell Recorder Division

From: Alan E.E. Rogers and Hans F. Hinteregger,
Haystack Observatory

Subject: Study of the Honeywell Model 96 Tape Path Stability

Haystack Observatory has started a study to try and understand the tape path in the Model 96. The main reason for the study being to find which components and alignments are critical to the tracking performance needed for longitudinal recording with high track density. The results of the study are being documented in technical memos of the VLBA project and we seek comments from Honeywell engineers.

Summary

With the Haystack configuration (using a fixed post in place of the idler) the tape rides away from the plate with an angle of about 100 arc seconds due to the torque exerted in the vacuum column. Capstan axis alignment error and taper are the most critical components which alter this angle and make the machine interchange tracking signatures different. After many thousands of hours, grooves form in the precision plate which can produce serious non-repeatability of tracking signatures.

Tests made with idler roller show that the sensitivity to capstan and tape imperfections are reduced by a factor of 3. Alternately a deliberate bias of the capstan axis to force the tape to run parallel to the precision plate reduces the sensitivity by a factor of 2 and because of its simplicity may be a better operating mode as we have experienced problems with slipping idler rollers.

Questions

What are Honeywell's suggestions on the following:

1] Should we return to using an idler roller rather than a fixed post and if so can we significantly reduce the idler moment of inertia to avoid slipping?

2] How can we solve problems of grooves being worn in the precision plate? We have experimented with hard inserts - what does Honeywell recommend?

3] Can we get capstans with significant taper replaced by rapid exchange?

4] What does Honeywell know about the wearing of capstan rollers? Could we get units which are more wear resistant?

5] Our theoretical study of the tape loop shows that the vacuum column depth should be at least 50 microns greater than the tape width. Without the use of a shim on the E-casting some tapes can bind and stretch in the columns. Does Honeywell recognize this problem?

6] Head wear is often uneven with one end of the stacks showing 2-3 times as much wear as the other. The sources of differential tension are not yet all well understood or controlled. What does Honeywell know about this problem?