

TALK

SOUND

FROM THE MAKERS OF "SCOTCH" BRAND MAGNETIC TAPE

June 15, 1952

BULLETIN No. 18

F. M. TAPE NOISE

The small amount of noise present in magnetic recordings can be thought of as arising from two separate and distinct causes -

- 1) Minute magnetic irregularities in the tape which vary the amplitude of the recorded signal.
- 2) Variations in the speed of the medium which frequency modulate the recorded signal.

The first of these is a well-known phenomenon and is mentioned here only because it is often blamed for the second type of noise, which is the subject of this discussion.

Variations in the speed of the magnetic tape can produce a variety of effects in the recorded program, ranging from wow (long term variations) and flutter (medium long term variations) to noise, which is the result of very short term speed variations. In order to be manifested as noise, the rate at which the tape speed is changing must be very much faster than that associated with the capstan or other parts of the drive system. It has been found that the principal sources of frequency modulation noise are the varying frictional forces acting upon the tape as it passes over the recording heads and guides. This action is similar to that of drawing a bow across a

violin string, except that the tape - being highly damped, does not respond with the "tone" but only the "scratch."

Noise of this sort may be introduced into the program during either recording or reproducing, although in most machines the recording function is considerably more susceptible to this effect.

There are two distinguishing features of frequency modulation noise which can be used to identify it from magnetic noise. F. M. noise is sensitive to the frequency of the recorded signal. Low audio frequency tones are almost completely free from this effect, whereas high audio frequencies are quite sensitive to F. M. noise. Therefore any noise which increases in intensity as the frequency of the recorded signal is raised is probably due to F. M. causes.

Another test for F. M. noise is to alter the tape tension or the arrangement of the tape guides and to note the effect upon high frequency recorded signals. In general, an increase in tape tension will result in higher F. M. noise. Also, the temporary removal of a tape guide or pressure pad usually lessens the friction and hence reduces the F.M. noise. Using this method, the various sources of noise can be easily located by trial and error.

Magnetic Products Division



"SCOTCH" is a registered trademark of the 3M Co., St. Paul 19, Minn.

While a certain amount of F. M. noise is usually tolerable, there are situations in which the amount of noise may reach alarming proportions. Fortunately, these conditions can usually be corrected by minor adjustments of the recording machine. Some common causes of this trouble are:

- 1) Guides too narrow for the tape. This pinches the tape and causes excessive friction at the edges of the tape. To correct this, it is necessary to determine whether the tape or the guides are at fault. The maximum width of domestic recording tape is .250" - and the tape guides should be adjusted to accommodate this width.
- 2) Grooves worn in the recording heads. This also tends to cause binding of the

tape and high friction. Grooved heads should be lapped smooth or replaced if badly worn.

- 3) Excessive tape tension.
- 4) Misalignment of heads or guides.
- 5) Tape idler pulleys sticking. If these rollers do not turn freely, the tape may slide over them, which greatly increases the friction. Lubrication or replacement of worn bearings may be necessary.

By maintaining the recording machine in good condition, and by special attention to the points outlined above, the F. M. noise can be held to a very low which is unnoticeable in recordings.