

# TALK

SOUND

FROM THE MAKERS OF "SCOTCH" BRAND MAGNETIC TAPE

Bulletin No. 8

## MAGNETIC RECORDING WITH D. C. BIAS

It is of interest to examine briefly the process of recording with D. C. bias in view of its historical significance and, as will be seen, because of the critical nature of the optimum bias requirement. Recording with D. C. bias, of course, gives a poorer signal to noise ratio than is obtained with high frequency bias, and so has yielded to the latter method for high quality audio applications. For fair quality audio work and, in computing machines, the use of D. C. bias may be more desirable by virtue of its simplicity.

When recording is to be accomplished by means of D. C. bias, the procedure involved is the following: The recording medium is, first of all, magnetically saturated in a certain direction with a D. C. erase head, as indicated by OAB in Figure I. Then in the record head, the function of the D. C. bias is to bring the medium to a point such as D, and for no signal, on leaving the record head the tape will be in the magnetized state D'. In the presence of a signal, the tape coming from the state B may reach the points CDE etc., and hence, have a recorded signal on it corresponding to C'D'E' etc.

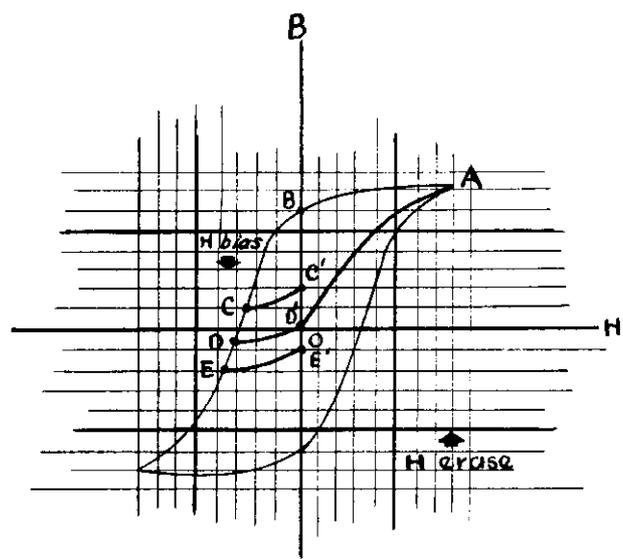


Fig1: D.C. RECORD CYCLE

It is evident then that although the same erase head current may be used to saturate any tape (providing only that the field is sufficient to saturate the most difficult one), each magnetic tape that has a different B-H curve is apt to have a different D. C. bias requirement. It turns out in practice that not only are different biases required, but that the required biases are critical within a few percent. This means that a machine employing D. C. bias which was set to record on a tape with a high coercive force would not record at all satisfactorily on a tape with a low coercive force without changing the bias. This is in contrast to A. C. bias recording where, although the optimum biases required are different, various media can be recorded fairly satisfactorily at the same bias.

Magnetic Products Division **3M** COMPANY

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The reason that the bias is so critical is that, as one shifts to a bias that is either too high or too low, there appears a marked increase in second harmonic distortion. Since the presence of undue second harmonic is indicative of improper bias, the correct bias may be found quite

simply by putting in a large audio signal and adjusting the bias until the second harmonic contribution is a minimum. This condition occurs in the region of maximum response.

The bias as determined in this way is critical enough to allow one to distinguish between various kinds of magnetic coatings. Typical curves of output and second harmonic distortion versus bias current for a constant input are illustrated in Figure 2. The noise level of the erased tape is, of course, high.

The above discussion brings to mind some advantages which A. C. bias has provided for magnetic recording: 1) better signal to noise ratio, to a large extent due to the quieter erase 2) less critical bias requirements and 3) along with the increased signal in a good system there appears none of the second harmonic distortion which is so prominent in recording with D. C. bias.

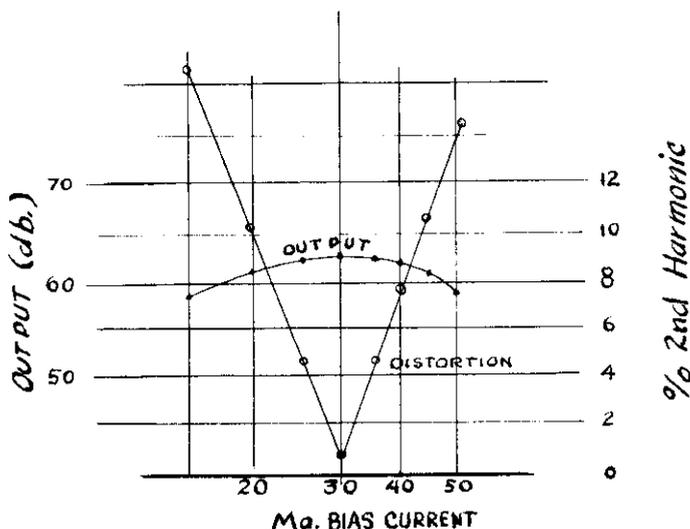


Fig. 2: OUTPUT & DISTORTION vs BIAS CURRENT