DESIGN DIGEST

Application factors to consider for audio magnetic heads

The theory of magnetic recording is discussed in detail in a number of textbooks on the subject (see bibliography – page 96.) Typical circuits for recording apparatus can also be found in numerous publications, however, there are application factors not always presented that pose questions to the designer. Therefore, in the pages that follow we have listed and discussed briefly those that are most frequently asked of Nortronics. These are listed in two general areas:

MAGNETIC HEAD CONSIDERATIONS AND RECORD/ PLAYBACK CIRCUIT CONSIDERATIONS.

I. MAGNETIC HEAD CONSIDERATIONS

A. RECORD/PLAYBACK HEADS

1. *LOW FREQUENCY RESPONSE*

All playback heads have a maximum wavelength or minimum low frequency response, sometimes called "contour effect". The low frequency cutoff is determined by three factors as shown in Figure 1:

1. Length of pole across the head face
2. Length of face window
3. Shape of lamination behind head face

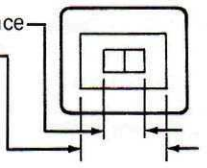

Fig. 1

The longest wavelength the play head can respond to is equal to the mean of the window and pole lengths. High tape speeds such as 15 ips or 30 ips on professional recorders pose severe problems to play head designs since the longest wavelengths may run up to 1-inch, requiring open head faces and very long poles. These are more expensive and also require external magnetic shielding against hum pickup from motors and transformers.

NORTRONICS offers four basic head types to permit optimizing the low frequency performance and hum shielding for a particular tape speed and transport application.

1. **Standard Heads.** Models B2H, B2Q, B1HY, G1H, G1HY, A2H, A1HC, A2Q, A1QC, etc. They have excellent hum shielding and low frequency response suitable for tape speeds of 7.5 ips and below. Low in cost, the standard heads are excellent for general purpose voice applications. Cutoff frequency 50 Hz at 7.5 ips.
2. **Premium Heads.** Models P-B2H, P-B2Q, P-B1HY, P-G1H, P-A2H, P-A2Q, etc. Shielding, hum pickup, and low-frequency cutoff are similar to the Standard Heads. However, pole tips are specially contoured to give smoother response curve for music reproduction, plus finer laminations for better high frequency response. Cutoff is 50 Hz at 7.5 ips or 25 Hz at 3.75 ips.
3. **WP-Series Heads.** Models WP-B2H, WP-B2Q, WP-B1HY. These heads have longer poles and windows for extended and smoother low frequency response. Cutoff is 25 Hz at 7.5 ips and 50 Hz at 15 ips. Fine laminations give excellent high frequency response.
4. **Studio Series and PR Professional Series.** For the ultimate in superb low and high frequency response. Extra long pole pieces and window openings give extremely smooth and extended low frequency performance. Cutoff frequency is 25 Hz at 15 ips and 50 Hz at 30 ips. Supplemental shielding against hum fields is recommended, although the heads do have integral case shields.

Typical low frequency response curves are shown in Figures 2 and 3.

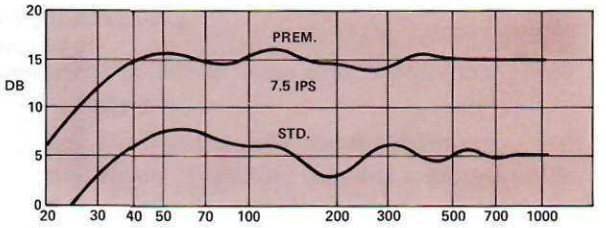

Fig. 2 – Low Frequency playback response, Standard and Premium heads, 7.5 ips.

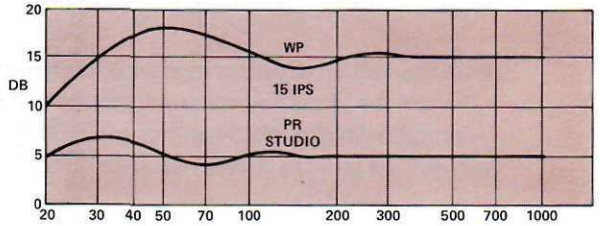

Fig. 3 – Low frequency playback response, WP, PR and Studio Series heads, 15 ips.

2. TAPE WRAP

It is important that a head have sufficient tape wrap around its nose and enough tape tension to insure good oxide-to-gap contact. Hyperbolic face contour is used on most NORTRONICS heads to reduce the tape contact area for a given degree of tape wrap, giving greater unit pressure in grams per cm^2 between the tape surface and head face. Only one head style, the "A-Combo" has a cylindrical face which requires pressure pads or very high tape tension.

Wrap Angle for hyperbolic heads typically can run between 5 and 10 degrees on a side. Figure 4 shows a head with tape wrap included angle of 165° or 7.5° drop back per side. The drawing can be used to make up a card or plastic template to hold against the head to check and adjust the tape wrap.