Playing Tapes from an Ampex 200A Magnetic Tape Recorder

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Standards for recording and playing tapes are now given by the IEC Standard [1], in terms of the recorded flux *vs* frequency. A reproducer response is set up by playing the appropriate "Calibration Tape" [2] that has the standard recorded flux *vs* frequency. The original IEC standard for recording at 30 in/s, called "IEC1", calls for "35 µs and ∞ µs" equalization, which means a constant recorded flux vs frequency below 4500 Hz, modified by a 6 dB/oct droop above 4500 Hz.

Two other equalizations have been used at 30 in/s: "constant flux" (CF) (no equalization at all in reproduction), that was used on the Ampex 201 [3]; and the current IEC Standard, IEC2, which uses "17.5 µs" (flux falls 6 dB/oct above 9000 Hz).

But the Ampex 200A was made before any standards were written, and there is no specification given in the 200A Instruction Book [4] for the flux *vs* frequency response.

The 200A Instruction Book, on page 10, says that "each machine is checked to match a standard tape to insure that recordings will be interchangeable among machines." But the only "standard tape" for a Model 200A that we could find (when we looked in 1998) was one at the Pavek Museum, and it seemed to have been partially erased, and very unsteady, so we did not trust it.

Also on page 10 of the Instruction Book, there is a description of the playback equalizing network, saying that it provides a fixed equalization for a recording that is constant flux, modified by a 6 dB/oct droop above 4000 Hz, and (we find from the schematic) a rise of 6 dB/oct below 100 Hz. In addition, there are several equalization "trims" in recording and reproduction with the 200A, and we don't know how those were set.

The other proviso of the Standard is that either the repro head gap length is so short that it produces no loss; or that the loss is compensated. The 200A Instruction Book says nothing about this, but LM measured the reproducing head gap length: it is 25 µm, which would produce a considerable high-frequency loss at this speed if not compensated. But we found that the head cable capacitance was great enough to produce a resonance at about 16 kHz, and that would compensate the gap loss [5].

Thus tapes made on a 200A should play with approximately correct frequency response on a reproducer aligned with a "30 in/s, IEC1 calibration tape". If the sound is too "bassy", you should add a 6 dB/oct high pass filter at around 100 Hz.

To verify this conclusion, in 1993 we gave Calibration Tapes with the 3 different 30 in/s equalizations (IEC1, IEC2, and Constant Flux) to Jon Samuels, then at BMG Classics (nee RCA Victor), who had symphonic music originally recorded in the 1940s or 1950s on an Ampex 200A. He set his players to each of these equalizations, then played their recordings. He definitely felt that the IEC1 was the correct equalization.

This description has been very brief. To learn more details of magnetic recorder equalization and standardization, see [6] .

REFERENCES

[1] International Electrotechnical Commission (IEC) Standard 60094-1, "Magnetic tape sound recording and reproducing systems", Part 1 "General conditions and requirements". Purchase IEC standards at http://webstore.iec.ch/Webstore/webstore.nsf/mysearchajax?Openform&ICS=33.160

[2] IEC Standard 60094-2, "Magnetic tape sound recording and reproducing systems", Part 2 "Calibration Tapes". Purchase Calibration Tapes from Magnetic Reference Laboratory, http://mrltapes.com

[3] Ampex 201 Conversion, http://aes.org/aeshc/docs/ampex200a/ampex-201-conversion.pdf

[4] Ampex 200A Instruction Book, http://aes.org/aeshc/docs/ampex200a/ampex-200a-instruction-book.pdf

[5] McKnight, Jay: "Gap-length Response In Magnetic Reproducers: Calculation, Measurement, and Compensation", http://home.comcast.net/~mrltapes/mcknight_gap-length-response.pdf

[6] McKnight, Jay: "Flux and Flux-Frequency Measurements and Standardization in Magnetic Recording", http://home.comcast.net/~mrltapes/mcknight_flux-and-flux-frequency-response-measurements.pdf