Cassette Tape Tests

CASSETTE RECORDERS have improved enormously during the past two or three years and the best Dolbyized models pose a serious challenge to open-reel machines in the same price range. However, because of the slow tape speed and smaller track width, they are much more dependent on the quality of tape and correct matching for best results. And heads have to be clean too!

One of the bugbears of cassette recorders is *tape saturation* which restricts the amount of high frequency signal that can be recorded on the tape. Even the best tapes show some loss in maximum output above approximately 5 kHz, and this is why it is necessary to keep high frequency signal levels well below the 0 VU mark on the meter. If this is not done, the tape saturation will tend to cut peaks and the recorded sound will be dull and lifeless. But if levels are cut *too* far, signal-to-noise ratio will suffer. Here the Dolby system helps considerably, but even so, it is essential to choose a tape having a high Maximum Recording Level (MRL) for best results.

Test Procedure

The machine selected for our tests was the Harman-Kardon 1000, which we included in our cassette recorder survey in August, 1972. We found it to be very suitable for our purposes because of its high standard of performance and because it is possible to measure both input and output signals without too much fuss. Both input and output controls are provided—this helps to select convenient reference points on the output meter. We used a Ferrograph Recorder Test Set which can measure distortion. Two other cassette recorders were used for cross-reference, a Pioneer CT-4141 and a JVC 1667.

Our first test was to measure the frequency response at 0 VU with a constant input. This was plotted in a graph and then we measured the distortion and output level, also at 0 VU level. Then we checked signal-to-noise ratio and finally made frequency measurements at -20 dB level. Frequencies below 400 Hz are not shown in the graphs as deviations were not significant.

Output

The Maxell UD was taken as a standard; the output was identical to the Scotch Highlander and TDK KRO. The actual figure for the Harman-Kardon 1000 was 480 mV for 0 VU recording level. So a tape having an output of -1 dB would produce about 415 mV; -2 dB, 390 mV, and -6 dB, only 240 mV.

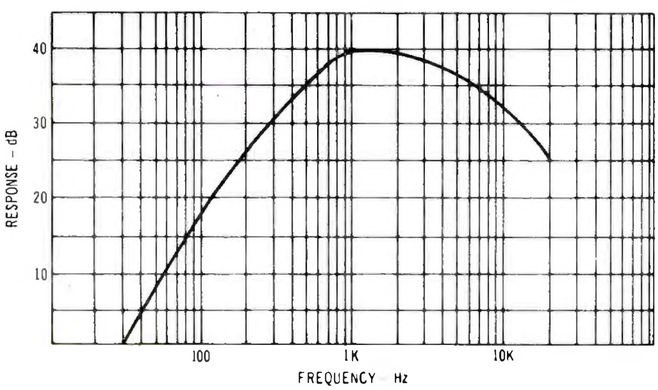


Fig. 1—ASA weighting characteristics.

3 dB Point

This is the frequency where the response has fallen by 3 dB. In general, the higher the frequency at which this occurs, the better the tape. However, distortion, signal-to-noise ratio, and headroom all must be taken into account.

Signal-To-Noise Ratio

Some authorities consider that a weighted noise factor is more accurate as it corresponds to what a person really hears. We wanted to isolate some of the noise due to the electronics of the record-replay amplifier so we used the ASA weighting characteristics as shown in Fig. 1. The reference figure is the standard 3% distortion level.

Distortion

Tapes having a low distortion at 0 VU will obviously have a greater headroom at mid-frequencies. However, variations among the tapes tested were not great.

Chromium Dioxide Tapes

As we have noted before, CrO_2 tapes are much more consistent—the variations between makes are quite small.

How To Choose The Best Tape

Recorders are factory adjusted to suit a particular tape and it is almost impossible to change bias current or equalization. But you may find a particular tape is deficient in treble response and so it is possible to improve matters by changing to one with a rising or extended high frequency response. If you do not have a Dolby or other noise reduction system, choose a tape with a high signal-to-noise ratio—plus adequate headroom. If you are using a tape with a low MRL, watch that VU meter!

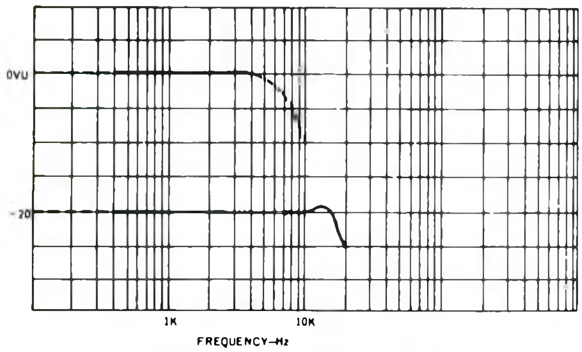
Dropouts

With only two samples of each cassette (three at most), it was not possible to make a reliable estimate of dropout probability. For example, Sample A of Irish 261 had three dropouts but Sample B had none at all! Two were considered to be more dropout prone than the others; they were the DAK LN and the TDK 180 LN. The latter is extra thin and the makers do stress that there is a need for special care in handling.

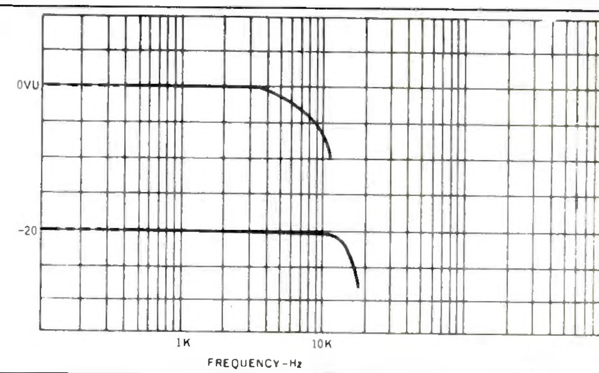
Construction

Some cassettes were welded together; others used screws. Both methods have advantages. The welded construction—in theory—is more accurate and reliable, but the screw assembly does permit repairs to be made. Note that all cassettes tested were C-60's unless stated otherwise.

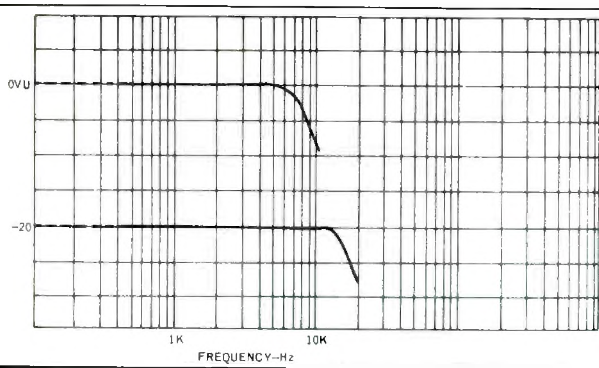
Chromium Dioxide (CrO_2) Tapes



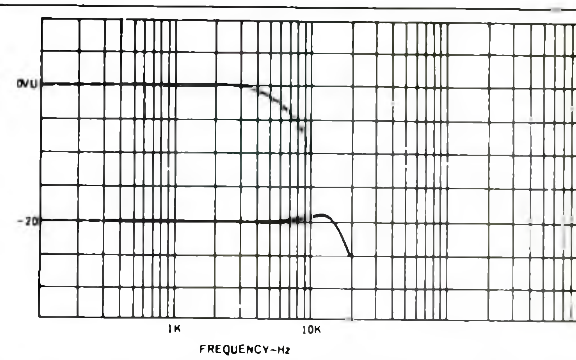
Advocate (Advent) Crolyn
C-90, welded case. Output: −0.5 dB. Distortion at 0 VU: 2.5%. 3 dB Down Point: 16 kHz. S/N: 60 dB. Average headroom.



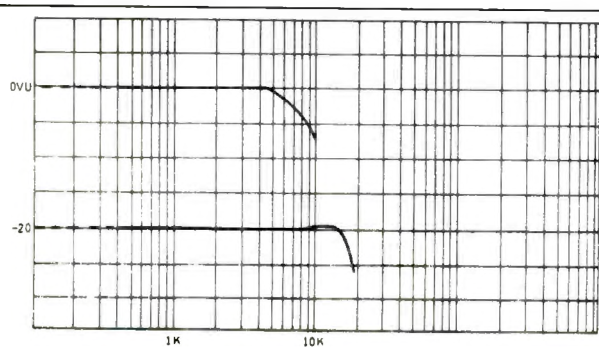
Ampex Series 363
Welded case. Output: −0.3 dB. Distortion at 0 VU: 2.5%. 3 dB Down Point: 15.6 kHz. S/N: 60 dB. Slightly above average headroom.



BASF Chromdioxid
Screw-assembled case. Output: −2 dB. Distortion at 0 VU: 2%. 3 dB Down Point: 15 kHz. S/N: 60 dB. Average headroom.

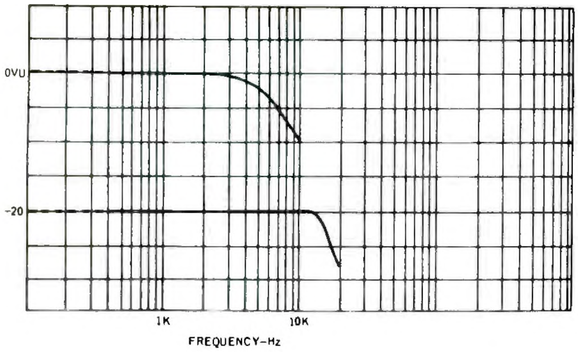


Norelco 400
Screw-assembled case. Output: 0.5 dB. Distortion at 0 VU: 2.3%. 3 dB Down Point: 15 kHz. S/N: 60 dB. Average headroom.

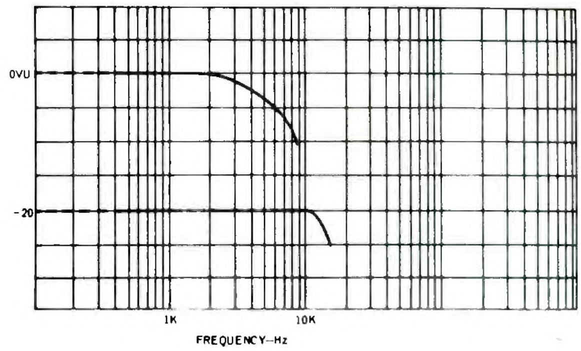


TDK KROM-0_2
Screw-assembled case. Output: 0 dB. Distortion at 0 VU: 2%. 3 dB Down Point: 16.5 kHz. S/N: 60 dB. Excellent frequency response.

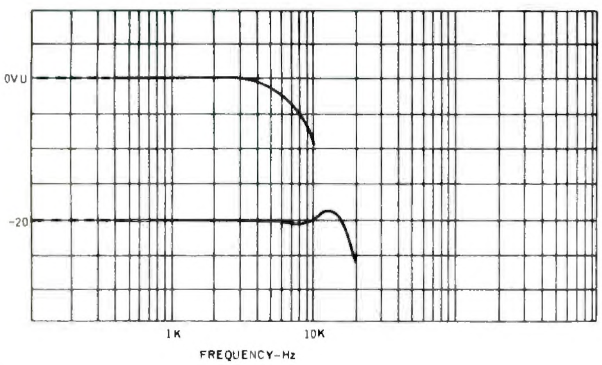
Ferric Oxide Tapes



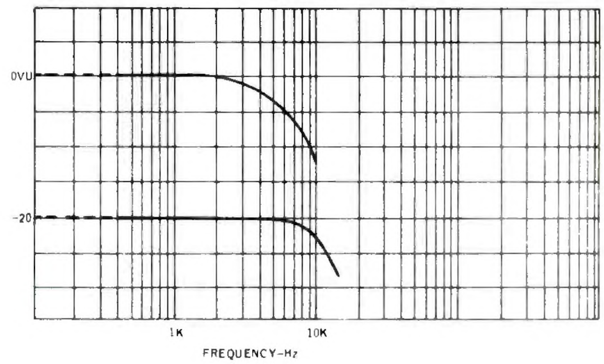
Ampex 20:20+
Screw-assembled case. Output: +1 dB. Distortion at 0 VU: 2%. 3 dB Down Point: 14.5 kHz. S/N: 55 dB. Average headroom.



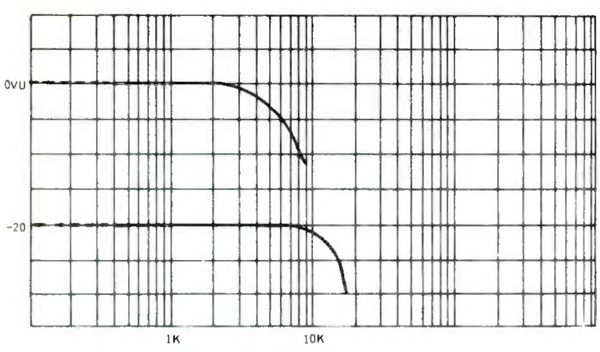
BASF SK/LN
Welded case. Output: –2 dB. Distortion at 0 VU: 2.5%. 3 dB Down Point: 12.5 kHz. S/N: 56 dB. Headroom 5 dB down at 6 kHz.



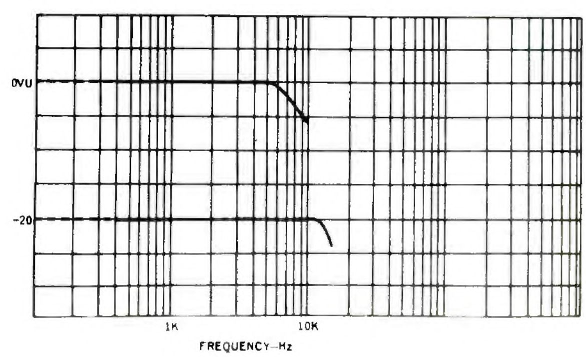
Capitol LN
Screw-assembled case. Output: –0.3 dB. Distortion at 0 VU: 2.2%. 3 dB Down Point: 16.3 kHz. S/N: 56 dB. Excellent frequency response; better than average headroom.



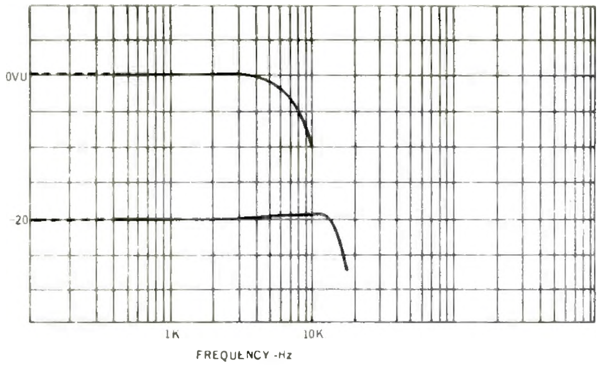
DAK LN
Welded case. Output: –0.5 dB. Distortion at 0 VU: 2.5%. 3 dB Down Point: 10.5 kHz. S/N: 52 dB. Slightly below average headroom; inexpensive general purpose tape.



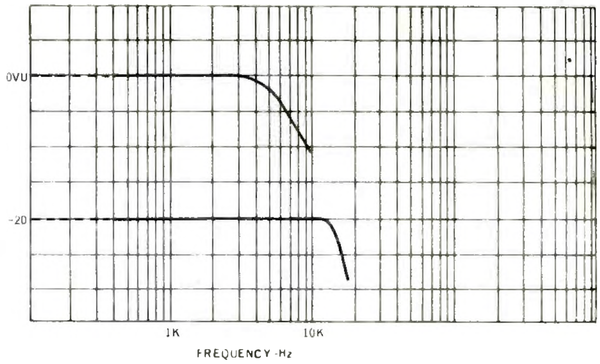
Irish 261
Welded case. Output: –2 dB. Distortion at 0 VU: 2%. 3 dB Down Point: 14 kHz. S/N: 55 dB. Slightly lower than average headroom—down 5 dB at 6.5 kHz.



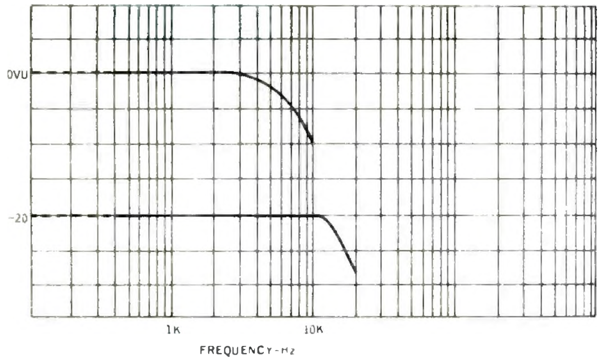
Maxell LN
Welded case. Output: –0.3 dB. Distortion at 0 VU: 2% 3 dB Down Point: 13.5 kHz. S/N: 56.5 dB. Excellent headroom; 5 dB down at 9 kHz.



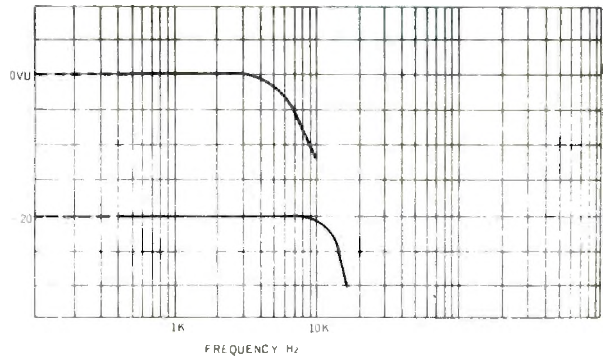
Maxell UD
Welded case. Output: 0 dB. Distortion at 0 VU: 2%. 3 dB Down Point: 13.5 kHz. S/N: 56 dB. Above average headroom.



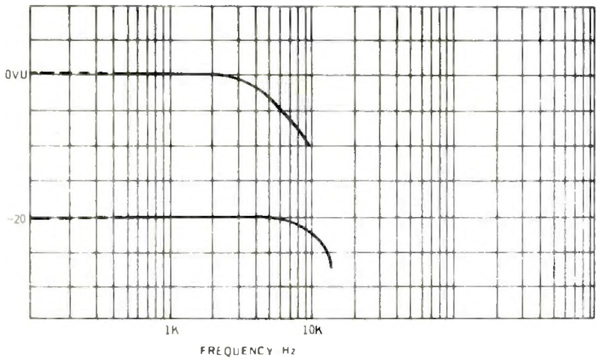
Memorex MRX
Non-standard plastic box, welded case. Output: +0.5 dB. Distortion at 0 VU: 1.6%. 3 dB Down Point: 15 kHz. S/N: 54 dB. Slightly lower headroom—down 5 dB at 6.5 kHz, excellent frequency response.



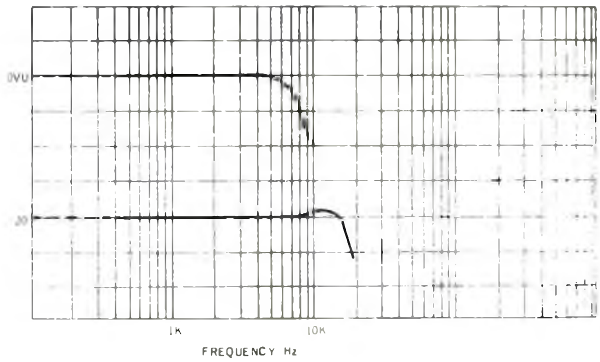
Primus 30
Welded case. Output: -0.5 dB. Distortion at 0 VU: 2.2%. 3 dB Down Point: 14.5 kHz. S/N: 52 dB.



Scotch Highlander
Welded transparent-plastic case. Output: 0 dB. Distortion at 0 VU: 1.5%. 3 dB Down Point: 12 kHz. S/N: 56 dB.

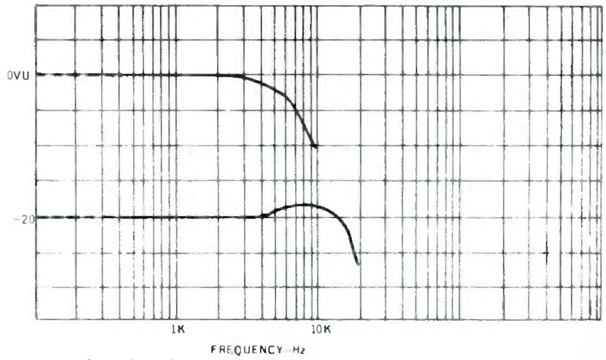


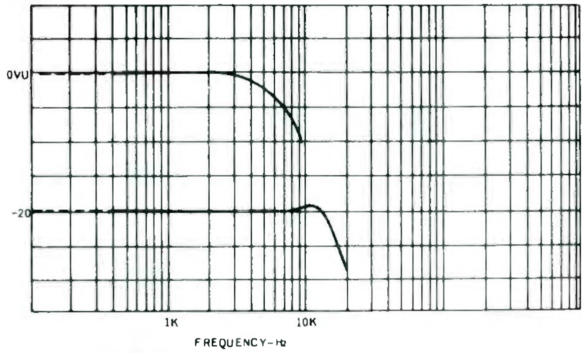
Scotch LN/HD
Welded transparent-plastic case. Output: -0.5 dB. Distortion at 0 VU: 1.5%. 3 dB Down Point: 11 kHz. S/N: 56 dB. Headroom slightly lower than average.



Sony LN
Welded transparent-plastic case, with auto-sensor. Output: -0.5 dB. Distortion at 0 VU: 2.1%. 3 dB Down Point: 15.5 kHz. S/N: 54.5 dB. Better than average headroom; excellent frequency response.

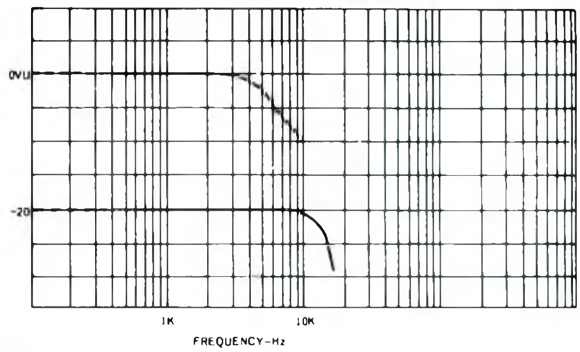
Sony UHF
Screw assembled case, with auto-sensor. Output: + 0.5 dB. Distortion at 0 VU: 1.6%. 3 dB Down Point: 13 kHz. S/N: 55.5 dB. Average headroom, excellent frequency response.

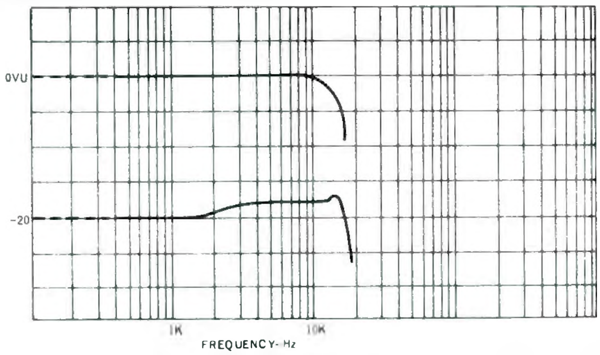




TDK ED
Screw-assembled case. Output: −0.5 dB. Distortion at 0 VU: 2%. 3 dB Down Point: 15 kHz. S/N: 56.5 dB. Average headroom.

TDK LN
Screw-assembled case. Output: −0.5 dB. Distortion at 0 VU: 2%. 3 dB Down Point: 13 kHz. S/N: 55 dB. Slightly below average headroom.





TDK LN
C-180, screw-assembled case. Output: −11 dB. Distortion at 0 VU: 3%. 3 dB Down Point: 16.5 kHz. S/N: 52 dB. Playing time of 3 hours is achieved at the expense of output; thickness is less than 25 millionths of an inch; headroom is excellent.

Tracs Plus
Screw-assembled case. Output: −0.5 dB. Distortion at 0 VU: 2.2% 3 dB Down Point: 15.3 kHz. S/N: 55 dB. Average headroom.