

## THE B.A.S.

The Boston Audio Society  
P.O. Box 7  
Boston, Mass. 02215

### SPEAKER

January  
1973

The B. A. S. does not endorse or criticize any product, dealer, or service. Opinions expressed herein reflect the views of their authors and are for the information of members.

---

January meeting. First the bad news. The tentative plan to hold the January meeting of the B.A.S. at Symphony Hall has, unfortunately, fallen through. Now the good news. The featured speaker at the January meeting will be Mr. Richard L. Kaye, founder of the annual WHRB Humor Orgy, host of "WCRB Saturday Night," bumper-sticker promoter of note, Manager of the Boston Symphony Orchestra's Transcription Trust, and Manager of WCRB. The meeting will be held in room 314 at B. U.'s Sherman Union at 775 Commonwealth Avenue, on Sunday Jan. 21 at 5:00 pm. Enter the basement from Commonwealth Ave. or the rear access road and use the elevator to ascend to the third floor.

Letters to RCA. According to an informal poll at the last meeting, only about three members had written their letters to RCA commenting on the Quadradiscs which were given to us by RCA through the efforts of Victor Campos of KLH. This level of apathy bodes ill for the Society because it suggests that B.A.S. members don't really care very much about the future availability of natural-sounding recordings -- specifically that you don't care enough to bother to write even one letter in order to try to influence the only major American record company which is showing any interest in natural sound.

It is both in your long-term self-interest (if you want good records) and in your short-term self-interest (since your apathy will discourage future freebies) to write a letter commenting on RCA's and Columbia's uses of the four-channel medium and making clear what kinds of quadraphonic recordings you will be willing to buy (fullscale three-dimensional realism, or a mini-orchestra in each corner of the room?). Send your letter to R. Peter Munves, RCA Records, 1133 6th Avenue, New York, N.Y. 10036. Then send a copy to Thomas Frost, CBS Records, 51 West 52nd St., New York, N. Y.

Master Tape Audition. Alan Southwick is arranging an audition of some of his recent recordings of the Newton Symphony Orchestra. BAS members are welcome to join the Newton Symphony members at the audition. Orders for dubs from Alan's Dolby A Master tapes of the Symphony can be placed at that time. See Alan at the BAS meeting for details.

Suggestions Solicited. The Executive Committee would appreciate suggestions from members about activities, programs or articles' Don't forget ideas for the Library are still needed. Anyone wishing to volunteer for working on the Library or who has suggestions about a "Library of Sound" should get in touch with Al Foster at the meeting.

## REVIEWS AND REPORTS

December meeting. The December meeting of the BAS was held on the 17th in the River Terrace room at the Sherman Union, with about 40 members attending. The direct-disc recordings on the Sheffield Label, which Al Foster had taken orders for in November, were delivered. Orders were taken for a group purchase of the DBX 117.

The meeting featured a demonstration of the DBX professional noise reduction system. The display, involving two Phase Linear 700 power amps, four Array 12 speaker systems, four Acoustic Research AR-3a's (two of them with non-AR midrange elements for higher sustained power handling), and assorted recorders and accessories, was provided and setup by David Blackmer, President, and René Jaeger, Products Manager, of dbx, inc.

René Jaeger briefly summarized the history and use of compressor-expanders, noting that compression and/or peak-limiting is employed in the production of virtually all records and broadcasts. This is considered necessary because a concert or studio recording session can involve, between the peak momentary sound levels and the hall's background noise, a total dynamic range of 80 dB or more, while recording and transmission media are limited to a maximum range of about 50-60 dB (and often are deliberately limited to much less). DBX has introduced two classes of equipment to attack this problem.

(1) A decibel-linear (i.e., unobtrusive and natural-sounding) expander/compressor, the Model 117, for expanding already-compressed sound sources (nearly all records and broadcasts), so as to restore the original dynamic power of the music and, incidentally, suppress playback noise. It can also be used in tape recording as a noise reducer. It is worth noting that RCA is currently using a fairly linear type of compressor, so playback expansion is especially natural. Others, such as DGG and also WGBH on the BSO, make heavy use of peak-limiting, which erases the distinction between loud and very loud, and this is more difficult to restore on playback.

(2) A series of professional noise-reduction units for live tape recording. The series ranges from multi-channel studio units down to the Model 152, a two-channel consumer unit, switchable for recording and playback, for \$400. These systems use compression in recording and expansion in playback to achieve noise reduction, but they also incorporate frequency-response weighted circuits to manipulate response according to signal level and frequency (a little like the B Dolby), so as to minimize the "breathing" of the background noise, a potential problem with any noise reduction system. The result is a tape noise reducer which has the operating simplicity of the type B Dolby but produces greater dynamic range than the professional type A Dolby -- to the point where the dominant noise in live recordings is not the tape hiss but mike preamp noise.

Extended musical samples were played, ranging from contemporary percussion and rock ensembles to Copland and Messaien. With the volume set for momentary peak sound levels of over 120 dB (at which point the Phase Linear 700's were just clipping, wafting a total of about 4000 watts into the room), no tape hiss was heard in the quiet passages -- even when a cassette was used as the signal source.

### Equipment Listing

Members with equipment to sell may list it with the Society by writing to the BAS at Post Office Box 7, Kenmore Square Station, Boston 02215. Those wishing to buy equipment should see Joel Sanberg at the BAS meetings or call him (244-2357). The following are some new additions to the equipment list

KLH #18 tuner  
KLH 55 compact  
Boxer cooling fans  
Acoustech XII amplifier  
Tubes: EL34/6CA7  
R.B. Annis Pocket Magnetometer  
Cecil Watts Parastat MK11A  
Cecil Watts Parastat MK4  
Head Demagnetizer  
Garrard Lab 80  
Garrard A70  
Dual 1210  
Records: Symphonic, all periods  
Record cases  
Recording tape: TDK and Scotch

Uher 4200 two-track portable stereo tape deck (Al Southwick)  
Ampex 1450 four-track Stereo tape deck, reversible

Revox service manual (Al Foster)

### BAS Publication

The most recent publication of the Society is attached and its value reaches beyond its title. One draws from the article the moral that it is wrong to live in fear of a tape recorder -- all one needs is a service manual, a little test equipment (borrowed if need be), and enough common sense to prevent obvious mistakes. Even then, one can still take the deck into a service agency to correct bias and equalization -- while these parameters can be maladjusted this won't do lasting harm to the deck.

Al Foster is lucky enough to use a Revox A77, Type III, half-track recorder; with a machine like this, anything but a thorough search for the best tape would have been a disservice. But members with lower priced machines may well find a tape and combination of bias and equalization settings -- and improved performance -- that could prove more satisfying than they might have suspected. While others may have to approach the problem differently than Al Foster did (other machines may have both pre-record and playback equalization, or more stringent biasing specs than Al's Revox), the ground rules are well set forth here. Go ahead and tinker.

Aside from the main thrust of the article, there are nuggets of information on tape handling and storage, and the professional way to spool tape avoiding wear and tear. The method of tape storage was written primarily from the point of view of a half-track machine but the same principle applies to quarter-track. You should always store tape as it is wound onto a reel at normal playing speed. This insures tight and smooth winding. If you want to have the tape stored on a particular reel, it might be necessary to rewind before recording or playing.

Note:

Copies of the Constitution and By-Laws are available to new members who wish them. See Joyce Brinton at the meeting if you would like a copy.

A Publication of the BAS

HOW TO DECIDE WHICH TAPE TO USE

by  
Alvin Foster

If you are like most tape recorder enthusiasts you probably have become confused by the claims of tape manufacturers. Many brands promise the lowest possible noise, no print through, the highest possible output, and the fewest dropouts of any tape on the market. The picture becomes even more confusing when the claims within a manufacturer's own line are escalated to the point where differences as advertised are indistinguishable -- leaving you to rely solely on price differences and guessing.

The advertising of most tape manufacturers is misleading and does the consumer a disservice; it does not enable him to make a reasonable purchasing decision based upon his specific needs.

Lofty claims are not confined solely to open reel tape but also are duplicated for cassettes. Each cassette manufacturer promises to do more for you than the other, and many iron oxide cassettes promise to deliver more than the CrO<sub>2</sub> cassettes.

Previously I paid little attention to the varied claims of tape manufacturers but the recent acquisition of a high quality open reel tape recorder forced me into the breach. I had to decide which tape to buy in order to bias and adjust the machine for optimum record and playback results.

My search started with the relatively new Scotch 207 from 3M. I already knew that Scotch 203 was said to be a superior tape and accepted as a broadcast industry standard. So after reading 3M's specs and claims, I adjusted the bias and equalization for the optimum results with the 207. The record/playback response was adjusted to within  $\pm 2$  dB from 20 to 20,000 Hz.

I was very satisfied with the results but still intent on finding the best tape for my needs. So I purchased one reel each of the various low noise tapes: Scotch 203, BASF LP-35LH, Sony SLH-180, Scotch 207, Memorex 1800, Maxell UD35-7, and TDK 1800-SD. I used several techniques to test the various qualities of each tape manufacturer and determined at the conclusion of the tests to adjust my tape recorder for the winner.

Each test series was repeated a minimum of three times and the results averaged. Differences of 1 dB were not considered significant. In any event, the relative rankings would remain unchanged.

Dropout

Dropout is defined in 3M's publication "101 Terms," as occurring during playback. It is "...the instantaneous loss of a recorded signal due to imperfections in the tape. ...most commonly

these imperfections are high spots on the tape surface which push the tape away from the magnetic head ...." Since the dropouts are more easily heard at higher frequencies the audible effect with music will often be an intermittent 'dulling' of the sound for up to a second or two. Dropout is particularly severe in the first and last few feet of most open reel tapes due mainly to the mistreatment that these sections endure in the normal loading and unloading of the tape. This is the reason why some manufacturers include a few feet of leader tape and why a tape recording perfectionist never records a signal on the first or last few feet of tape. Of the tapes included in these tests only Scotch 203 and Memorex were without leader tape.

To test for dropout the author used a procedure similar to the one described by Julian Hirsch in STEREO REVIEW (September 1971) on "Laboratory Tests of Cassette Tapes." The test procedure requires that you record a 10 kHz tone at 72 ips for three minutes on the tape and observe the playback results over an AC VTVM. The playback amplitude variation in decibels gives a rough guide to the dropout qualities of that particular tape.

Table 1 gives the results of my findings using brand new tape: Maxell and Scotch 207 were best here with Sony coming in last. The table reflects only minor differences; however, the results change dramatically for some of the tapes after use. Tale 2 gives the performance of 'old' tape -- used in these tests -- BASF and Memorex grew much worse.

Maxell UD35-7	1.0
BASF LP-35LH	1.2
Sony SLH-180	4.0
TDK 1800-SD	1.2
Memorex 1800	1.2
Scotch 207	1.0
Scotch 203	3.0

Why? My theory is that these two tapes deteriorated more rapidly because of the stiffness of their polyester backings and not because of oxide imperfections. The Memorex and BASF backings were much stiffer than the others and more easily creased or permanently pinched. Thus these two tapes could be more easily abused by mishandling.

Maxell UD35-7	1.5
BASF LP-35LH	3.0
Sony SLH-180	5.0
TDK 1800-SD	1.5
Memorex 1800	3.0
Scotch 207	1.3
Scotch 203	3.5

I was surprised to find such noticeable deterioration between new and slightly used tapes and was convinced that careful handling of tape is a prerequisite to good recording. Even the type of reels one used effected dropout. Take up reels which cover the tape with only one or two small holes for threading protect it because the larger plastic area covering the tape inhibits pinching or creasing

of tape as the reel is handled. The pressures exerted when handling the reel of tape are distributed more evenly over the tape edges.

TDK, Maxell, Sony, and BASF, in that order, come with the best designed reels for minimal handling abuse and actually are easier to thread than the Scotch and Memorex reels.

Another procedure you can use to minimize the negative effects of handling tape is to record 'backwards' on a reel of tape. You simply wind a new reel of tape onto a well designed take up reel and then record from that reel, meanwhile spooling onto the original reel. There is some inconvenience involved with this procedure in that you must unwind a reel before you can play it back, but your program source is stored in a tightly wound and more importantly an 'evenly' wound position. The even winding adds insurance that there will be fewer tape edges exposed to pinching when the tape is handled.

Of course, avoid warped reels. Warped reels or reels that are seriously out of round are a prime cause of pinched tape edges. The procedure for obtaining near perfect reels will vary with the individual. I buy several reels at a time and exchange the warped ones.

The importance of dropout will vary with the design of the recorder's tape transport, the width of the tape track, and recording speed. A 3 dB dropout at 7 1/2 ips may be inaudible, audible at 3 3/4 ips and disturbing at 1 7/8 ips. The speed factor and many others make cassette recorders more prone to dropout; however, cassettes have a key factor in their favor -- the tape is completely enclosed in a nearly crush-proof container which minimizes the dust, dirt, and handling problems which plague open reel tapes. Most cassette recorders go a step further by completely enclosing the cassette transport area during use to keep dust from contributing to dropout. Still other cassette design factors may make audible dropout a serious problem.

### Sensitivity and Printthrough

Tape sensitivity is the amount of output for a given input. The tape sensitivity can be measured easily by recording a one kHz tone at a fixed input level on each tape and afterward measuring the relative outputs on an AC VTVM. A high output signal usually means a higher signal/noise ratio -- less tape hiss. This is because the recorded signal is further above the tape's inherent hiss level. Table 3 gives the results; TDK and Sony win here while Scotch 203\_ ranks lowest in this test.

Table 3

Output Level in dB Using 1 kHz Tone

Maxell UD35-7	-1
BASF LP-35LH	-1
Sony SLH-180	0
TDK 1800-SD	0
Memorex 1800	-0.8
Scotch 207	-0.3
Scotch 203	-1.8

I was not satisfied with this test procedure, which is fairly standard, because I do not feel a test tone represents the complex character of music or gives any indication of the tape's sensitivity at other frequencies. Fortunately, I have a Scott 811-B Noise Generator which offers 'pink noise' output. Pink noise is not a communist plot, rather it is random noise, but with constant energy within each octave Pink noise in terms of its frequency and energy distribution closely resembles music. I, therefore, recorded pink noise at -20 W on each tape and then measured the relative outputs. In Table 4 TDK and Sony are still highest but the rankings have changed somewhat. Scotch 203 still is the least sensitive of the tapes tested.

Table 4

<u>Output Level in dB</u> <u>Using Pink Noise</u>	
Maxell UD35-7	0.5
BASF LP-35LH	-1
Sony SLH-180	0
TDK 1800-SD	0
Memorex 1800	-1
Scotch 207	-0.5
Scotch 203	-1.5

Printthrough is difficult to measure. It is the transfer of a signal from one layer of tape to the next. No attempt was made to quantify it because none of these tapes appeared to have any audible printthrough.

Table 5  
Frequency Response in dB at  
-20 VU at 7 1/2 ips  
(Tape Recorder Adjusted  
for Scotch 207)

Frequency Response

The results of the frequency response and output tests were the deciding ones for me; I selected the tape for which my machine is now biased and equalized largely because of these results.

Tape recorder frequency response is a measure of the recorder's sensitivity at selected frequencies. To perform this test all tones were recorded at -20 W at 72 Vs. Initially, with the machine adjusted for Scotch 207, I was less concerned about how flat the response was with the various tapes than with which tapes exhibited rising or falling levels at higher frequencies. A rising high frequency response would indicate which tape would have the lowest hiss level. As shown in Table 5, Maxell and BASF both have the desired rising characteristic starting around 2,500 Hz. Reduced hiss level using the Maxell or BASF tapes occurs because the tape machine's high-frequency playback de-emphasis can be increased.

Hz	Maxell	BASF	Scotch. 207
20	-2	-2	-2
30	-1	-1	-1
50	0	0	0
100	0	0	0
300	0	0	0
500	0	0	0
1,000	0	0	0
2,500	0.2	0	0
5,000	1	1	.5
8,000	1.6	1.6	.8
10,000	2	1.8	.1
12,000	3	3	0
15,000	3	3	0
16,000	4	4	-1
18,000	4.2	4.3	-1.2
20,000	4.5	4.8	-1.4



Increasing playback de-emphasis to offset rising high frequency response concurrently flattens frequency response and reduces hiss level of the tape by the same factor.

At this point I re-adjusted my deck's equalization to compensate for the observed rising response. (The service manual of the author's tape recorder recommends the same bias for the 207, Maxell, and BASF tapes.)

All the following tests were performed with the tape recorder adjusted for BASF and Maxell. Table 6 gives the frequency response of each tape. The winners here are clearly BASF and Maxell which seem to have the greatest nature? high frequency retention. Scotch 207 comes in last.

Table 6

Frequency Response in dB at -20 VU at 7 1/2 ips

(Tape Recorder Adjusted for BASF and Maxell)

Hz	Maxell	BASF	Sony	TDK	Memorex	207	203
20	-2	-2	-2	-2	-2	-2	-2
30	-1	-1	-1	-1	-.5	-.5	0
50	0	0	0	0	0	0	0
100	0	0	0	0	0	.5	0
300	0	0	0	0	0	0	0
500	0	0	0	0	0	0	0
1,000	0	0	0	0	0	0	0
2,500	.5	.5	0	0	0	0	0
5,000	.5	.5	0	0	0	-1	-.5
8,000	.5	.2	-.5	-.8	-.6	-1.6	-1
10,000	.6	.2	-1	-1.1	-1.2	-2	-1.5
12,000	0	0	-1	-1.5	-2	-3	-2
15,000	0	0	-1.2	-2.2	-2.2	-3	-3
16,000	0	0	-2	-2.5	-2.2	-4	-3
18,000	-.5	-.7	-3	-3	-3	-4.5	-3.2
20,000	-1	-.8	-3.6	-4.5	-3.5	-5	-4

High frequency saturation

A test that separates the men from the boys is a check of a tape's retention of high frequencies recorded at 0 VU. All tapes experience high frequency saturation of varying degrees when recorded at levels above -20 VU. That is why tape recorder manufacturers recommend that all frequency response tests be run at -20 W or below. But I feel a frequency response test at that level doesn't represent the way a recorder is actually used when recording music. When recording, you will probably permit your VU meter to read slightly

below 0 VU for the average levels and above 0 VU on the peaks. And when saturation occurs on peaks the recording can sound dull.

Information gained from recording test tones at -20 VU is interesting but gives you little indication of what really happens when recording music at higher levels. The test I designed to measure tape saturation at high frequencies was to record 10 kHz, 15 kHz, and 18 kHz tones at 0 VU. One kHz was used as the reference frequency. In Table 7 a correction factor is included to compensate for the tape's response to the same frequencies at -20 VU. In other words, if Scotch 207 was down 2 dB at 10 kHz when recorded at -20 VU, 2 dB was added algebraically into the results for 0 VU record levels.

Table 7

Saturation Test at 0 VU in dB

	<u>10 kHz</u>	<u>15 kHz</u>	<u>18 kHz</u>
Maxell UD35-7	0	-1.5	-2.8
BASF LP-35LH	0	-1.0	-2.5
Sony SLH-180	-1	-1.7	-4.0
TDK 1800-SD	-1	-2.3	-4.7
Memorex 1800	-0.4	-1.2	-3.0
Scotch 207	-1.3	-2.0	-4.5
Scotch 203	-0.7	-1.5	-3.3

Table 7 gives you the results of the saturation test. BASF and Maxell are clear winners here again while TDK and 207 are the losers. BASF and Maxell's retention of high frequencies at a playback level of 0 VU at 10 kHz and 15 kHz indicates that the dulling experienced by high record levels may be less of a factor in selecting record levels. This means that cymbal clashes and the last whomp of the orchestra will be retained with little or no loss of the high frequency sheen.

Out of curiosity I repeated the test using a +3 dB VU playback level and with same frequencies. This test was designed to find out if the differences between the tapes shown in Table 7 remained and to see how much loss occurred at high frequencies at that record level.

Table 8 shows that the differences between the tapes remain about the same; Maxell and BASF are still within 2 dB of the 207. However, high frequency roll-off has increased an average of 3 dB for all tapes at 18 kHz while 10 kHz is down only about one dB. Since most musical energy lies below 10 kHz, the audible effect of recording at levels slightly above 0 VU should be negligible as far as loss of high frequencies is concerned. Distortion resulting from high record levels now is the main limiting factor with BASF and Maxell tape.

Table 8

Saturation Test at +3 VU in dB

	<u>10 kHz</u>	<u>15 kHz</u>	<u>18 kHz</u>
Maxell UD35-7 -	1.0	-2.8	-5.7
BASF LP-35LH	-0.9	-2.1	-5.4
Scotch 207	-1.5	-3.5	-7

Cost and Other Factors

Table 9

List Price for 1,800 ft.

Table 9 gives the list price of the various tapes as listed in the Stereo Directory and Buying Guide 1973. A quick check of the major hi-fi retail stores in the Boston area indicate that none of these prices really apply. For example, Table 10 gives the actual purchase price at Tweeter, Etc. As you can see, BASF is clearly the winner here.

Maxell UD35-7	\$8.55
BASF LP-35LH	6.85
Sony SLH-180	6.49
TDK 1800-SD	4.99
Memorex 1800	6.85
Scotch 207	7.70
Scotch 203	6.85

BASF is another winner when it comes to packaging. BASF tape comes in a hard gray plastic case with a hinged slot from which the tape is removed. It has two stick-on labels and a foil strip to actuate the stop mechanisms of tape recorders so equipped. The tape is further packaged in an additional soft plastic container. The two winners for my money are Maxell and BASF. BASF gets the best buy award and Maxell gets the prize for the best all around performance. But no single tape had all the virtues or won all the tests. The ideal tape would have the 207's non-slip backing and non-creasing properties, BASF's high frequency retention and packaging, 207's dropout characteristics, the reel design of TDK and Maxell, the output level of TDK and Sony, and BASF's price.

Table 10

Selling Price for 1,800 ft.

Maxell UD35-7	\$5.75
BASF LP-35LH	4.79
Sony SLH-180	5.25
TDK 1800-SD	5.35
Memorex 1800	5.25
Scotch 207	\$5.50-6.00
Scotch 203	5.00

Cassettes: Iron Oxide vs CrO<sub>2</sub>

I decided to run the saturation test on two CrO<sub>2</sub> cassettes and the Maxell iron oxide cassette. The Maxell UD C-60 cassette is representative of higher quality iron oxide cassettes.

Table 11 shows that CrO<sub>2</sub> is the clear winner. The CrO<sub>2</sub> Advocate Cassette was down only 1.1 dB at a -5 VU playback level. By contrast, the iron oxide cassette was incapable of recording a flat

frequency response curve above -30 VU and in my opinion probably would fail the pink noise and high level recording tests.

Table 11

Cassette Saturation Test

<u>Advocate CrO<sub>2</sub></u>	<u>Record/Playback Level</u>	<u>Frequency</u>	<u>Response in dB</u>
	0 VU	10 kHz	-14.5
	-5 VU	10 kHz	-1.2
		15 kHz	-6.8
	-10 VU	10 kHz	0
		15 kHz	-1.8
	-20 VU	10 kHz	0
		15 kHz	0
<u>Maxell</u>	-5 VU	10 kHz	-12.5
	-10 VU	10 kHz	-5
	-15 VU	10 kHz	-1.5.
	-30 VU	10 kHz	0
		15 kHz	0

A more detailed analysis of cassettes may follow but for now the Advocate CrO<sub>2</sub> cassette seems to perform better than the BASF and Sony CrO<sub>2</sub> cassettes. The Ampex CrO<sub>2</sub> cassette's performance seems identical with Advocate's and usually the Ampex cassette sells for less.