THE B.A.S. SPEAKER

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THIS MONTH'S PUBLICATIONS

Greater Boston is fortunate to have WCRB AM and FM. As one of only six commercial full-time fine music broadcast outlets in the United States, WCRB caters to a discriminating audience. This is made financially possible by income derived primarily from the sale of a "motivational background music service" and commercial advertising. Authorized by the FCC, subsidiary communications authorization (SCA) allows WCRB to use a portion of its FM broadcast channel to distribute background music throughout greater New England. This service is sold on a subscription basis to business and industry. The income thus derived is an absolute necessity to finance WCRB's full-time fine music programming.

While SCA may make the broadcast of music financially feasible, the accompanying birdy can make the music broadcast almost unlistenable. So, this month we have a publication by Alan Southwick based on interviews with Kevin Mostyn, Chief Engineer at WCRB. Broadcast techniques and legal limits are discussed—and so is the uncomfortable point that today's birdies are most apt to originate in your tuner rather than at the station.—Jim Brinton

Even if the music was too loud for some of the faint of heart, Dick Burwen's demonstration of his dynamic noise filter excited a good deal of comment. It was a product which—at the October meeting at least—seemed to be either superb or no good, depending on your point of view. This was an obviously unrealistic evaluation, so we took a unit into the group for some extended listening. Happily, and more rationally, the DNF-1200/1201 appears to be very useful in the proper situations.

This month, we publish two reports on its use. We would have liked to have involved more people in the evaluation, but one of the IC's in the DNF failed in the midst of testing. We are trying to get another unit, and until Dick Burwen can free one up, we at least can read the interim user's report in this month's Speaker.—Jim Brinton

COMING UP

Publications and features on the way include:

• A low-cost, high-performance noise generator designed by Rene Jeager uses one FET and two IC's to produce either pink or white noise at the flip of a switch. The linearity of response is limited only by the tolerance of the passive components used.

• In "Son of a Witch-Glitch Switch," Dan Shanefield will provide a hands-on guide to A-B-versus-live-performer comparisons together with notes on building the sort of switches needed to make comparisons without blowing out speakers, amps, etc.

• "Using Your Sine-Wave Oscillator," by Peter Mitchell, will explore applications for the BAS oscillator, many of which may be new to you.

• Peter Mitchell strikes again with notes on how to modify your FM tuner to use a phase-locked-loop stereo demodulator chip. This is a simple modification that will add new life to older tuners, increasing stereo channel separation, lowering distortion, and cutting SCA interference.

Speaker COMMENTS SOLICITED

Before the new distribution and printing methods were introduced in October, the Speaker reached members a week before meetings and there was an opportunity to discuss its content then. This sort of immediate feedback was valuable, but we aren't getting it now- So we would like to solicit cards and letters, gripes and praise, if appropriate; tell us when we do something you like or dislike. Also, we would like to have, from the membership, suggestions as to topics you would like to see covered in the Speaker, and volunteers to help with such coverage. We need authors, ideas, and criticism, in that order, and any member input will be appreciated.

Note on the November Mailing. When the November Speaker was packaged, there were some glitches in the sealing of the plastic mailing envelopes. So if you did not receive the November issue, or received it in damaged condition, please let us know.

BULK TAPE PURCHASE

Al Foster will make Maxell UD-35 recording tape available to BAS members at a price of $3.75/reel; this price is well below discount rates. Also, Al has Advocate cassettes (C-90) in hand at a very low price of about $1.89.

TDK AUDUA REVISITED

In October (see "How the New Open Reel Tapes Compare," Alvin Foster), I concluded that TDK Audua's rising high-frequency response made it the hottest tape on the market. Unfortunately, Audua's severe dropout kept me from displacing my test standards in high-end response, Maxell UD-35 and BASF LP-35LH.

Since that time, I have obtained a second sample of Audua and found it to have excellent drop-out characteristics. In fact, it compares favorably with Scotch Classic and Maxell- Audua shows 1 dB more output at 1 kilohertz than Maxell and 1 dB less than costly Classic, and therefore will—with proper bias and equalization—help improve the signal-to-noise ratio performance of your tape/recorder combination.

The Audua also requires less bias current than Maxell. So, if you formerly had trouble biasing for Maxell, try Audua.

The price of Audua in Boston is higher than Maxell, but competitive enough for it to be considered a personal reference standard.—Alvin Foster.

Anyway, the effect is that of increasing the apparent signal-to-noise ratio of the tape. Also, because there is less danger of breathing, one can use higher degrees of compression than possible before; say 1.5, up from 1.1 or 1.2. This is good because the tape deck's signal-to-noise ratio is multiplied by the compression factor. And as noted, you often don't need the DNF on playback, assuming that the dbx's expression control is set properly.—Jim Brinton

Comment

I was able to use a Burwen DNF-1200 briefly and compared it to a dbx 119, which I also use as an after-the-fact noise reducer. I basically like the DNF-1200, but found it to be only marginally useful beyond what the 119 does for me. If it were substantially less expensive, I would probably add it to my system.

Both units effectively reduce noise by lowering gain at low input levels. The DNF-1200 lowers gain only at high frequencies, thus reducing the volume of high-frequency signals and hiss. The dbx 119 lowers gain at all frequencies, thus reducing the volume of the entire signal and all noise including hum and rumble. The dbx 119's response is keyed to the power level of both channels at all frequencies while the DNF-1200 is keyed to the relative absence of low-level, high-frequency signals (musical harmonics).

Properly adjusted, neither should affect system response to musical signals at any level- Both devices have a single control that sets the amount of action. An ideal, noiseless signal should need no action while a noisy source needs as much as possible. And there's the rub.

Both work well and unobtrusively on good sources which have only slight tape hiss present. The DNF-1200 attenuates the hiss at low levels with little noticeable effect on the music- The 119's operation can be more noticeable since it lowers the music level too (and raises the high levels as well).

I prefer expanded listening and usually leave the dbx 119 set for 1-1 expansion which, for me, adequately reduces the slight residual noise in most good source material.

I used some 78-rpm records, a TV sound signal, and some non-Dolby cassettes to compare the dbx 119, DNF-1200, and my old Scott Dynaural preamp. The Scott reduces gain at both high and low frequencies, slowly responding to total signal level; it's sort of an active, reverse loudness control.

The DNF-1200, of course, did not remove 60-Hz hum and buzz from the TV signal regardless of level settings (not all noise is hiss). The high-frequency surface noise of the 78-rpm records could not be cut down as much as I would have liked before noticeable breathing occurred, and finally, low-level highs were lost.

The dbx 119 reduced all noises equally well at low settings. Increasing the expansion setting resulted first in breathing and then, in place of removing low-level highs, it added a "pumping" sensation to the sound.

The Scott operated so slowly as to dull all soft passages. Also quick peaks stayed muffled and slow build-ups gained brilliance.

Subjectively, I would grade the dbx 119 best all around and the DNF-1200 superior for tape hiss. I did not notice an advantage in using them together, but it seems possible.

I spent a lot of time switching the DNF-1200 in and out while varying the level control to be sure that the highs were not being overly affected. This was an annoyance that I hope would go away once familiarity was established. I recall doing the same with the dbx 119, which now is less often readjusted. Since the dbx 119 has other uses in addition to unilateral noise reduction and is less costly, I would have to recommend it over the DNF-1200.--Joel Cohen

Three-head cassette decks, pioneered (if you'll excuse the expression) by Nakamichi, and introduced here by Ed Nakamichi at a BAS meeting 18 months ago, offer monitoring and other advantages usually associated with open-reel machines. Unfortunately the first units, like Nakamichi's own Tri-Tracer 1000, were in the kilobuck category. Now things are changing for the better.

Hitachi and Akai both showed three-head cassette units. Hitachi's D-3500 is a redesigned model of a prototype first shown about a year ago. It uses something called "double-Dolby," and carries a $330 price tag. Akai's GXC-325D is a directly competitive unit with dual servo-controlled capstan drive, Dolby, and the firm's so-called "automatic distortion-reduction system." Price is $367.

Perhaps egged on by the acceptance of Revox's A-700, several firms are showing more costly open-reel decks. Sony's entry, the TC-8750-2, is a four-head, two-track machine (two-way record and playback) with ac-servo-controlled, closed-loop, dual capstan system, optical peak-reading meters, and a real-time tape counter. Frequency response is a claimed 20 Hz to 40 kHz, and the price is a modest $1833. The machine seems designed as much for hi-fi applications as to help Japan's balance-of-payments problem.

Akai's open-reel giant, the GX-400D, appears to be similar to Sony's, perhaps lacking some of the more flossy features. Still, the price is $1600. And by contrast, Teac's A-7400, already advertised stateside, seems quite modest; for only $993, it offers most of the features of the Sony and Akai machines, plus three-level bias/equalization, edit, cue, and memory-automatic-stop functions.

With the exception of the Teac deck, almost none of this equipment is yet on the U-S. market. Look for it this spring.

THE GREAT DOLBY FM COPY FALLACY

It has been known for some time that the FCC eventually would authorize the use of Dolby-B encoding in FM broadcasting, and in anticipation of this, most manufacturers of cassette recorders have advised in their instruction manuals that you can switch off the Dolby and can record Dolby-encoded broadcasts straight (using the occasional broadcast calibration tone to set the input level controls for proper Dolby calibration), and that you can then play back the recording with the Dolby decoder on and hear a correctly decoded, noise-reduced signal.

We've got bad news for you; it won't work very well. It may be that in some cassette recorders with appropriate internal switching the recorder's Dolby circuit will be usable for decoding Dolby-FM broadcasts <u>for listening</u>. But it will not be practical, with any cassette recorder, to record Dolby-FM broadcasts directly in their encoded form with the intention of decoding them on playback because severe tape saturation will be encountered.

This depressing situation, the first public mention of which appears to have been on the October 19 "Shop Talk," is due to two specific differences between the Dolbyized FM and cassette media: a different relationship between the Dolby calibration level and the maximum usable modulation level, and—more serious—different treble equalizations.

The Dolby calibration tone level in all Dolby-encoded FM broadcasts will be a 50 percent modulation level. But musical signals can be broadcast at up to 100 percent modulation (and some stations illegally use even higher peak modulation levels, i.e., musical peaks can reach 6 dB higher than "Dolby level"). Now, in open-reel recorders, this would be no problem; measurements show that in many open-reel machines, the tape distortion remains fairly low at modulation levels more than 8 VU above Dolby level. But cassettes contain thinner oxide than open-reel tape, and this reduces the modulation level at which serious distortion begins. At midrange frequencies, the

maximum usable modulation level in cassettes is just about 0 VU, and at bass frequencies, distortion due to tape saturation becomes noticeable if the recorded level rises much above -10 VU. So if you follow the prescribed procedure to record encoded broadcasts, setting the input levels for correct Dolby calibration, the musical peaks in the broadcast will saturate the cassette tape- You cannot solve the problem by turning down the recorder's level controls, because that would mis-calibrate the Dolby, producing volume-dependent frequency-response aberrations on playback.

To keep the record straight, we should mention that in stereo FM, 8 to 10 percent of the permissible modulation index is used for the 19-kHz pilot tone and another 10 to 20 percent is used for the modulated multiplex subcarrier, so that in stereo operation the maximum baseband modulation level is normally 70 to 80 percent, or 3 to 4 dB above Dolby level- This ameliorates the situation a little, but hardly enough; experienced cassette recordists know that peak music levels usually must be kept below the Dolby cal level (way below on some kinds of music) in order to avoid saturation and a "congested" sound quality.

In the past, American FM stations have used a 75-microsecond pre-emphasis of the high frequencies in broadcasting. Because of this massive treble boost (about 13 dB at 10 kHz), the maximum modulation usually is caused by the high-frequency part of the signal. This has forced broadcasters to reduce the overall volume level of the audio signal in order to avoid high-frequency overmodulation, with the result that the midrange modulation (which corresponds to subjective loudness) stayed rather low. To avoid this, most stations use Volumax-type limiters which leave the audio signal alone at low levels but chop off the high frequencies when the signal gets loud, thus permitting the FM broadcaster to put out a "loud" signal without getting the high-frequency overmodulation that the 75-microsecond pre-emphasis would produce if the highs were left in.

Henceforth, however, stations that elect to use Dolby encoding will switch to a 15-microsecond pre-emphasis (involving very little treble boost—only about 4 dB at 10 kHz). For the broadcaster, this is good; it eliminates the problem of high-frequency overmodulation and so voids the need for Volumax-type limiters- Broadcasts then can contain midrange modulations up to 80 percent stereo maximum (+4 dB re Dolby level) while still retaining full treble content. For people listening to the broadcast, this certainly is an improvement.

But if you try to use the "Dolby FM copy" procedure to record the encoded broadcast straight, an incompatibility arises- Cassette recorders employ a 120-microsecond pre-emphasis in recording, with a boost of about 18 dB at 10 kHz- So if in recording you put midrange frequencies on the tape at a level equal to or higher than the Dolby cal level, treble frequencies will go on the tape at a level many dB higher and will saturate the tape-

This is one reason why Advent and Tandberg use equalized meters that register the boosted treble; by showing you when high-frequency saturation would occur, they induce you to lower the overall recording level to prevent it. Similarly Teac uses a non-standard "0 VU" which is 3 dB below the Dolby cal level, in order to induce you to under-record the midrange frequencies and thereby avoid high-frequency saturation of the pre-emphasized signal- But in the "Dolby FM copy" procedure, you would not have the freedom to hold down your recording level: you would have to keep the input level up where it was set when the Dolby cal tone was broadcast in order to maintain proper Dolby calibration.

So, as we said at the outset, the advertised Dolby-FM copy procedure will produce severe and unavoidable tape saturation in cassette recorders. In order to make a really good cassette recording from a Dolby-encoded FM broadcast it will be necessary to use a separate Dolby unit, attached to the tuner and calibrated via the broadcast calibration tone, to decode the FM signal. The decoded signal can then be fed to the amplifier, listened to, and recorded like any other normal signal using the Dolby circuit in the cassette deck as for any recording, and setting the recording

STP Seems Safe

Several people in the BAS have tried the tonearm damping modification described in the January Speaker on their own record players, and everyone I've spoken with has been pleased with the improvement. The audible difference ranges from subtle to terrific, depending on the cartridge, arm, and record in use. In all properly adapted cases, however, it's safe to say that the bass is cleaned up and overall detail is enhanced.

The only "complaint" that has been received is about the use of STP as a damping fluid. The fears are that STP, a petroleum product, may attack the elastomer parts of the turntable, including the cartridge suspension block. One member—our president—reported having his record mat crumble in his hands when he peeled it off the turntable. This, of course, was very sobering, so I set up a test to determine the possible dangers of STP. I put about 4 or 5 cc's of STP in a small plastic box (1 by 1.5 by 2 inches), placed a piece of similar foam above the fluid, and covered the box. After a week's time had passed, I removed the foam and tried to tear it, but it seemed just as strong as an "untreated" piece of the same material.

Since my own damping system has been in use for three months, with a dust cover when not in use, and I have had no obvious trouble, I feel that STP is probably safe to use.

As with anything new, however, it's wise to be careful, so I would advise watching for ill effects no matter what damping fluid is used. (Jim Brinton's turntable mat was old; maybe it just rotted.)

I'm currently investigating the use of Dow-Corning 200 silicone fluid as a damping material. This substance is nontoxic, rubber-compatible, and is actually used in hand creams, suntan lotions, hair grooming aids, furniture polish, and in food processing applications. It is available in viscosities ranging from 0.65 centistoke (water is 1 centistoke) to 100,000 centistokes (just try and spill some). It is also temperature-stable, so damping characteristics won't change with the weather. Once a suitable viscosity is determined, the information will be published in the Speaker, and since the material generally is sold only in large quantities, perhaps a group purchase can be arranged.—Bob Graham

(Ed. Note: As you can appreciate, we are trying to get this matter straightened out. Unfortunately, as we went to press, there came word that both STP and silicone fluid can—at least sometimes, and by a poorly understood mechanism—find their way to other parts of the record-playing system. This has not proven to be a problem in all systems, nor is either STP or silicone harmful to all materials. But since the possibility exists that either may be harmful to some materials (as STP is to nonsynthetic rubber, for example), we encourage you to use the fluid you already are using until we can evaluate realistically the degree of risk—if any—involved.)

Backcoating Versus Tape Wrap

Some surprising results were obtained when I decided to measure the frequency response of the Revox Mk III half-track recorder with some back-coated tapes. My results indicate that the so-called "posi-trak" coating, because it makes the tape thicker and/or less flexible than normal, decreases tape-head contact and reduces the quality of the head wrap. The net result is to measureably affect frequency response. For example, at 15 kHz Scotch Classic, Scotch 206, Ampex 9472-002, all of which have back coatings, were down 1 dB.

To restore the frequency response and lower the dropout rate, the large/small reel switch on the Revox had to be switched to the large-reel position regardless of the takeup reel size. As expected, there was no variation in performance when the reel-size switch position was changed with non-back-coated tapes such as Maxell UD35, BASF LP-35LH, Scotch 212, or TDK Audua.

The Citation had a good deal of hum, more than any of the other units, and more than a tuner of this price category should have- Rearranging power plugs didn't help. The other tuners had no audible hum.

SCA Rejection. The TX-9100 was best, with essentially perfect audible rejection of SCA-birdy material- The Sony and Citation were about equal, while the Marantz was worst. The antenna was aligned for minimum multipath on WCRB—essentially zero multipath at the test location-

Weak Station Performance. We located a very weak station at 107.1 MHz (WGHM, Skowhegan, Me., about 180 miles away). The Marantz was at its limit of sensitivity, but the signal was powerful enough for the 10-B to go into stereo operation- The TX-9100 had enough signal to deflect its meter fully halfway, and went stereo with good quieting- The Citation found the signal too weak for stereo operation, but was readjusted to go stereo, and did so with some hiss; it was the noisiest of the four in stereo. But the Sony, in mono, was noisier than the Pioneer in stereo.

There you have it—a far from exhaustive test, but perhaps useful to those about to buy an FM tuner in the higher price range. And also useful, perhaps, as an index of how far we may have come since the days of the Marantz 10-B.—Jim Brinton.

HIGH FIDELITY 'S TAPE RECORDER TESTS

The October Speaker reported my comment about High Fidelity's October 1974 report of "strikingly low" IM distortion in the Teac 2300, which I characterized as "highly misleading;" I suggested that the higher IM figures which they usually report in tape recorders were a result of inappropriate test procedures- We have received a detailed response from Robert Long, audio video editor for High Fidelity. (A copy of Long's letter is available to members on receipt of a self-addressed, stamped envelope.) He says that in fact the high-frequency component of the IM test tone is not recorded at a near-saturation level on the tape, as I had suspected-

> "The upper frequency in question is 7 kHz; the lower one is 60 Hz. They are mixed four-to-one and the combined level is fed to the tape 10 dB below the "standard' 0 VU for that format—that is, in this case, -10 VU NAB- Obviously a 7-kHz tone is nowhere near saturation at -10 VU in the open-reel format. As a matter of fact, the lab makes the same test at 0 VU in all our open-reel reports. Though these figures are not published we continue to ask the lab for them as an extra clue to equipment performance. Obviously if saturation were involved it would be far worse at 0 VU than at -10 VU. But, as a matter of fact, the two figures often are identical or very nearly the same."

When the question of high-frequency saturation in High Fidelity's test reports initially arose, it was in the context of cassette recorders with their considerable treble pre-emphasis. I erred in applying the same presumption of difficulty to the open-reel recorder test reports without checking the numbers—though at 7½ ips the treble boost is only about half that used in cassette machines.

Mr. Long goes on to say that although the Teac's meters read 6 dB high, the lab wasn't fooled; the IM test was correctly made at the same signal level on the tape as for other open-reel machines.

If High Fidelity's tape recorder IM test is valid, we still are left with a mystery. What do the often high IM-distortion figures in those test reports mean? Looking at High Fidelity's test reports for the last few years, I find reported IM values ranging from 1.2 to 4.2 percent (average 2.5 percent) at 7½ ips, and from 3.2 to 15 percent (average 6.5 percent) in cassette recorders. And is a recorder's sound quality correlated with its IM distortion?

In the March 1973 report on the Harman-Kardon 1000 cassette deck (with 15 percent IM reported for the left channel and 11 percent for the right), High Fidelity said that even with exceptional program material, copies made on the recorder sounded indistinguishable from the original—the highest compliment you can pay to a tape recorder. If 15 percent IM was inaudible in this case, why call attention to the Teac 2300's "strikingly low" 1.2 percent IM? What causes some machines to exhibit more IM than others and cassettes to have more than 7½ ips machines? Does the IM test actually reflect true IM distortion due to amplitude nonlinearity, and not something else such as scrape flutter? And isn't High Fidelity at least confusing consumers by publishing IM values exceeding a 10-to-1 range without making the difference meaningful?

Thanks to Bob Long for his detailed and informative letter. I apologize for having falsely accused High Fidelity of invalid procedure. He writes that the February 1975 issue will include an article by Ed Foster (formerly of CBS Labs) on "How We Test Tape Recorders." Perhaps there or in another issue the above questions will be answered.—Peter Mitchell.

IN THE LITERATURE

Absolute Sound, Fall 1974

- Reviews of the Magneplanar Tympani IIIa , Soundcraftsmen 2212 preamp-equalizer, Dyna 400 amplifier, SAE III CM amplifier. Ampzilla, and Transcriptors Vestigal tone arm; capsule reviews of the Phase 700 B, the ESS Preamplifier model III, and the Micro-Acoustics cartridge.

Audio Scene/Canada, Oct. 1974

- Audiolab Test of Twelve Headphones: Notable for frequency response curves made using simulated pina (outer ear), some of which agree, and some of which badly disagree, with manufacturers' specifications.
- Testing Speakers in Ordinary Rooms, Part I: A good introduction to objective testing by a member of the faculty of Ryeson Polytechnic Institute in Toronto (Part II will appear in November 1974 issue).
- Binaural Recording: Pitfalls and delights of binaural recording, in which the author notes that—in this application at least—headphones aren't designed to reproduce music at the ear.

Electronic News, Nov. 11, 1974

- A brief report on the Japan Audio Fair, lists the companies bringing out FET amplifiers as Sony, Toshiba, Kenwood, and Sharp (where are the Americans?). Also mentioned were two new Nakamichi cassette decks in the $400 to $500 price ranges.

Electronics World, Feb. 1966

- Amplification Using Switching Techniques: A discussion by Don Lancaster of class-D power amplification, or switching mode operation, which gives nearly 100 percent efficiency for audio amplifiers. Good background for the new Infinity Systems power amplifier.

Hi-Fi World, all issues

- (Formerly the Hi-Fi Newsletter) Wretched trash; avoid like the plague. Even if the quality were higher, it would still be overpriced. The only "functionally illiterate" hi-fi periodical.

Journal of the Acoustical Society of America, Sept. 1974

- Time-Variant Spectra of Violin Tones: Interesting for the complexity of the harmonic structure and the time variation of the harmonics of a violin.

Journal of the Acoustical Society of America, Oct. 1974

- Comparative Study of European Concert Halls: Not as good as it sounds; gives all the credit to reverberation time. [This journal may sound obscure, but the library of any self-respecting engineering school (electrical or mechanical) or any music school should carry it. —ed.1

Popular Electronics, Nov- 1974

- Measure Low Millivolts with a Multimeter: Using a 709 and a 741 to turn your meter into a millivolt meter with x10 or x100 gain modules; schematics and calibration instructions. Note seemingly low input impedance.

Popular Electronics, Dec. 1974

- Special Report on Hi-Fi: You've heard it all before-
- Digital filtering (for audio-frequency use), by tech editor Leslie Solomon: A one-pager worth all twelve pages of the hi-fi supplement. Bill Ziff should give Les Solomon his own magazine.
- Putting Your Multimeter to Use, by Leslie Solomon-

Scientific American, Nov. 1974

- Musical Dynamics: "Contrasts in loudness make music exciting- Many performers do not, however, produce the variations composers expect from them."

Stereo Scene/Canada, Aug. 1974

- Audiolab Test: First known review in America of Revox A700 tape deck. A good job, flawed only by postage-stamp-sized performance graphs. A700 doesn't appear much of an improvement over A77-III; has worse signal-to-noise performance.
- Canadian Pressings: North of the border, Columbia already is using from 25 to 50 percent reground (i.e-, used) vinyl in records, depending on "market prosperity." This gives "extra strength" according to Toronto plant manager Hans Klopher. More information including quality control techniques used in Canadian plants.

Wireless World, Oct. 1974

- Reducing Amplifier Distortion: An alternative to straightforward feedback loops for op-amp amplifiers.
- Microphone Survey: Four pages on operating principles, followed by a six-page tabulation of British and European microphones.

EQUIPMENT FOR SALE

Teac AX-300 microphone mixer, six mike inputs and four line inputs, mono/stereo/quad output, used once, blank two-year warranty card, ideal for recording or P.A. mixing, $360- Four small Advents, $65 each. Wurlitzer reverb guitar amplifier, two channels both with EQ, $50. Call Mike after 7:00 p.m. 277-8668.

Teac 7010-GSL, 7½ and 15 ips, has head sets for half- or quarter-track use, has space for installation of four heads, $550. Call Dave at 617-864-1968, early evening or early morning.

NOVEMBER BAS MEETING

Business and Open Discussion

About 60 members met on November 17th at B-U. Jack Stevens suggested a group purchase of Burwen's Schoeps mike elements (see last month's Speaker for details). Harry Zwicker delivered copies of the Burwen "Perfectly Clear" record for members. Jim Richardson and Al Southwick discussed obtaining Scotch Classic (or its bulk-pack equivalent) at reduced, though still high, prices. David Ranada proposed that the monthly meetings be held earlier than at the present 6 p.m.; the members voted to retain the existing schedule. Larry Kaufman and Jim Richardson reported difficulty in getting capacitors, and this has delayed delivery of the BAS sine-wave oscillator kit for another month. Rene Jeager discussed design of a low-cost, high-accuracy white/pink-noise generator, which he will describe in a forthcoming issue.

Meeting Feature: Panel Discussion on Dealer/Customer Interface

Steve Goldstein (a former salesman in several local audio stores), Nick Anagnostis (former salesman and store manager at the now-defunct Audio Lab), Sandy Ruby (co-founder of Tech Hi-Fi), Rich Malesweski (co-founder of Suffolk Audio), and Peter Mitchell participated in a 3½ -hour panel discussion.

The panelists began by placing audio retailing in perspective, starting with the late 1950's. (In the early 50's there were a few audio "salons" which offered custom equipment selection, installation, and servicing, at elevated prices, but technically sophisticated audio hobbyists put together their own systems—even buying wire by the foot to make their own cables—dealing with an electronics supplier like the original Radio Shack who sold at "audiophile net" prices. There was little competition at the retail level.) In 1957 Dan Boynton founded Audio Lab in Cambridge, offering assembled systems and full service at "net" prices, and it rapidly grew to a $2-million-a-year business.

But during the 1960's the audio market underwent a basic change in nature and exploded in size. The advent of widely available acoustic suspension loudspeakers and Japanese solid-state integrated stereo receivers made complete audio systems higher in performance, lower in cost, and easier to install and use than ever before. This, combined with the post-Beatles growth of the popular record business, created a huge market for hi-fi equipment, especially at the high-school and college levels.

Sandy Ruby at M.I-T., and other students, started selling audio equipment at discount prices from their dormitory rooms; these operations grew into the audio chains of today (Tech, Atlantis, Team, Pacific, CMC, etc.). Since these outlets sell to a "youth" market, and since today's components are easier to install and more reliable than formerly (so that there is less apparent need for dealer installation and routine servicing), today's stores are less service-oriented and more price-competitive than before.

Steve Goldstein and Sandy Ruby discussed the difficulties of a salesperson in such a store. His goal must be to sell what is in the stockroom. Even though a chain store may be franchised for 50 brands, it will rarely have all 50 brands in stock at one time. For example, if manufacturer A offers dealers a special discount (in order to unload excess factory inventory and keep factory and staff at full production during the slow-selling spring and summer months), the dealer may buy a lot of brand A; he may then be unable to pay his bills for manufacturer B, who proceeds to impose a credit limit and stop shipping goods, resulting in brand B being out of stock. If a customer is interested in brand B, the salesperson (forced to sell his "quota") has to convince him to buy brand A instead. Similarly, when there are 10 brands of $300 receivers on the market, all of similar overall quality, the salesperson nevertheless must convince the customer that the brand in stock is the best choice among the 10- Salesmen often will manage to convince themselves that their products really are better than the competition's. Sandy Ruby suggested that it actually isn't important that a customer gets talked into buying a Kenwood receiver rather than a Pioneer or vice versa, since these receivers are of comparable quality anyway.

There are direct financial factors also operating to bias dealers and salespeople. For example, co-op advertising where the manufacturer pays the dealer half the cost of local radio or newspaper ads featuring the manufacturer's product. (It is not surprising, then, that some brands turn up more often than others in dealer ads and featured "systems.")

"Spiffs" are another example, prizes or cash kickbacks given to the individual salesman for pushing a manufacturer's product; so salespeople are encouraged to sell you the product that is spiffed rather than the one which best fits your needs. Nearly all manufacturers offer spiffs at one time or another, which may tend to reduce this bias. But salespeople still value spiffs as added income; in principle an attentive salesperson could augment his income by 10 to 20 percent with spiffs.

What is important, as Steve Goldstein suggested, is the impact of these influences on sales ethics. Salespeople grow accustomed to trading upon product differentiations which are in fact trivial, false, or nonexistent; and under intense competitive pressure, they may degenerate further, using practices which are downright dirty. Steve described cases of speakers (not favored by the store) with blown tweeters that were left on display and used for A-B comparisons to convince customers to buy the store's favored brand. Rich Malesweski, who worked as a salesman before founding this own store, confirmed that such practices are common in some stores. A-B comparisons are also rigged by maladjusting midrange/tweeter level controls, placing speakers badly with respect to room acoustics, and mismatching impedances or levels- Sandy Ruby added that because of heavy use, even the best speaker switching systems stores use tend to become unreliable and may affect the sound without the salespeople realizing it.

Steve also mentioned a case of a Sony receiver with a damaged tuner section that was kept on display, used to induce customers to buy the Kenwood receiver which the store stocked. He said that while he was employed as a salesman at the Harvard Square Tech Hi-Fi store he complained about such situations to the store manager, without result.

Evidently, at least in intensely competitive areas such as Harvard Square and midtown Manhatten, store managers acquiesce in unethical sales practices. Steve concluded that the dealer/customer relationship is an adversary one in which consumers must beware, and that some customer paranoia probably is justified.

Nick Anagnostis recalled that in the old days at Audio Lab one of the store rules was that a salesperson must not bad-mouth a competitor's product unless its deficiencies were documented. When asked about competing gear, one was supposed to reply, "Brand B is a reputable product but we carry only brand A, and we think it's a better choice because it has these distinctions ..." In contrast, one often hears today's salespeople describe competing brands as "junk," "unreliable," "only a fool would buy that," citing myths, rumors, or half-truths to support these criticisms.

Nick noted that one of the principal difficulties in hi-fi selling is the customer's fear of the salesman. If an unsophisticated music-lover ventures into a hi-fi store with $300 and is met with arrogance, technical jargon, and contemptuous claims that "brand B is vastly better than unreliable brand A," when he has just been convinced down the street that "only a fool would buy brand B because it's junk," he is likely to lose confidence in salesmen's judgment and in his own ability to choose and may retreat to Radio Shack, Sears Roebuck, or Magnavox- Thus the hi-fi industry loses a customer and the music-lover loses the chance to get really satisfying reproduction at a decent price.

Sandy Ruby willingly admitted that among all the Tech Hi-Fi stores, the ones in which he finds it hardest to keep salespeople honest and considerate are the Harvard Square (Cambridge) and 45th Street (New York) branches- He outlined some of the reasons why salespeople get to be the way they are:

1. The usual pay for salespeople is about 6 percent of sales volume, either in commissions or salary. (This is an industry-wide average according to an Advent Corporation study.) In a typical month with gross volume of $15,000, this is a comfortable income for a beginning salesman, especially for a college student/audiophile who wants to be a salesman because it looks interesting, will give him an opportunity to do lots of equipment comparisons, and will let him obtain his own gear at cost or less. But after a few years this income is unsatisfactory, particularly for a salesman whose technical knowledge is extensive, and who can get a job at much higher pay. So technically skilled salespeople leave and the ones who remain look for ways to boost their sales volume in order to raise their pay.

2. The amount of advice giving and product comparing that the salesperson must do for each successive customer is almost unique to the audio industry. In most retailing, salespeople provide only incidental assistance and ring up the sale- As Steve Goldstein noted, people who go into McDonald's don't ask the clerk to convince them that McDonald's uses better hamburg than Burger King does. In hi-fi, people not only are looking for the lowest price, but also for comparative technical advice, interpretation of specifications, and the reassurance that they are making the ideal choice from among the enormous and confusing variety of products on display in the various stores. This not only makes shopping traumatic for the consumer, it also may mean that the salesperson has to do a high-power selling job to close the sale.

3. In suburban areas with little competition, a relatively high proportion of the people who enter an audio store actually buy something, making for a pleasant customer/dealer relationship- But in competitive areas, price-shopping consumers may tour a dozen stores before buying, so when you walk in, the frustrated or depressed salesman knows he has only one chance in twenty of getting any income from you. If after a few minutes he senses that you aren't a buying customer, or if you expect him to explain the technical differences among all of the tape formulations on the market so you can then mailorder the best brand from Dixie, or if you yourself are a knowledgeable audiophile and try to debate his claims of the superiority of his favored brands, then he may decide that the pain of being honest and courteous isn't worth the effort. It's easier just to set up dramatic (if rigged) demonstrations, bad-mouth the competition, and intimidate customers with a hard-selling sales pitch. Salespeople `burn out" within a year or two because of the intense pressure and lack of personal reward.

It is widely agreed that when Tech Hi-Fi was only one or two stores and Sandy Ruby was personnally in charge, a more attractive atmosphere was maintained. As Steve suggested, in a large chain the sales attitude in each store reflects the convictions of the store or area manager, and so the atmosphere varies from store to store within a chain. When a manager reminds his salespeople that customers pay their salaries and that they should help the customers make satisfying choices, an attractive atmosphere results. When a manager tells his salespeople to "go out and wring some money out of those assholes" (reportedly a direct quote), a hostile atmosphere results.

Evidently the grim situation in some of the urban chain outlets is in part attributable to the dealers, who gather in lucrative markets like Harvard Square and thus stimulate cut-throat competitive pressures. But part of the blame also lies with the customers. On one hand we expect stereo dealers to provide a level of consultation and services that an engineer or lawyer would charge $20 and hour for, plus lavish opportunities for precise and time-consuming comparisons, free borrowing for home trials, and instant free repairs of small malfunctions.

But at the same time we demand the sharpest discounts. We can't have it both ways for long. Ruby suggested that he could solve the problem of surly salesmen and provide attractive discounts by replacing his stores with a supermarket-style warehouse operation; you would simply pick out your items and pay for them (no advice, no information, no comparisons, no servicing, no salespeople, just high-school students operating the cash registers). This might work for the few audiophiles who know exactly what they want to buy, but for most people it would be a hopeless situation. At another extreme is the Radio Shack type of operation: all house brands and no choice—equally unsatisfactory.

Speaking of servicing, in the last two years Tech has had its own in-house service shop. Over 60 percent of its work has been warranty repair, resulting in a severe deficit. Manufacturers reimburse service shops poorly for warranty work (for instance BSR and Garrard allow about $3 for repair of a $50 turntable). Consequently a defective product becomes a headache for the customer and dealer, while the manufacturer gets off easy- Ruby noted that in general, manufacturers make much higher profits than dealers do.

In a discussion of house-brand or private-label speakers, Sandy Ruby denied the widespread report that Tech Hi-Fi owns or controls Ohm Acoustics. Nick Anagnostis suggested that a. house-brand speaker can be a fair deal for the consumer if it is honestly represented, citing the Audio Lab LSD-29 as an example. Sandy defended the general concept of house-brand products, citing Heathkit's audio and television lines and Sears Roebuck's steel-radial tires and Diehard batteries as the equal of any national brands- He suggested that if a dealer becomes big enough to bypass the middleman and deal directly with the manufacturer, he can get a better buy for the consumer- As an example of such a middleman he cited United Audio who import Dual turntables for the American market, adding a sizable markup in the process. And to mollify the skepticism of BAS members who feel that house-brand speakers such as Tech's TDC line are always poor, he offered to let a BAS listening panel evaluate alternative candidates for selection as his next house-brand speaker.

Returning to the primary topic, it became evident that there is no easy solution to the buyer/seller interface problem as it exists in audio retailing. Sandy mentioned that with audio having become a billion-dollar market, more profit-oriented businessmen are entering the field and driving out the audio-hobbyist retailers. With stiff competition from Radio Shack and other national chains, with the pressure of many stores competing near one another in urban areas, with rapid turnover among salespeople (each of whom must sell the equivalent of 50 $300 systems a month), there will not be a relaxed atmosphere in the store, and undesirable sales practices can flourish.

In addition, as a retail chain grows larger, the control of top management over the selling practices of each store becomes looser until, finally, an area manager's only criterion for the performance of a store is its sales versus cost statistics. Of course a store manager will not report to the chain's owner deceptive tricks his salespeople may be using. In this situation, Sandy suggested, knowledgeable audiophiles such as those in the BAS can perform a service to hi-fi consumers by reporting improper sales practices to higher management. The BAS can establish a feedback loop to the owners of various stores and chains for the correction of abuses. If we mean our complaints to be taken seriously, this is a constructive challenge which we should accept.

The panel discussion was wide-ranging, sometimes chaotic, occasionally bluntly worded, and often good-humored. Members of both the audience and the panel conveyed to Sandy Ruby the extent of their distress at some of the practices at urban branches of Tech, practices which also are common at Atlantis and other stores. Sandy, Steve, Nick, and Rich, in turn, provided a clear, valuable, and extraordinarily frank insight into the influences which affect dealers and salespeople, for better or worse. In sum, it was one of the most absorbing BAS meetings to date. And the opportunity of seeing some of the concerned human beings behind the storefront facades gave hope that perhaps the dealer/customer interface need not be an adversary relationship after all.—Peter Mitchell and Keith North.

Comment on November Meeting

I was distressed by the tone of the meeting in which we were complaining about hi-fi merchandising practices without ever clarifying our expectations of audio equipment dealers. I began to feel as if we expected local dealers (1) to be opinionless, unless they agree with our own biases; (2) to spend incredible amounts of time with us, regardless of customer conditions in the store at the time; and (3) to abandon the profit motive.

I have certainly had my share of rotten experiences with audio dealers, and did not end up with my present equipment because everyone in town was dying to sell me these products (Advent speakers, for example). However, I have been treated fairly by a number of people, and I believe that we must recognize the dealers' right to their own biases (should they be any less opinionated than we are?). If BAS members feel there is a need for improvement among local dealers, perhaps we should use this journal to commend or censure dealers on the basis of the way we have been treated.

Therefore, I thought I would share with you some of my impressions of an afternoon spent at the Stereo Lab in Groton, Conn. I had been looking for a new amplifier for a couple of months, and decided to drive down to Groton because Boston dealers do not generally display Large Advents with "high end" electronics, and it was nearly impossible for me to draw any conclusions about amplifiers after hearing them through unfamiliar loudspeakers. In addition, The Stereo Lab handles some interesting products not available in Boston. They are, to my knowledge, the closest Audio Research dealer, and they display the only complete line of RTR loudspeakers I have seen in this area.

We spent at least three hours there, listening to a great variety of equipment, some of which we were clearly not considering purchasing (Magneplaners), and the salesmen were courteous, responsive, and never rushed us. We compared several amplifiers, but were not subjected to any pressure, either for or against, any product. All in all it was an enjoyable experience. A pity we had to travel so far. —Steve Reich.

GUIDE TO THE BAS SPEAKER AND BAS PUBLICATIONS
MAY 1972 – SEPTEMBER 1974

This guide is intended to be a short "Table of Contents" of the past two years of The BAS Speaker instead of a full alphabetical subject index. All BAS feature articles are listed (along with their price for those members who wish to order copies); guest speakers are listed according to the issue in which their talks were summarized. In addition to these major items from The Speaker, small comments made on other topics still of current interest (e.g., record buying service or tape dubbing information) are included. (The following abbreviations are used: S – speaker, P – publication, N – note, RR – recommended recording.)

If you wish to order copies of articles, send your order with your check to P.O. Box 7. A minimum order of $1.00 is necessary. The articles we plan to have available have their per copy price noted in parentheses. We will accept orders only until mid-February. At that time the necessary copies will be made and orders filled.

5/72 Announcement of first meeting of BAS.

6/72 Minutes of the first meeting; temporary slate of officers.

7/72 Minutes of June meeting; some excellent records played.

8/72 Minutes of July meeting; discussion of BAS Constitution; demonstration of AR-6 speakers and Metrotec equalizer.

9/72 S: Webster Dove and John Nabb — Demonstration of preamp and power amp offered for sale.

10/72 First issue of The BAS Speaker.

BAS Constitution and By-Laws (Amendments 9/73).

P: Some Amplifier Test Clinic Results, Alvin Foster (20¢).

N: Election of 1972-1973 officers.

S: Mike Wargo (Tech Hi-Fi) — Discussion of add-on Dolby units.

S: Alan Southwick — How to shop for hi-fi equipment.

RR: First list of recommended recordings.

11/72 P: Recordings: How Hi the Fi? Peter W. Mitchell (35¢).

N: Demonstration of the effect of cable capacitance on phono cartridges.

N: Report on live recording seminar.

N: Report on AR factory tour.

S: Andrew Petite (Advent) — Choosing and using microphones.

RR: List of recommended records.

12/72 N: Results of BAS tape recorder clinic.

S: Victor Campos (KLH) — Honesty in the hi-fi industry; recording practices in the industry; microphones, tape recorder setup; power amplifier overload protection circuits; gift of RCA records.

RR: List of recommended records.

1/73 P: How to Decide which Tape to Use, Alvin Foster (45¢).

S: David Blackmer and Rene Jeager (dbx) — Demonstration of professional noise-reduction products, and discussion of the 117 audiophile unit.

2/73 P: Selecting Opera Recordings, Dennis Boyer (40¢).

S: Richard L. Kaye (WCRB and BSO Transcription Trust) — DGG recording practices for the BSO, Columbia practices; Transcription Trust recording methods; WCRB signal and birdie elimination; use of null method (L - R) in aiming the antenna.

3/73 P: Diagnosis and Treatment of Audiophilia , Dr. Richard P. Goldwater (40¢).

N: Discussion of the AT-11 cartridge.

S: Roy Allison (AR) — Discussion of room acoustics; resonance and excitation of modes; wall absorption and net low-frequency rolloff; propagation of high frequencies at higher humidities.

4/73 P: Adding a Null Switch to Your Stereo , Peter W. Mitchell (20¢).

N: BAS record-importing service established.

S: Laurie Cote and Friends — A live concert, recorded by members.

5/73 P: Clean Records for a Cleaner Sound, James B. Brinton (55¢). (Addition 2/74.)

N Tape dubbing service established.

N: Change in used equipment listings procedure.

N: Report on April meeting's open-forum discussion of BAS programs and plans.

6/73 P: Test Report: Revox A77III, Braun TG 1000, Teac 3300 , Alvin Foster (45¢).

N: Note on tape saturation and head-driver-amplifier clipping, Alvin Foster.

N: Report on BAS questionnaire; emphasis on classical music and lack of interest in rock/folk/jazz; ratings of Speaker content and guest presentations.

S: Oskar Heil (ESS) — Discussion of cherry-pit tweeter and demonstration of the AMT-1 loudspeaker.

7/73 P: Your Tape Recorder- Part I: How Magnetic Recording Works , Alan Southwick (65¢).

N: Membership and phone list.

S: "Ed" and "Ted" Nakamichi (Nakamichi Research) — Introduction and demonstration of the 1000 Tri-Tracer cassette deck; concept of three heads; internal head alignment facilities; DNL; deck initially an industrial unit for tape QC.

8/73 P: Speaker Efficiency: An Initial Review , Peter W. Mitchell (20¢).

N: Distribution of activities list for formation of subgroups.

N: Listing of dubbing fees ($2.00 plus tape).

N: Note on Barclay Crocker.

N: Note on protection against burglary.

N: Report on Advent tour.

S: Live versus recorded sound, with three performing groups — Comparison of reproduced sound over AR LST's, Dayton-Wright electrostatics, and Smaller Advents; investigation of the variation of sound with mike placement.

9/73 N: Amendments of By-Laws — Dues raised to $12; change of duties of officers and distribution of honoraria; change of quorum requirement.

N: Distribution of equipment-servicing questionnaire.

S: Mark Davis (MIT) — Demonstration of psychoacoustic phenomena; effects of harmonics on timbre; lack of effect of phase shift; difference between phase shift and phase interference; sensitivity to 1-dB frequency-response aberrations; 1/3 octave limits of aberration sensitivity.

10/73 P: Balancing the Books on the Pioneer TX-9100 AM/FM Tuner , James Brinton (200).

P: Reprint of article by Gordon Holt on tape recorder setup, biasing, and equalization.

N: Elections for 1973-1974.

N: Note on Rhoades Teledaptor.

N: Comments on tuner testing using cable signals and on testing of nonproduction units in the national magazines.

S: Andrew Petite (Advent) — Introduction and demonstration of the Advent-2.

11/73 P: Phono Cartridge Tracking: A Simplified Physical Analysis, Peter W. Mitchell (65). (Errata 12/73.)

N: FM tuner overload prevention, Alvin Foster and Peter Mitchell.

N: Proposal for an audio oscillator project.

N: Discussion of lack of good polish on the AT-11 stylus.

S: Peter W. Mitchell — Phono cartridge tracking (included as publication).

12/73 P: Temperament and Intonation, Laurie Cote (40¢). (Errata 1/74.)

N: Tape dubs of WBUR broadcast on temperament and intonation are available.

N: Summary of servicing questionnaires.

N: Request for short user reports for newsletter.

N: Suggestion to compile a list of running times of musical works for use in off-the-air recording.

S: Joe Hull and Andrew Petite (Advent) — Introduction of the Videobeam TV and tour of the Advent factory, including speaker area, TV plastics and electronics area, and cassette electronics and tape duplication area.

1/74 P: Microphones for Use in the Studio and on Location, Mark L. Forman (4(4). (Errata 2/74.)

P: A Successful TV Audio Receiver, Peter W. Mitchell (25).

S: Robert Carver (Phase Linear) — Discussion and demonstration of the Model 4000 preamplifier, with peak unlimiter, downward expander, dynamic low-frequency filter, and autocorrelator noise-reduction facilities; discussion of the uselessness of rise times below 5 milliseconds; comment by Carver that openness of some Decca cartridges is due to too much L R signal in the internal matrix network, similar to Dyna ambient-sound recovery system.

2/74 P: The Veritable HUMpendium, James Brinton (65). (Errata 3/74.) Discussion of removing audio hum.

N: Opinion that Absolute Sound is the best semi-periodical available.

N: Note on tape head cleaner — Freon-11.

N: Boston AES meeting summary — Mark Davis discussing meaningful specifications in hi-fi equipment; note that phase shift is audible if within 1/3 octave segment; notes on audibility of THD and IM.

S: Sherwin Greenblatt (Bose) — Effect of rooms on speaker sound; discussion of specifications versus what we hear; audibility of THD, phase shift, etc.; tour of Bose factory with particular emphasis on driver testing equipment.

3/74 P: Listening-Room Resonances Versus Low-Frequency Response, Peter W. Mitchell (35).

P: Restoring Rolled-Off Bass with a Simple Active Filter, Mark Davis (25). (Errata 4/74.)

N: Dubs of the Colin Davis WBUR programs available.

S: Peter W. Mitchell — Low-frequency response (included as publication).

4/74 P: Four User's Reports: The Connoisseur BD-2 Turntable, Laurie Cote (Addition 5/74); Investigations with the Revox A77 Recorder, Alvin Foster; De-Humming a Dynaco FM-5 Tuner, S. Leigh Phoenix; The Audio Technica Cartridges, Alvin Foster (50¢).

S: Roy Allison (Allison Acoustics) — Measurements of loudspeakers in listening rooms; the bass response varies as the effective loading of the speaker and baffle change with frequency and spacing from the walls and floor; description of a solution to the problem. (Errata 5/74.)

5/74 P: Asperity Noise Biasing of Tape Recorders, James Brinton (20¢).

P: User's Report: Trouble with the Advent 201, Kenneth Deen (20¢).

N: Current membership directory; out-of-state members can write to neighboring audiophiles via_ P.O. Box 7.

	S:	Rich Malesweski and Dick Pierce (Suffolk Audio) — A discussion of component compatibility; arms and cartridges; phono overload resulting from low-frequency resonances; how to identify stylus/ arm resonance problems; changing arm mass; interaction of preamps and power amps to give less than their independently measured performance (especially if the power amp is the band-limiting element); comments on huge negative feedback amplifiers.
6/74	P:	Music and the Perception of Time, Dr. Richard Goldwater (65¢). (Errata 7/74.)
	P:	Norman Laboratories Model Five Acoustic Equalizer, Robert J. Graham (20¢).
	P:	Evaluating the Dahlquist Speaker, Alvin Foster (20¢).
	N:	Notes on Advent 201 — Pinch roller, low-frequency response, and fast-wind latch-
	N:	Note on new Unisette tape format (to be marketed in 1975).
	N:	Report on BASF tape-facility tour.
	S:	Dr. Richard Goldwater — Reflections on music, time, and psychiatry (included as publication). Goldwater composition played, "Remembrances of Things Past" (dubs are available).
7/74	P:	The Phase Linear 4000 Preamplifier, Alvin Foster (plus comments by Goldwater and Mitchell). (35¢).
	P:	The Sony TC152-SD Cassette Recorder, David Letterman (20¢).
	P:	A Cheap, Simple, Good Audio Oscillator, Peter W. Mitchell (35¢).
	N:	Letter to High Fidelity from Peter Mitchell concerning Bozak ads.
	N:	Organization of domestic record-buying service, with order form.
	S:	Victor Brociner (Avid) — Discussion of the design of loudspeakers, especially the Avid 103; review of the history of the industry; simple but vital design aspects of speakers, such as grill-to-driver spacings and placement on baffle.
8/74	P:	Cassette Versus Cassette Versus Open Reel: Advent 201, Lafayette RKD-50, Sony 152-SD, and Revox A77, Mark Davis (65¢). (Additional information 10/74.)
	P:	In Defense of the Piano, Laurie Cote (20¢).
	N:	Second letter to High Fidelity from Peter Mitchell on Bozak ad.
	S:	Tom Horrall (BB&N) — Discussion of the BB&N simulation system for bench-testing acoustic treatment of concert halls; demonstration of the simulation of Boston's Symphony Hall.
9/74	P:	IC Op-Amps — The Audiophile's Friend, Peter W- Mitchell ($1.00).
	N:	Organization of the new Speaker staff.
	N:	Letter from member Dan Shanefield on A-B testing, plus comment.
	N:	Results of questionnaire on content of meetings and The Speaker, 1973-74.
	N:	News on bucket-brigade ICs for audio delay lines.
	S:	John Draper and Dave McIntosh (EPI) — Description of the Model One power amplifier and the Model Two preamplifier/audio analyzer; discussion and demonstration of the improved EPI loudspeakers.

BAS MEMBERSHIP LIST

This list is for the use of BAS members only

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Anderson, Victor		232-5272
Baker, Donald		1-879-1904
Barber, Patrick	(213)	331-5883
Bardach, Howard	(213)	877-8770
Bauman, Eric	(703)	354-3927
Berg, Bruno	(612)	881-4913
Bergen, Peter		Canada
Bernier, Emil		
Boentgen, Rudolf		665-3729
Bolanos, Louis	(213)	764-6206
Borden, Robert		1-475-4817
Bosslet, Ronald		1-369-7959
Bowness, Colin		235-8183
Boyajian, Robert		272-2787
Brinton, James/Joyce	(off.)	232-6972
Brook, Joel		New York
Burke, Kevin	(703)	860-0793
Bush, Dale		472-0010
Cannon, Harley	(714)	462-8857
Centorino, Richard		924-7398
Charland, Yves		Canada
Charpentier, Michael		262-2222
Chin, Wayne	(408)	733-0601
Cleary, Robert		328-1089
Cohen, Joel		734-5070
Cote, Laurie		783-0920
Covell, Carl		776-3894
Craig, Dana		762-4221
Cromarty, A. Bruce		1-485-8927
Cruze, David		Rhode Island
Cullen, Michael		Illinois
Cunningham, William		Ohio
Davis, Mark		
Deen, Kenneth		272-7488
Del Bono, Adam		444-7588
Demone, Robert		259-8876
DeMond, William	(509)	525-8749
Denise, Richard		1-358-7949
dePetter, Nela	(Dom. Rep.)	682-9483
Dexter, Arthur	(off.)	357-9500 ext. 2842
DiCamillo, Robert		444-4052
DiLeo, John		
Edstrom, Ralph		New York
Emerson, John		438-6025
Ergmann, L. Langdon	(215)	694-0879
Feinstein, Steven		
Felipe, Alberto	(Bahia, Brazil)	7553
Fernald, Albert		283-9043
Finlay, Fred		Missouri
Foster, Alvin		296-2622
France, Joseph		864-5395
Freedman, Steven		593-7503
Fulton, George		Texas
Gal, Joseph		
Garfinkle, Nathan	(415)	934-7206
Goldwater, Richard		
Graham, Robert		944-8738
Gupta, Chris		Canada
Haigh, Bradley	(703)	528-1106
Hamlin, William	(703)	527-5418
Hammer, David		325-5660
Hansen, Ed	(216)	666-4797
Hatch, James	(603)	893-0801
Henry, Robert		353-1341
Holman, Tomlison	(off.)	661-9500 ext. 231
Horlivy, John		Wisconsin
Horrall, Thomas		1-456-8715
Imbier, Edward		933-5899
Ing, Wendell		
Isveck, Stuart		783-3493
Jaeger, Rene.	(603)	654-9814
Jang, Terry		Canada
Johnson, Gerald	(405)	524-7233
Karkos, Stephen		787-1542
Kaufman, Lawrence		566-7315
Kleinman, George		523-6136
Konicoff, Donald (off.)	(305)	395-7616
Kunz, David		1-481-1219
Langelotti, Frank	(off.)(716)	342-0834
Laynor, John		1-369-6436
Leonard, Ira		731-5817
L'Esperance, Vic.	(off.)(714)	624-0919
Leventhal, Les		Canada
Mahler, Ben		275-9628
Mashey, Thomas	(203)	667-1358
McGrath, Peter	(305)	891-5373
Meyer, Eugene		646-3864
Meyers, William		762-0812
Miller, Nicholas		782-7751
Mitchell, Peter		242-4542
Moore, William		
Moran, David		244-5971
Moulding, Richard	(413)	247-5870
Nadeau, Ronald		1-683-7285
Nanbu, James	(203)	445-6605
Newberry, Cammann		1-927-0264

Newton, Carlyle		762-9474
Nicholakakos, Peter		New York
North, Keith		
Ontell, Richard		1-879-4431
Ouelette, Gerard	(off.)	1-928-4249
Paterson; John		California
Peirce, Michael		491-0643
Pelinski, Edward		1-895-4289
Pettus, Charlton		738-8488
Phoenix, Leigh	(607)	257-0347
Pierce, Lewis		1-657-4366
Pike, Charles		862-4712
Pinton, Daniel		625-5994
Plotkin, Leonard	(off.)(603)	642-3231
Pollard, J.K.		731-1060
Prescott, Arthur		
Prymak, Rostislaw		1-358-4484
Quail, Alphonse		
Quill, Joseph		1-685-7993
Ranada, David		498-5819
Randall, Fred		1-278-3117
Reich, Steven		1-475-4359
Reilly, James		965-0092
Riceman, Elliot		1-443-3040
Richardson, James		566-1192
Riggs, Michael		254-1962
Roby, Stephen		1-682-5398
Roth, Steve	(212)	727-1482
Rubin, Matthew		
Ruby, Sandow	(off.)	961-4177
Sampson, Edward		1-686-2323
Sapolsky, Walter		731-3941
Sarhanis, Theordore		254-6815
Sarper, Stephen	(203)	661-7245
Satz, David		492-2263
Scantlebury, Robert		
Schecter, Fred		1-453-4650
Scheiner, Bruce	(212)	251-2333
Schlafer, John		1-358-2006
Schneider, Robert		262-1298
Seibert, George		1-293-2852
Seiler, Bruce	(213)	474-7163
Shacknow, Dennis	(201)	567-1161
Shanefield, Daniel	(609)	924-9450
Shelton, William		
Shulman, Robert		1-872-6464
Sisk, Robert		261-1440
Skricki, John		769-0528
Slindee, Dean	(319)	533-4676
Smith, Harlen		322-6089
Smith, Joan	(609)	921-1398
Southwick, Alan		1-663-8340
Sprague, John	(201)	327-1664
Steinmetz, C. Martin		235-9472
Stevens, Jack		776-3672
Stewart, O.H.	(402)	489-1909
Stinson, Walton	(303)	778-0780
Strong, Edward		1-887-5452
Symonds, David		283-9043
Thomas, Lowell		A.P.O. New York
Tardif, Blanid		484-5024
Tomlison, Michael		426-5309
Tooley, John	(302)	645-9154
Vahldieck, Michael	(608)	251-3348
Vanderbilt, Jay		729-3144
Vicari, Kenneth		1-281-0629
Watters, Peter		492-6467
Westfall, Randy		494-8805
Wettenstein, Warren		738-1741
Weyrauch, Theodore		Virginia
Whitehead, William	(919)	776-0784
Widenor, Malcolm	(516)	671-5884
Williams, Dow	(408)	449-2220
Winslow, Richard		
Winterbottom, T. Andrew	(313)	851-9104
Wisan, Richard	(607)	432-4133
Wolf, Richard	(313)	477-4582
Wolk, William		536-8284
Zwicker, Harry	(off.)	862-5500 ext. 5811
		275-2171

SCA Interference, Cause and Cure*

Alan Southwick

A fully utilized FM stereo broadcast channel consists of four basic elements: (1) the monophonic (left plus right) audio information, (2) the stereo pilot tone, (3) the decoding information required for stereo reception, and (4) the SCA (subsidiary communications authorization) signal- A frequency spectrum of a typical format is presented in Fig. 1. The monophonic (L + R) information to be transmitted is generally restricted to a top-end frequency of less than 19 kHz (generally 15 to 17 kHz). This restriction is imposed on a stereo broadcast in order to avoid interference with the 19-kHz (±2 Hz) stereo indicator pilot tone which is transmitted at a volume or percent modulation level between 8 and 10 percent of the total signal. Ultrason-

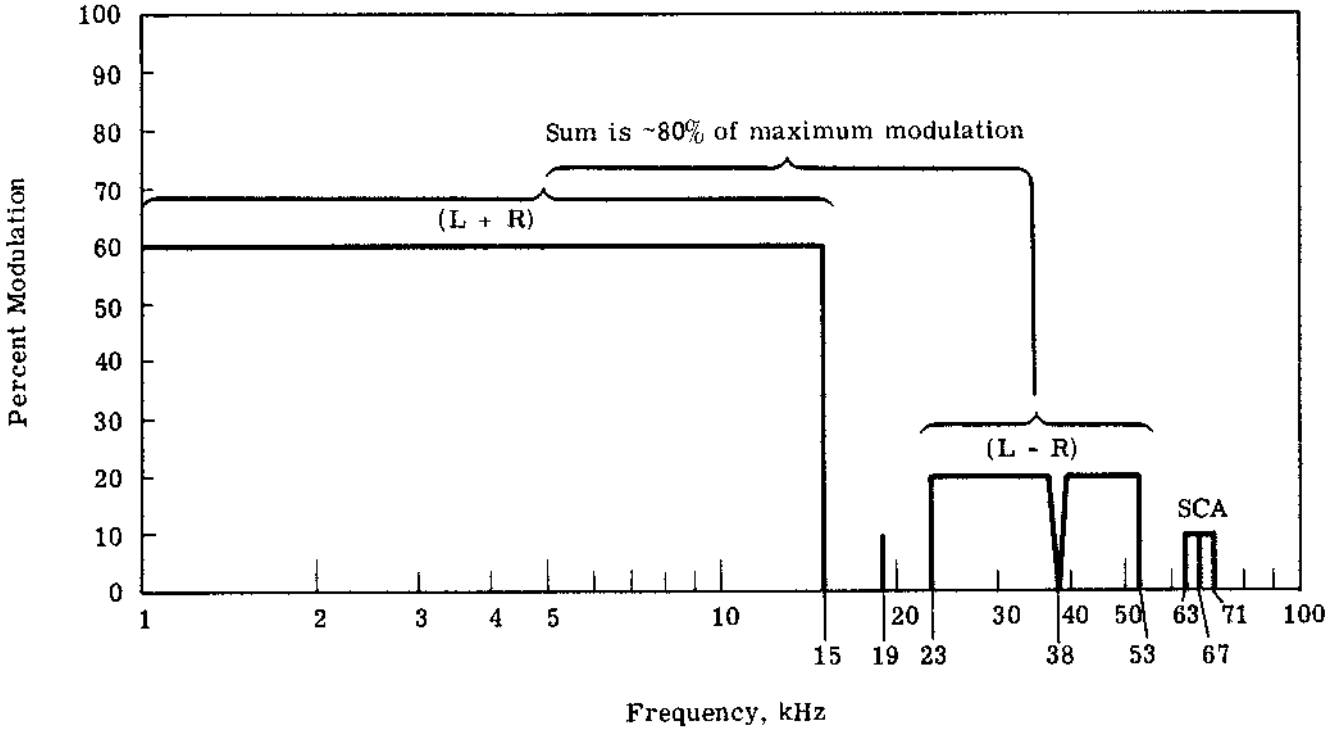

Fig. 1 — Frequency spectrum of a typical FM stereo signal with SCA

*This article is based on interviews with Kevin P. Mostyn, Chief Engineer, WCRB AM/FM, Waltham, Mass.

ically superimposed about a frequency of 38 kHz is a difference signal (L - R) used for stereophonic decoding. A little algebra explains how the stereo information is recovered:

(L + R) + (L - R) = 2L (left-channel signal)

(L + R) - (L - R) = 2R (right-channel signal).

This "mathemagic" is done electronically in the tuner's stereo decoder.

For a typical FM stereo broadcast, the main carrier (L + R) and stereo subcarrier (L - R) information account for up to 90 percent of the total modulation of the signal. The additional 10 percent is allotted to the 19-kHz stereo pilot tone.

Transmission of SCA modifies these maximum modulation percentages somewhat: SCA is broadcast by a similar frequency modulation centered about a 67-kHz subcarrier and is restricted to a deviation maximum of ±4 kHz. When SCA is transmitted, about 10 percent of the total modulation of the FM stereo signal is "eaten up" by the SCA signal, which in turn restricts the maximum modulation available for the (L + R) and (L - R) signals to about 80 percent- The FCC is not terribly specific about these modulation limits but does require that adjacent carrier interference and "birdie" spillover be maintained below specified levels dependent upon the broadcast format.

At WCRB, the 19-kHz stereo pilot is transmitted at 9.8 percent modulation; the SCA is limited to ±4 kHz deviation and 9.5 percent modulation; the remaining approximately 80 percent modulation is allocated to the main stereo signals. As noted earlier, bandwidth limits are imposed on the signals to prevent crosstalk and annoying intermodulation "birdies" in the transmitted signal. Also, peak limiting is employed, via the CBS Volumax System, to prevent interference with the SCA signal itself and with neighboring broadcast channels at 102.3 MHz and 102.7 MHz. The background music signal (SCA) is severely compressed and limited so as to improve "listenability" in varying acoustical environments. The main channels of audio, however, are only slightly peak-limited to afford the widest possible dynamic range to the listener.

Thousands of dollars are invested in the stereo encoding and broadcast transmission equipment at WCRB and periodic tests and calibration procedures are carried out to ensure stable performance. Most difficulties encountered with reception can be traced to receiving apparatus and an astonishing lack of design care on the part of the receiving equipment manufacturer-

In the past it was true that some SCA interference was generated in the transmission process. For example, some of the early FM stereo generators produced a distorted 19-kHz pilot tone, inadvertently creating a 57-kHz carrier as well, resulting in a modulated 10-kHz "birdie" in even the best FM receivers. Early stereo generators also produced a 38-kHz carrier that was not properly suppressed and contained 76-kHz (second harmonic) components which would beat against the modulated 67-kHz SCA subcarrier, producing audible 9-kHz interference-

In this connection it is worth noting that although WCRB FM has been on the air since 1954, and stereo tape recording was common by 1955, it was not until 1961 that the FCC authorized the multiplex method for broadcasting stereo on FM. It then took some years for FM broadcast equipment engineers to discover, track down, and eliminate the various possible causes of SCA interference in transmission. The newest FM exciters and stereo generators contain all of the elaborate filtering required to ensure that the broadcast is free of interference. Since May of 1972, WCRB FM has been utilizing an FM transmitter of state-of-the-art design. This transmitting system was specifically designed for stereo and SCA broadcasting and is also used by many other stations in the greater Boston area. Now that the transmitting equipment is definitely excused as the culprit in cases of SCA interference, it has become generally accepted that the receiver is at fault, and some of the newest FM tuners are much improved in this regard.

The following edited excerpt from Communication News of April 1974 details some of the problems encountered in stereo-SCA FM reception as outlined by Leonard Hedlund, Vice President and Director of Research for McMartin Industries, a widely respected manufacturer of state-of-the-art professional AM and FM broadcast transmission equipment.

FM broadcasters today are often confronted by questions or even complaints by listeners and others about "birdies" and "whistles" in their stereophonic signal. Often the background music or other SCA being transmitted by the station is blamed for the interference. The interference is most often in the receiver and is the fault of the designs of older receivers. The "birdies" or "whistles" can be totally eliminated from the transmission side of FM. New receivers can also be designed to be "whistle" and "birdie" free.

SCA interference in FM stereo reception is caused by intermodulation products formed between the SCA channel and the stereo 19-kHz pilot subcarrier and its harmonics. This intermodulation generally takes place in the stereo tuner or receiver; however, it can also be generated in the transmission system.

How does this intermodulation occur in a stereo tuner or receiver? Interference is created by the third harmonic of the 19-kHz pilot (57 kHz) usually generated in the stereo demodulator of the receiver. The most common stereo demodulator is the switching type utilizing diode switches, and diodes are nonlinear devices. The transmitted 19-kHz pilot carrier fed to the nonlinear diodes produces a strong third-order harmonic (57 kHz). If the 67-kHz SCA signal is not properly attenuated in the stereo demodulator, the SCA signal also fed to the nonlinear diodes will mix with the 57-kHz harmonic product and produce the 10-kHz "whistle," the difference frequency of 57 and 67 kHz. Modulation of the SCA carrier produces the familiar "squishy" sound which can be very annoying-

This same interference occurs when an envelope detector stereo demodulator is used. Envelope detectors are particularly sensitive to SCA interference. Hard or square-wave switching stereo demodulators, ideal for good separation and stability, will produce the most SCA interference.

The ideal solution to these SCA interference problems is to prevent the 67-kHz SCA signal from entering the nonlinear diodes in the stereo demodulator by means of a filter in the receiver. This filter would provide a flat pass band and linear phase response up to 53 kHz and provide infinite attenuation from 60 to 75 kHz. Physical size and cost make use of these filters most impractical in consumer receivers. Unfortunately some receivers, even those that are of the highest price and of otherwise the highest quality, have poor or no SCA filters.

Another possible source of SCA interference in receivers is the 38-kHz regeneration stages where the 19-kHz signal is amplified, doubled in frequency, and injected at a high level into the stereo demodulator. The 38-kHz sine-wave switching signal must be free of any second-harmonic component (76 kHz) which can intermodulate with any residual 67-kHz SCA carrier in the stereo demodulator, producing an audible 9-kHz "whistle" or "birdie " in the recovered stereo audio signal.

The new phase-locked loop (PLL) stereo demodulators available and used in some present-day, high-quality receivers offer excellent SCA rejection while still maintaining excellent separation at the higher audio frequencies. Unfortunately, a majority of receivers today still use the switching technique rather than the PLL demodulator.

SCA intermodulation can also occur in the IF stages and detector circuits before it is fed to the stereo demodulator circuits. It is this source of intermodulation that is noticeable in some stereo receivers; in tuning these receivers, SCA interference is the lowest when the receiver is mistuned rather than when tuned correctly. This phenomenon is caused by non-linear phase response in the IF and detector system. Correct design and proper alignment of the receiver will minimize this type of intermodulation.

If you suspect SCA interference in your FM receiving system, there are a few preliminary steps that you can take prior to performing surgery on your tuner.

First, try swapping tuners with a friend who has a non-phase-locked-loop tuner and is not experiencing difficulty with SCA interference. Should your tuner continue to behave poorly at your friend's home, chances are the problem lies with your tuner. However, if your tuner performs properly at his house, and his doesn't at your house, inspect your antenna and downlead- A remote possibility is a poor reception area; the only cure for this is to attempt to relocate your antenna. If that fails, move.

Your receiver is only as good as its antenna system; a good directional outdoor antenna equipped with a rotator is strongly recommended. In addition, shielded downlead (twinlead or coaxial cable) is usually preferable to standard twinlead (the flat ribbon-type wire) because of its strength, durability, and ease of installation (wire standoffs are not required)- Shielded 75-ohm coaxial cable has much less attenuation than 300-ohm shielded twinlead and is preferred.

Lastly, be sure your tuner is properly aligned. If SCA interference decreases when your receiver is slightly detuned but everything else sounds fine, evidence points to inaccurate alignment of the unit. Finding competent service for proper alignment is not easy, but a little tenacity with a reputable service agency will probably yield adequate results-

New receiver-tuner designs are finally beginning to recognize the design criteria necessary for good stereo reception without SCA interference, and fortunately for stations such as WCRB, ease the amount of irritation on both sides concerning proper broadcast procedures for SCA. Most of the newer tuners utilize some form of active or passive filter above 53 kHz just before the signal enters the stereo decoding circuitry, thereby effectively reducing the overall presence of SCA in the signal. A multistage trap (LC type) with a resonant frequency of 67 kHz and a very high Q (sharp cutoff) can be used quite effectively under certain circumstances to clear up SCA interference.

Recently, a somewhat drastic-sounding but more pragmatic approach has become feasible: replacement of the entire multiplex decoding section of the tuner-receiver with one of the new phase-locked loop stereo decoder integrated circuits, such as the Motorola MC1310P. This will be the subject of a construction article in a forthcoming issue of the BAS Speaker.

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A BAS Users' Report

The Burwen DNF-1200

James Brinton and Joel Cohen

I've been living with the Burwen DNF-1200 dynamic noise filter for several weeks now, and I've come to like it. Frankly, I wasn't impressed with the $300 de-noiser when it was shown at the October meeting of the BAS, probably because of the very noisy program material used to demonstrate it- It may also have been that Dick Burwen, in his eagerness to show how effective the unit could be, was over-adjusting the unit's sensitivity control—a bad move, as will be seen.

Basics

Like most noise reduction gear, the DNF-1200 depends on masking for its effects. If the aggragate signal is above a certain level and contains a certain proportion of high-frequency information, it passes through the DNF unprocessed. If the level falls momentarily below a preset level—and if there is a proportionate decrease in the amount of high-frequency information it contains—the DNF becomes a low-pass filter with a fairly rapid rolloff. Thus, the DNF chops off the high end of the audio band and with it almost all of the hiss, and a little of the harmonic content of the music. If the sensitivity control is properly set, about all that's cut is hiss.

The filter's normal condition is rolled-off, so that transient signals broaden the pass band; this action takes about 400 microseconds—that's less than 500 millionths of a second, and those who claim to hear it are perhaps kidding themselves. Only if the sensitivity control is improperly set will there by any audible degradation of the sound.

Operation

Obviously the DNF is good for taking the hiss out of hissy tapes, discs, and FM broadcasts. Note the use of the word hiss; the Burwen device is not a tick or pop filter, nor does it offer relief from really bad SCA interference in FM signals.

It is tempting to set the sensitivity control so that some of the energy of ticks and pops is removed, but with these noises will go much of the harmonic content of music, making the sound muffled, and that's not how the unit is meant to be used.

It's easy to get a feeling for what the DNF does just by sliding the sensitivity control from left to right (it's a slide pot). With the pot in its left-hand position, music is muffled and almost totally lacking in high frequencies; as it is pushed to the- right, the highs return, and beyond a

certain point, so does the hiss. The proper setting is just before the hiss returns, and it is probably farther to the right than one might expect (i.e-, at a lower sensitivity). On the control's 0-to-10 scale, the proper setting in my system always fell between 6 and 8—rather more insensitive than sensitive, but good at removing hiss without audible effect on overtones.

The setting worked for material with a fairly wide dynamic range too, including a "Victorized" BSO broadcast—not that there was much hiss, but one could tell when the filter switched into its narrow-band mode by watching the front-panel light emitting diode (LED) indicators (red for narrow band, green for broadband). Thus the fear that the unit would work best only with material having a narrow dynamic range proved false-

Obviously, the sensitivity control is easy to overset. Unfortunately, just using the flashing red LED to gauge its effect isn't always enough. Passing square waves through the DNF showed that the unit began rounding the leading corner before the red LED came on. For example, if the LED lit at position 6, square wave rounding had usually begun at position 7. I don't imply that this is audible, and the effect is less dramatic with lower-frequency signals, but bear in mind that LED's flash on and off very quickly—often in microseconds—and set the sensitivity control by ear.

The DNF-1200 has three rolloff settings suited to the type of program material encountered; one each for "phono," "phono-78," and "tape/FM." The rolloff rate is highest for the "phono-78" setting and mildest for "tape/FM," with "phono" only a little more rolled off than "tape/FM." I was able to test only the first and last settings properly, although the 78-rpm record curve seemed well suited to old 45's. Everything seemed to work well, although you might wish to listen to some noisy broadcast records with the DNF in the "phono" position.

I tried the other typical things- I listened to old mono discs, and they sounded nicer; I played some tapes I had made on a hissy deck, and they sounded nicer; I listened to FM and got rid of a lot of the clouding hiss on locally weak stations like WHRB. On WCRB, using a birdy-prone tuner, I found that the birdy signal itself could activate the filter. This made for a weird sensation as the birdy modulated the high-frequency content of the broadcast- This isn't the filter's fault, though, and repeating the test with a Pioneer TX-9100 tuner having little or no birdy proved the point.

For Recording

After having used the Burwen in a lot of after-the-fact applications, I tried using it at the input to a recording setup. This is not an advertised application, but I got interested in it in this way.

I installed the Burwen in the same tape monitor loop as my dbx 117, ahead of it, and when taping, usually pushed the filter "out" button on the DNF's front panel. One time I didn't, and I got a cleaner sounding signal.

The dbx 117, as we know, can breathe a bit as it expands the dynamic range of music. Putting the DNF ahead of the 117 removes much of the hiss that would otherwise appear as breathing on playback. During recording, there's a similar but different effect; hiss and noise surge up to fill momentary silences in music when the 117 compresses the signal, and naturally, if there is less hiss and noise to surge up, there will be less recorded on tape, and less breathing in playback, even if the DNF isn't used after the fact- That's what happens.

(By the way, playing back compressed recordings which have been sanitized using the DNF-1200 proves that the 117 has quiet electronics; there doesn't seem to be any surge of noise on clean signals, indicating only a small noise contribution by the dbx.)

Anyway, the effect is that of increasing the apparent signal-to-noise ratio of the tape. Also, because there is less danger of breathing, one can use higher degrees of compression than possible before; say 1.5, up from 1.1 or 1.2. This is good because the tape deck's signal-to-noise ratio is multiplied by the compression factor. And as noted, you often don't need the DNF on playback, assuming that the dbx's expression control is set properly.—Jim Brinton

Comment

I was able to use a Burwen DNF-1200 briefly and compared it to a dbx 119, which I also use as an after-the-fact noise reducer. I basically like the DNF-1200, but found it to be only marginally useful beyond what the 119 does for me. If it were substantially less expensive, I would probably add it to my system.

Both units effectively reduce noise by lowering gain at low input levels. The DNF-1200 lowers gain only at high frequencies, thus reducing the volume of high-frequency signals and hiss. The dbx 119 lowers gain at all frequencies, thus reducing the volume of the entire signal and all noise including hum and rumble. The dbx 119's response is keyed to the power level of both channels at all frequencies while the DNF-1200 is keyed to the relative absence of low-level, high-frequency signals (musical harmonics).

Properly adjusted, neither should affect system response to musical signals at any level- Both devices have a single control that sets the amount of action. An ideal, noiseless signal should need no action while a noisy source needs as much as possible. And there's the rub.

Both work well and unobtrusively on good sources which have only slight tape hiss present- The DNF-1200 attenuates the hiss at low levels with little noticeable effect on the music- The 119's operation can be more noticeable since it lowers the music level too (and raises the high levels as well).

I prefer expanded listening and usually leave the dbx 119 set for 1-1 expansion which, for me, adequately reduces the slight residual noise in most good source material-

I used some 78-rpm records, a TV sound signal, and some non-Dolby cassettes to compare the dbx 119, DNF-1200, and my old Scott Dynaural preamp. The Scott reduces gain at both high and low frequencies, slowly responding to total signal level; it's sort of an active, reverse loudness control.

The DNF-1200, of course, did not remove 60-Hz hum and buzz from the TV signal regardless of level settings (not all noise is hiss). The high-frequency surface noise of the 78-rpm records could not be cut down as much as I would have liked before noticeable breathing occurred, and finally, low-level highs were lost.

The dbx 119 reduced all noises equally well at low settings. Increasing the expansion setting resulted first in breathing and then, in place of removing low-level highs, it added a "pumping" sensation to the sound-

The Scott operated so slowly as to dull all soft passages- Also quick peaks stayed muffled and slow build-ups gained brilliance.

Subjectively, I would grade the dbx 119 best all around and the DNF-1200 superior for tape hiss. I did not notice an advantage in using them together, but it seems possible.

I spent a lot of time switching the DNF-1200 in and out while varying the level control to be sure that the highs were not being overly affected. This was an annoyance that I hope would go away once familiarity was established. I recall doing the same with the dbx 119, which now is less often readjusted. Since the dbx 119 has other uses in addition to unilateral noise reduction and is less costly, I would have to recommend it over the DNF-1200.—Joel Cohen