THE B.A.S. SPEAKER

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In This Issue

This month's issue of The Speaker contains a feature review of the Allison: One loudspeaker. As might be expected, considering its developer, it is an excellent loudspeaker, but in ways both expected and unexpected. The opinions of an eleven-person review panel, who both met together and listened separately in their homes, forms the basis of the review—one which, to our certain knowledge not only is the first serious review of this system, but which also will remain among the most thorough from the auditioning standpoint.

This is not Roy Allison's first speaker, it should be noted; nor were the designs he worked upon at Acoustic Research. Allison designed the "Air Coupler," which surfaced briefly in the 1950's as part of a spurt of speaker development just prior to Edgar Villchur's development of acoustic suspension, each unit trying, and to a degree, each failing to do what Villchur's AR-1 succeeded in doing. Eventually, Allison joined AR and became vice president with engineering and plant management responsibilities. Although he says that he always had less time for research than he might have wished, he was heavily involved in product development, especially with the AR-4, the –4X, the 3a, and the LST.

About the Company. Walking into Allison Acoustics must be somewhat like entering the AR plant of years ago. Former AR president and board chairman Abe Hoffman is in charge of finance; former AR sales manager Sumner Bennett is marketing manager; former AR manufacturing director Frank Callahan has the same function at Allison. If possible, the similarities go even deeper, making Allison even more like the pre-Teledyne AR. Marketing is low-keyed, as is advertising; growth is to be a function of customer acceptance rather than of artificially generated demand; the corporate goals are oriented far less toward making money than to the promulgation of technology and accurate reproduction of music. Refreshing . . . .

But having been through the experience of AR, there are some things that the Allison partners have vowed to do differently. Allison is expected to hold the dealers' hands, not just the customers', for a couple of reasons. If improperly demonstrated, the Allison might prove a difficult speaker to sell (more also about this in the review). Also, in order to be properly demonstrated, the unit(s) must be properly arranged in listening rooms—sometimes at the expense of floor space, and perhaps of room for other products. Also, Hoffman, having worked in his wife's Harvard Square art gallery as a co-opted salesperson, figures that dealers are human beings too, and has vowed to make Allison's policies reflect this.

But the proof of the corporation is in the listening, in this case. Read the review, and by all means go listen to the Allison: One.

This issue continues the battle for clean records with a short article based on the Discwasher. This is not so much a users' report as a compilation of comments on the Discwasher brush and the DII fluid along with a very unusual description of the chemical makeup of the vinyl used in phonograph discs. Warnings are given as to why not to use soap, detergent, water, alcohol, or almost anything on the disc surface. The material is taken primarily from a letter from Dr. Bruce Maier, head of Discwasher, addressed to a member of the BAS, and also from some of the material used as sales literature for this brush. Jim Brinton has talked with Dr. Maier and is convinced that this expensive brush is not another technological con but is actually a product based on real investigations of the makeup of discs, the types of stuff that can clog their grooves, and the best methods of removing them. A limited number of copies of the booklet he sells for 25 are available to members who request it on a postcard to Box 7. The booklet will arrive with a forthcoming issue of The Speaker.

Also in this issue, Peter Mitchell has compiled the latest data on turning the 814 capsules into working microphones. Those of you who do live recording should read this to keep up to date. Also of interest to recordists is a note on how to determine how much time is left on a reel of tape.

Equipment for Sale

- BGW 500R power amp, $600; Radford SC24 Mk II preamp, $325; Connoisseur BD-1 turntable with custom base and KMAL tonearm, Ortofon M15-E Super cartridge (stylus perfect), and Discwasher isolation subbase, $250; Sony ST-5130 tuner $230. All items in perfect condition with original packing and blank warranty cards. Call Don Baker, 1-879-1904.
- Dayton-Wright XG-8 Mk I electrostatic speakers with ST-300 (special XG8/2 custom enclosures), $1495; Phase Linear 700 power amplifier (mint condition), $775; Sony TTS-3000A (one of the last made, no. 51553), $199; Decca 4RC (1½ hour use), $39; Revox F36 (4 track, ¾ and 7½ ips, used 20 hours in all), $325; Quad AM2 tuner (MW/LW/SW, broad and fine tuning, with power supply, 5 hours total use), $80; Sony ST-5000FW FM tuner (mint condition with walnut case), $395; Pioneer SE-700 Electret headphones (with warranty card), $59.50. Call (519) 945-8486 or write "Canada", c/o P.O. Box 7, Boston, Mass. 02215.
- Sony SQ-2020 metered four-channel adapter/rear tone control, with walnut cabinet, $200; Teac AN-300 four-channel Dolby unit, $250 (both units in original box and in warranty); KLH Model 12 loudspeaker, 4-speaker, 3-way, external contour controls, $220/pair. Call Rudy Boentgen, 890-3350 (days) or 665-3729 (evenings).
- Sony 5000 tuner, $175 or best offer. Garrard TT, Scott integrated amp, three various (cheap) reel-to-reel tape decks, mono amp and tuner, etc., all best offer. David Moran, 244-5971 or 536-5393, ext. 525.

Dyna at a Discount?

Al Smith of Wolf and Smith Camera, Cambridge, has agreed to supply BAS members with Dyna PAT-5 preamplifier kits and Stereo 400 power amplifier kits at a better-than-this-normal-discount price if they purchase in a group. Prices should be $329 for the 400 and $139.95 for the PAT-5. You must pick up your purchase in the store (the BAS is not shipping them to out-of-state members) and payment will probably be either cash or by certified check. These prices are the best available locally, but are met (for the 400) or bettered ($129 for the PAT-5) by mailorder houses. The 400 is heavy and not mailable, and of course with out-of-state mailorder you take all the risks. For details or to arrange a purchase call Jim Richardson at 566-1192.

And Mike Preamps at a Discount

Prepaid orders for the Wollensak mike preamp are also being taken. This unit is identical to the Advent preamp model MPR-1, although servicing must be obtained through Wollensak. Price is $25 each, or $10 less than the Advent. Again, contact Jim Richardson at 566-1192.

Ordering European Records

According to Ross Robinson (BAS member in Windsor, Ontario), the best place to order European records is Maildisc and Co., 17 Red Lion Square, London, WC 1, U.K., c/o Mr. P. B. Carroll. Robinson sent a large record order (around 500 pounds) to some 27 mailorder firms. Maildisc answered quickly (4 days), were the most precise, had the best discount, and paid for surface parcel post.

If anyone else has suggestions on ordering records from Europe or on ordering equipment from overseas, we'd be interested in hearing from you. We plan a comprehensive article on overseas purchases (especially English) for the next issue, and any contributions will be added to that publication.

Can You Help?

My entire audio system was ripped off last month, and I have reluctantly decided—willpower allowing—that my financial position doesn't allow me to start replacing the system for a year or more.

My record collection is intact, however, and I'd like to keep it active. I have a cassette player in my car, and I wonder if anyone in the BAS would be willing to play host to me once or twice a month and allow me to dub records to cassette using their equipment.

Since this generous soul would probably have to listen to whatever I dub, it's only fair to give some warning of the nature of the collection. There are 400 LP's covering pop, jazz, rock, folk, and concert music. Of the 400, perhaps 20% falls in the last category. The vast majority are "popular" in the old-fashioned (pre-1960's) sense of the term.

So with all that in mind, I'd be most grateful to hear from anyone in the Society inclined toward helping me out. I attend all the meetings; my home phone is on the BAS list; or I can be reached days at (617) 275-9200, ext. 505.—Henry G. Belot

June BAS Meeting

Business and Open Discussion

More than 160 audiophiles, including a good number of new faces responding to mailings or Shop Talk, attended the June BAS meeting at GTE Labs in Waltham. Jim Brinton called the meeting to order and immediately asked how the car pooling system (from BU to Waltham) was working. He would greatly appreciate it if someone actually using the car pool would volunteer to organize it next time; please call Jim or write to Box 7 if you are willing to help.

In audio matters, Jim pointed out that the omnidirectional microphones used at Symphony Hall have been changed from Neumann SM-2B's (tube-type condensers) to Neumann KM-83's. The difference in sound is more audience-noise pickup and the removal of a slight presence peak at 7.5 kHz.

Several new developments with the Thermo Electron 814's were reported. Included were a new package design by Ira Leonard, which has the same basic shape as the Group 128 unit and is suitable for either battery or phantom power. Another by Peter Mitchell makes use of a piece of aluminum tubing with a three-conductor phone jack in one end; this design, intended for use with the Advent preamplifier, would be suitable only for phantom power if an amplifier were built in. Both designs utilize the socket mentioned in the May Speaker. These very handy sockets are on sale for $2 each from Peter Mitchell.

Turning to tape, Al Foster warned that Advent, Maxell, and possibly BASF tape have gone up in price. No new batches of tape will be purchased in bulk for members for another six months, and all tape and Sheffield and Shure records were sold out at the meeting, including Ira Leonard's BASF. Jim Richardson took orders for Scotch and Ampex tape and for the Wollensak (Advent) mike preamplifier. For an alternate source or BASF chrome C-90 cassettes, Midwest HiFi was mentioned at a recent price of $2.10 in case lots (this was to go up as of July 1). Peter Mitchell warned that some apparent good buys in Scotch C-90 and C-120 chrome are lemons; the C-120's saturate 6 dB lower than Advent C-120's.

Jim Brinton gave preliminary results of the BAS tuner clinic, which is still in progress (all current appointments have been taken). At most two or three units "passed"; all others could have benefited significantly from realignment, with FM-5's a standout offender. There is a possibility that in the fall, when the clinic enters its second phase, the BAS may undertake alignment at a cost substantially below the cost at local repair shops. A manual will be required, so begin procuring them now. If you have a manual which can be lent to the pool, please contact Jim. For owners of AR tuners who can't wait, AR has a maximum charge of $30 for tuner repairs.

Eli Heffron, a Cambridge-based used equipment outlet, is selling MacIntosh MC-30's for $35 without tubes and $43 with. The initial BAS group purchase of bucket brigade chips for delay line "research" was reported, but these are now sold out. A kit may be forthcoming, but only when the devices become more readily available.

Meeting Feature: Sequerra Company

Fred Barrett, Chairman of the Board of the Barrett Group and Chief Executive Officer of the Sequerra Company, and Sam Lew, Chief Engineer of Sequerra, spoke on the philosophy of the company and addressed the technical and design features of the Sequerra tuner. For background on the company, see an article by Ira Leonard in the May Speaker.

Fred Barrett was born in Jamaica and became a U.S. citizen in 1973. He is one of the foremost American black capitalists and is both an entrepreneur and an engineer. He began with a "garage shop" in Queens in 1968 under the name Barrett Intercommunications; this company quickly achieved yearly sales in excess of $3 million. He took leave to become first Executive Director of the Consumer Product Safety Division with the U.S. government. This office has control of over 10,000 product categories and grew from a $40 million to a $60 million annual budget during Barrett's tenure. He returned to his own companies to put Sequerra on a firmer managerial basis. He now heads the Barrett Group of three companies, comprising Barrett Communications, Quadratech, and Sequerra Co.

Barrett's personality and philosophy came through strongly during his admittedly rambling presentation. After quoting one of his favorite anecdotes (it was a PR man who separated the waters of the Red Sea to save Moses and his flock from the Egyptians), he summed up his beliefs with a quotation from Sargent Shriver: high technology is the one challenge which can relieve America's social problems.

To date, the American high-fidelity industry has failed to take full advantage of current technology, particularly with respect to reliability and component quality. One of the standout American manufacturers, Marantz, went down the drain, along with the tradition of the 10B, when the company was sold to enter the mass production arena. With regard to equipment specifications, Barrett used the phrase "specification myopia" to define the short-sighted view that measurable quantities are more important than audible ones. From his work in setting noise standards for consumer equipment, performed in conjunction with William Fletcher of NASA and with Bell Labs, Barrett gained insight into those noise factors that are most uncomfortable to the human ear. These concepts are applied in the design of the Sequerra tuner—for example, in the wide use of balanced stages to reduce distortion below that of single-ended designs, even though the parts count is doubled.

Barrett came through both as a businessman and as a man who really believes in the validity of his product. His wide background in business, administration, and military electronics are fully melded in the Sequerra effort. He keeps his eyes open for applications of military electronic designs in consumer products. But his fight to overcome the problems of a small, black capitalist in America were a large part of his message.

The policy of the Sequerra Company is to build the best possible product at all times. Without a large advertising budget, this philosophy is almost forced on any new company. Instead of the "me too" route in audio, he gave Dick Sequerra and eight other engineers a free hand to design what was to become the Sequerra tuner. The project commenced in February 1972, and the prototype was displayed in New York by October. Then came detailed investigations of manufacturing techniques and component selection, areas where Barrett claims the industry is most out of date. After a research expenditure of $1.2 million, the tuner was on the market.

Sam Lew took over from Barrett for the technical discussion. Rather than giving a full presentation on the design and circuitry of the Sequerra, his portion rapidly became a question and answer session. Owing to the wide exposure of the tuner in reviews already, neither the performance specifications nor the tuner design were fully discussed. Copies of many test reports were on hand, and the reader is referred to August 1974 Audio, March 1975 Radio Electronics, and other publications for these details. Literature is, of course, available from the company.

The most notable difference from the equipment reviews concerned the physical appearance of the unit. The current version is greatly toned down in cosmetic impact, now having sedate white rather than yellow pushbuttons down both sides. In the most lengthy answer to a question, the concept of a tuner within a tuner (for the model with the panoramic display) was stressed.

Circuitwise, balanced FET's fill the front end after a balun-transformer antenna input. Both noise and distortion are cancelled by this "push-pull" design. The audio portion of the tuner is separated from the display section after the 10.7-MHz mixer stage, where a transformer divides the signal into its two parallel paths.

The spectrum analyzer section of the tuner was examined first. In this signal path the wideband 10.7-MHz output from the transformer is mixed down to a 2.4-MHz signal by beating with a voltage controlled local oscillator operating in a 12.1- to 14.1-MHz swept-frequency range. Varicaps are used as the control element and the sweep rate is fixed at 60 Hz. This mixer is followed by a six-stage, 120-dB gain IF strip with a narrow 25-kHz bandwidth. Frequencies within ±1 MHz of the tuned frequency are thus "probed" at a 60-Hz rate, amplified to the point of limiting, and the total signal strength present within a 25-kHz bandwidth (as measured by summing the currents present in each of the six gain stages) is available for display on the oscilloscope. The result is the panoramic display, in which the tuned station and several of its near neighbors appear as independent blips across the face of the scope. The tuned station appears in the center with stations 1MHz below displayed to the left and stations with 1 MHz higher frequency displayed to the right. Because of the 25-kHz resolution, minor structure on each station's main blip can indicate the presence of a 19-kHz stereo multiplex pilot tone or any SCA subcarrier at about 65 kHz. The width of the main blip gives the modulation of the FM carrier (the audio signal amplitude) and can indicate overmodulation (more than 75-kHz deviation from the carrier) by excessive width. The presence of compression in any displayed station is indicated by a consistently wide blip, while a station with a large dynamic range will have a blip that rapidly fluctuates from narrow to full width. The amplitude of each blip gives the relative signal strength. The vertical scale is calibrated in 20-dB increments with an enormous 90- to 120-dB full-scale range. (For some basic information on panoramic displays, the reader is referred to the Heath SB-620 amateur radio unit, which would be very difficult to modify for FM.)

Turning to the design of the audio portion of the tuner, the second half of the output from the signal-splitting transformer is fed to a six-stage 10.7-MHz IF strip, again with 120 dB of gain but this time with wide bandwidth. The FM signal is demodulated in a Travis-Smith double-tuned stage redesigned by S. Marantz; this is the type of detector used in the 10B and has an enormous 1-MHz bandwidth. Because of this bandwidth, the output is extremely linear over the 75-kHz FM modulation range, having 0.06% distortion at 400 Hz with 100% modulation. AM rejection is also extremely high at 70 dB, which gives the circuit great resistance to multipath. Early demonstrations of the tuner were performed with a dipole, and even in the center of Manhattan, signals received were superb. The use of a dipole is one of Barrett's key ideas. He believes that multipath is a three-dimensional effect that cannot be fully minimized simply by rotation of the antenna. Instead, he both rotates and folds the arms of the TV-type dipole to overcome multipath. This concept is an outgrowth of his work with defense electronics where a receiver with two antennas was used to pinpoint the location of an incoming target. Here, instead of a target, the antenna is adjusted to pinpoint the location of the FM transmitter's most direct signal path. Originally Barrett intended that the arms would be servo-controlled to automatically minimize multipath, but . . . maybe next year.

For the multiplex demodulation section, a phase locked loop was rejected because the IC's were not good enough and a circuit with discrete devices was too elaborate. Instead a sync-lock circuit with a very carefully designed diode-switching matrix is used. After detailed questioning, Sam Lew simply stated that this design is used because it works so well, and he backed up this claim with separation figures of 50 dB in the midrange and 40 dB at 15 kHz. Distortion is also lower than in the 1310 PLL.

The scope display has two functions in addition to the panoramic display mode. While this first mode displays the signals in the raw RF stage, the second examines the tuned signal within the IF strip, and the third is the audio signal (after demodulation). The IF mode is a rather standard multipath-display scheme, termed the "tuning" mode by Barrett. In the tuning mode, not only can multipath be eliminated but also, by use of a slider across the antenna terminals, one can tune out reflections caused by the downlead from the antenna. (The slider will be described in a later BAS article.) The multipath display can also aid broadcasters in reducing multipath from their end, which has been a particular problem at the present location of WBUR's antenna. The unit, with its panoramic and multipath modes, is of such great interest to broadcasters that Collins Radio, a transmitter manufacturing company recently bought out by Rockwell, is distributing the Sequerra tuner along with their main products. Broadcasters have accounted for about 90% of the tuner's sales to date, and even the FCC has purchased a couple. (Examination of WCRB's signal in the multipath mode indicated that their SCA subcarrier is "probably" overmodulating, which is not news to WCRB listeners.)

In the audio ("vector") display mode, either the left-right signals can be displayed along two 45-degree diagonals, or signals can be fed into phono jacks on the rear for a quad display. This feature is similar to the Epicure or Heath quadriphonic modes of their display units. Sweep rate is 60 Hz (nonadjustable) and sensitivity is 1 volt full scale.

Other than a great controversy over the use of rabbit ears for the antenna on a $2500 tuner, the only points of criticism of the product were the lack of a level control and the sensitivity to overload. Signals above 100 mV will cause the tuning to shift and may also cause distortion. If the user insists on using a high gain antenna, he should also add an attenuator to the input path. The RF-IF sections are designed without AGC and thus the unit has no overload capability. This lack of AGC also makes design of the multipath display more difficult than in normal tuners.

Although Barrett was questioned about other upcoming Sequerra products, he declined to elaborate beyond admitting the existence of preamplifier and power amplifier investigations. He stated that the preamplifier is being designed to "never become obsolete," and that he will be testing the first American vertical FET devices to become available. He also mentioned the possibility of an arrangement with the Dunlap-Clarke amplifier concern, but did not elaborate.

Even though almost no one in the audience could afford to purchase a Sequerra tuner, Barrett was barraged with questions even as he passed out the door. The presentations were extremely well received. A sample of the tuner was left with the BAS for about a month, and a users' report is forthcoming.—Jim Richardson et al.

Atlanta Audiophiles

Atlanta, Georgia, has its own audio society—Audio Forum. Damon Hill [(404)432-0245], one of the organizers of the group, has been corresponding with the BAS over the past several months. The Audio Forum group meets monthly and has a small newsletter to keep its members informed. They have been successful in obtaining discounts on records at several stores and one of their members is able to obtain discounts on some audio equipment. Atlanta seems to be fairly rich in high-fidelity groups. A second group, the Audiophiles, appears to be primarily a listening group, while Audio Forum seems to be more equipment and hardware oriented.

In Praise of Tennstedt

In the June 17, 1975, issue of The Boston Phoenix, critic Richard Buell gave his thoughts on the best of the past year's musical performances in the Boston area. Here are his remarks on the BSO as conducted by Klaus Tennstedt, about whom we spoke several months ago (January):

"The musicians were well primed for the appearance of guest conductor Klaus Tennstedt, whose leadership elicited quite the most exciting—and excited—playing I've heard from the BSO in ages. In the all-Brahms concert, the distribution of sonorities one heard was not this orchestra's standard, business-as-usual one. Tennstedt brought with him an unusually fresh and acute judgment of timbral values. (The Fourth Symphony and the Academic Festival Overture seemed so sensitively heard.) They came across with the bloom of health on them and not a whit less brainy for that. The Bruckner Eighth Symphony of the following week was no less than sublime. It even won over many who ordinarily are put off by garrulous spiritualities for huge Wagnerian orchestra. Tennstedt is an intense, gangling man in his 40s, and he is still new to what used to be called the 'Free World,' having fled East Germany a couple of years ago. He can be heard twice this summer at Tanglewood: in the Beethoven Sixth and Eighth Symphonies, and in a repeat of the Bruckner."

Again, we urge you to tune in to the rebroadcasts of his performances, and we request feedback on how the tapes sound in your locality.

How to Really Suppress RFI in Audio Equipment

A bill (H.R. 7052) was introduced into the House of Representatives by the Honorable Charles A. Vanik (Ohio) on 15 May 1975. This legislation, if it becomes law, will give the Federal Communications Commission the right to regulate the manufacture of electronic home-entertainment devices such that the susceptibility of these devices to signals from nearby radio transmitters is reduced.

The bill has been referred to the Committee on Interstate and Foreign Commerce, and specifically to the Subcommittee on Communications. Here, the bill must receive a hearing before it can be sent to the House of Representatives for action. If the bill is to receive a hearing, however, the Congress must be made aware of our support for such legislation, support which we can demonstrate by writing letters or sending telegrams to the Chairman of the Subcommittee on Communications:

The Honorable Torbert H. Macdonald
Chairman
Subcommittee on Communications
Room B331
Rayburn House Office Building
U.S. House of Representatives
Washington, D.C. 20515

The letters do not have to be long, though background material on your RFI problems could be of importance. Even a note to the effect that you support H.R. 7052 and respectfully request an early hearing on this bill would be a valuable contribution to the effort.

As audiophiles, we have become increasingly aware that the majority of RFI problems are not due to interference per se, but are due to the interception of signals by devices which were not designed to operate in today's urban and suburban RF environment. And one way of eliminating over 90% of all problems is through legislation such as H.R. 7052, which could eventually require the manufacturers to correct those design deficiencies which lead to RFI. We also know that some companies have been able to design equipment which does have a high degree of interference rejection, and that this equipment has remained price-competitive in a very crowded market. Therefore, industry's argument that the expense is prohibitive is not based on fact, unless of course Congress overreacts. If you agree with the provisions of the proposed bill, please let your representative or Representative Macdonald know.

The most important excerpt from the bill is given below:

"302a <u>INTERFERENCE WITH RADIO COMMUNICATIONS AND ELECTRONIC EQUIPMENT</u>

(a) The Commission may, consistent with the public interest, convenience, and necessity, make reasonable regulations governing

(1) [Transmitters and other RF sources . . .]

(2) <u>the use of protective components in audio and visual electronic equipment which are capable of reducing interference to such equipment from radio frequency energy</u> ."

—Edited from correspondence received from T. J. Cohen, Secretary, ARRL (amateur radio) RFI Task Group.

The 814 Column

One of the differences that characterize audio manufacturers is the degree to which they distill and refine a product design before marketing it. One company will rush into production as soon as it gets a design working, and then after consumers discover the bugs and design errors, the company will bring out an "improved" version the following year. Another company will thoroughly wring out the design in the lab, going through numerous experimental prototypes before settling on a final, consistently satisfying design. This is the process which we find ourselves in now as we attempt to develop the 814 microphone as a "product." Each successive issue of the <u>Speaker</u> has contained, in effect, progress notes on our investigation of the potential and the problems of assembling a convenient high-performance package based on the 814 capsule. Ira Leonard's discovery of sockets to mate with the capsule has accelerated these studies, so we have a lot of information this month—including a couple of surprises.

Sockets Eliminate Equalizer?

For the dozens of live concert recordings that I have made with the 814's since last fall, the signal cables, battery wires, and RF-suppression capacitors have been soldered directly to the capsule pins. I have made and used four of these assemblies and found empirically that they required some equalization for best sound (April Speaker). Lately I have assembled some 814 mikes with sockets and found that they consistently sound brighter than the soldered mikes. It appears that the heat of soldering may have depressed the high-frequency response of the capsules, perhaps by altering the diaphragm tension. So our previous warnings about being very careful when soldering the capsule were too mild. The use of sockets (available from the BAS for $2 each) should be considered imperative rather than optional.

The tentative conclusion that the sockets eliminate the need for equalization is based on preliminary tests. A final conclusion must await the resumption of regular concert recording in the fall, since live music is the best test of a mike. Incidentally, the apparent high risk of capsule damage in soldering makes it clearer than ever that the Electronic Enterprises mike kit (in which an 814 is soldered to a circuit board) is not likely to be a desirable product.

Phantom Powering the 814C

In the March Speaker Al Southwick described a method for phantom powering the 814. In phantom powering, the bias voltage for the mike capsule is derived from the preamp or recorder circuit and is supplied to the mike through the signal cable, with no battery required at the mike. Omission of the battery makes the mike as convenient to use as a dynamic and also makes the mike less bulky. The 814 capsule was not originally designed to be phantom powered but Al found a way to do it—the key step being to short out the 4700-ohm resistor in the capsule (in the FET's drain circuit) and to replace it with a similar external resistor in the source circuit of the FET.

Unfortunately we have found that while this method is successful with the 814, it does not work with the 814C (the high-overload version). Evidently the reason is that moving the 4700-ohm resistor from the drain side to the source side of the FET alters its biasing, raising the current flow through the capsule. In the 814 the current flow is 0.06 mA in simple battery-powered operation and rises to 0.5 mA with phantom powering via the circuit in the March Speaker. In the case of the 814C, the current is 0.6 mA with simple battery operation and 2.3 mA with phantom powering. This current flow through the 4700-ohm resistor produces a voltage drop (in accordance with Ohm's law) of 2 volts with the 814 and about 11 volts with the 814C. Consequently the residual voltage reaching the B+ terminal of the 814C capsule is too low for proper operation of the FET. The elevated current flow in the 814C also causes an excessive voltage drop in the matched splitter resistors in the preamp where the phantom bias voltage is obtained. Thus in my prototype, with a preamp supply of 16 volts, only 12 volts goes up the signal cable and only 1 volt appears at the B+ pin of the 814C. Clearly more study will be required to develop an effective phantom-powering circuit for the 814C, assuming that it can be done at all.

Incidentally, there is a term missing from the equation (March issue, p. b2, and April issue, p. 6) for calculating the value of the splitter resistors. The formula should read:

$$R_1 = \frac{\text{(Supply voltage) - (Required mike voltage)}}{2 \times \text{(Maximum current flow)}}$$

To phantom-power the 814 from an 18-volt supply, I use 2700-ohm splitter resistors. Higher values can also be used, up to about 5000 ohms.

814 Kits Available

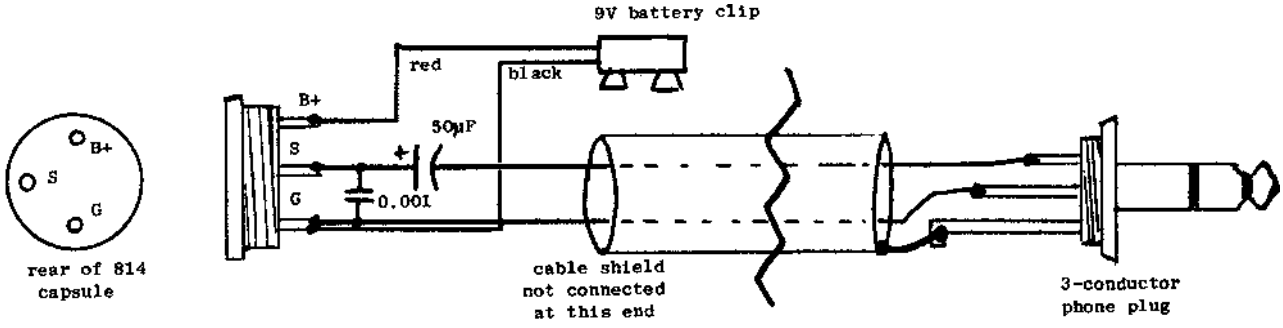
A complete kit of parts for assembling a phantom-powered balanced-line 814 mike is available. A 6-inch length of aluminum tubing (5/8 inch o.d. and 0.51 inch i.d.) houses the package. The mike socket mounts in one end of the tube, a steel three-circuit phone jack is press-fitted permanently into the lower end, and the circuitry fits inside. The kit includes 20 feet of shielded cable and a steel three-circuit phone plug which mates with the jack in the mike; the total length of the mike, from the face of the capsule to the end of the cable connector, is then 9 inches. Since the cable unplugs from the mike, you can make yourself a compact carrying case for safe storage of the mikes. For the other end of the cable, a second phone plug is provided to mate with the Advent or similar preamp, though of course you can substitute a Switchcraft/ Cannon cable connector if you prefer. If you need more than 20 feet of cable, as you certainly will in many live-concert situations, extension cables can be supplied. A matched pair of splitter resistors is included for installation at the preamp. The total kit price is $20 per mike (excluding the 814 capsule, which costs $27). On request, one of the phone plugs can be omitted, reducing the kit price to $18.50; you would then supply your own Switchcraft connector. I have not yet made any provision for mailing these kits. Since there have been requests for it, I will also supply fully assembled and tested mikes for $50 each; this excludes the cost of the capsule but includes the installation of your capsules in the mikes, wiring the splitter resistors in your preamp, putting the connectors on the cables, and checking the phasing and general performance of the complete system.

Of course, if you would like an even more compact metal package for the phantom-powered 814, Al Southwick continues to supply one based on a Switchcraft S3FM connector.

The Simple Approach to Wiring the 814 or 814C

If you don't want to expend either the effort or the expense involved in a sturdy, self-contained, shielded, elegant-looking metal package for the 814, you can simply hang the capsule (in its socket) on the end of a signal cable with a battery attached. This approach makes up in economy what it lacks in beauty, and of course the quality of the recorded sound is unaffected by the crudeness or elegance of the capsule's mounting. We've been asked to illustrate explicitly how the capsule (whose internal wiring is "unbalanced") should be wired for effective balanced-line operation. In the accompanying diagram, note that the cable shield is wired to the plug ground, but at the microphone end of the cable the shield is left unconnected. Use tape or heat-shrink tubing on the connections to prevent accidental short circuits, and tape the battery to the cable.

Incidentally, when studying the behavior of the FET's in the capsules, I found that the current flow through the FET in the 814C (and so its biasing and general behavior) is completely invariant as the B+ voltage is varied from 6 to 20 volts, implying that increasing the voltage above



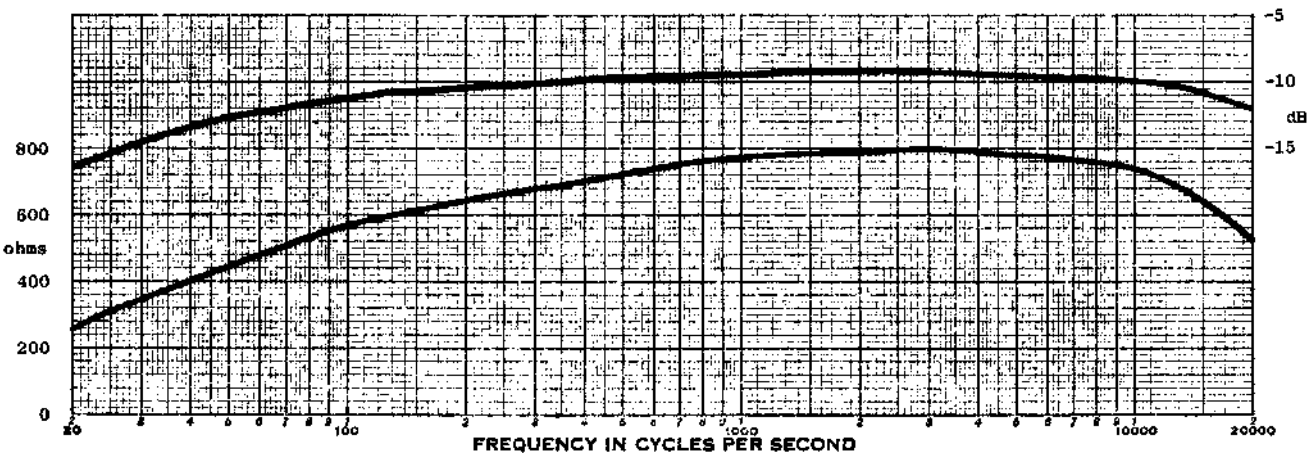
Simple wiring approach of 814 and 814C for balanced-line operation

6 volts will effect no improvement in distortion or overload characteristics. Similarly the FET current in the 814 is invariant as the B+ voltage is varied from 1.2 to 20 volts. So a 9-volt transistor battery is ample for either the 814 or 814C capsule.

The 814 and the MPR-1: An Impedance Mismatch

Last winter I reported a crude measurement of the effective impedance of the 814, since Thermo Electron did not specify it. I obtained 500 ohms, evidently a good mate to the nominal 1000-ohm input impedance of the Advent MPR-1 mike preamp. But TE's new spec sheets specify an impedance of 1700 ± 700 ohms for both the 814 and 814C, and while I was studying the current flow through the FET in the phantom-powered 814C (above), it became clear that the method I had used to measure the 814's impedance must have altered the FET's bias, causing an invalid result. Finally, Scott Kent has suggested that the reactance of the input transformer would reduce the MPR-1's impedance substantially below its nominal value. So I now have carefully measured the impedance of both the 814 and the MPR-1; the results are not catastrophic, but they are not optimum either.

I had only one 814 capsule available for measurement; its impedance is 1500 ohms, give or take 100. The input impedance of the MPR-1 is indeed lower than nominal, and it varies with frequency, going as low as 350 ohms at 30 Hz. The lower curve in the accompanying graph shows the variation. The MPR-1's frequency response was measured at the same time; it is quite flat, with a slight rise above 10 kHz and a rolloff below 30 Hz.



Input impedance of MPR-1 preamp (lower curve and left-hand scale) and attenuation of 814 output due to loading of MPR-1 (upper curve and right-hand scale)

According to Advent's specs, the MPR-1 works best with mikes whose impedance is lower than 600 ohms, and the impedance curve shows why. With a 150-ohm mike, for instance, the preamp's impedance variation would have no effect. But with a mike whose impedance is equal to or higher than that of the preamp, the input transformer "loads down" the mike, attenuating its signal and altering its frequency response. (See the January Speaker, p. a4.) The upper curve in the graph shows how the MPR-1 will alter the response of a 1500-ohm mike such as the 814; the dB scale at the right side gives the actual signal attenuation due to the loading. At mid frequencies, the natural output of the 814 mike at 94 dB SPL is -48 dBV, and the preamp attenuates this to about -58 dBV before amplifying it. The mike's frequency response, inherently flat in the bass, is rolled off by 5 dB at 30 Hz due to the loading.

Is the mismatch intolerable? Not at all. I have made dozens of recordings in recent months with 814's plugged into an MPR-1, and many of these sound very good indeed. In fact, the attenuation may have been useful in eliminating any possibility of preamp overload, and the low-end rolloff eliminates the subsonic garbage (such as floor vibration reaching the mike stands) which usually turns up in recordings made with mikes having a flat low end.

However, bass drums and pipe-organ pedals have been recorded with less weight than I wished, and it is possible that the severe loading on the capsule may have raised the distortion of its FET somewhat at very high signal levels (above 100 dB SPL). So the fanatics among us will search for a way to improve the mating of the 814 to a preamp. I have been doing so, and preliminary experiments indicate that it may be possible to design a transformerless balanced-line preamp suitable for only the phantom-powered 814 and costing even less than the MPR-1.— Peter Mitchell

Time and the Tape Recorder Turns Counter

When taping off the air or from other more controllable sources, one often needs to know accurately just how much recording time remains on the tape supply reel. The penalty for wrong guesses can be depositing the final poignant chords of Boeme on the leader, or leaving lots of unused tape at the ends of the reel. My deck (a Sony TC-377) is supplied with a turns counter, but this counts rotations of the supply reel and does not give a direct indication of the tape time used and/or remaining. I've tried timing with stopwatches but often I forget to reset them or loose track of the total elapsed time already on a side. Tabulating the time versus turns-counter reading at 2- to 5-minute intervals for all the types and lengths of tape I use rapidly becomes a chore greater than my patience. A true capstan turns counter or convenient elapsed-time meter is beyond my means, as are decks equipped with such devices (e.g., the new Revox or the Nakamichi 550). "Rulers" for measuring the thickness of tape remaining on a reel exist, but I've never found them fully accurate for tapes of various thicknesses or reels of various inner-hub diameter. There must be a better way.

One solution is to find mathematically an expression for the amount of tape wound on a reel as a function of the number of windings or tape layers. On most decks this number is proportional to the turns-counter indication. An expression for this length is as follows:

$$L = \pi i[H + (i + 1)T],$$

where L is the total length wound on the reel, H is the diameter of the inner hub, T is the thickness of the tape (all in inches), and i is the number of wraps as given by the turns counter. Time left on the reel is related to L by simply dividing it by the tape speed in ips. But now instead of a stopwatch I need a pocket calculator. And where do I get reliable numbers for tape thickness, T?

Going one step further, thickness can be computed from two numbers taken after playing through a tape. These are (1) the total number of turns from beginning to end and (2) the total elapsed playing time. From these we find

$$T = \frac{(60MS)/(\pi N) - H}{N + 1},$$

where S is the nominal tape speed in ips, M is the total time in minutes, and N is the turns-counter reading at the end of the tape (assuming it's reset at the beginning). This thickness allows for different winding tensions on various machines and should be slightly different from the tape thickness specified by the tape manufacturer. More important, this value also allows for gearing between the turns counter and the recorder reel. On my Sony, the ratio is 1:1 and

the counter gives exactly the number of reel revolutions, but if the gear ratio is other than 1 :1 the computed value of T, when used in the above formula for tape length, will compensate for gearing without further trouble (even though the counter no longer gives exactly "i").

With values of T and H on hand for each manufacturer's tape and hub, a table of tape length or playing time can be constructed for convenient intervals of the counter index. I use such a table rather than computing L each time I need it. For one specific combination of tape, hub, and machine (BASF DP-26LH supplied from a Meister reel on a TC-377) an example table is given below. The 50-turn interval of computation makes interpolation of intermediate turns-counter readings quite accurate. There is one glitch, however. On some machines the turns counter is geared to the supply reel, while on others it is linked to the takeup reel; Sony counts the former, while older Revoxes (before a capstan-counter was added) count turns of the takeup reel. This is

COUNTER	TIME LEFT		TIME USED	
	SUPPLY	TAKEUP	SUPPLY	TAKEUP
0	64: 30	64: 30	0: 0	0: 0
50	62: 12	63: 38	2: 18	0: 52
100	59: 56	62: 44	4: 34	1: 46
150	57: 43	61: 48	6: 47	2: 42
200	55: 31	60: 50	8: 59	3: 40
250	53: 22	59: 49	11: 8	4: 41
300	51: 15	58: 4?	13: 15	5: 43
350	49: 10	57: 42	15: 20	6: 48
400	47: 8	56: 35	17: 22	7: 55
450	45: 7	55: 26	19: 23	9: 4
500	43: 9	54: 14	21: 21	10: 16
550	41: 12	53: 1	23: 18	11: 29
600	39: 13	51: 45	25: 12	12: 45
650	37: 26	50: 28	27: 4	14: 2
700	35: 36	49: 8	28: 54	15: 22
750	33: 49	47: 46	30: 41	16: 44
800	32: 3	46: 21	32: 27	18: 9
850	30: 20	44: 55	34: 10	19: 35
900	28: 39	43: 26	35: 51	21: 4
950	27: 0	41: 56	37: 30	22: 34
1000	25: 23	40: 23	39: 7	24: 7
1050	23: 49	38: 48	40: 41	25: 42
1100	22: 16	37: 10	42: 14	27: 20
1150	20: 46	35: 31	43: 44	28: 59
1200	19: 18	33: 49	45: 12	30: 41
1250	17: 52	32: 6	46: 38	32: 24
1300	16: 28	30: 20	48: 2	34: 10
1350	15: 6	28: 32	49: 24	35: 58
1400	13: 47	26: 42	50: 43	37: 48
1450	12: 29	24: 49	52: 1	39: 41
1500	11: 14	22: 55	53: 16	41: 35
1550	10: 1	20: 58	54: 29	43: 32
1600	8: 50	18: 59	55: 48	45: 31
1650	7: 42	16: 58	56: 48	47: 32
1700	6: 35	14: 55	57: 55	49: 35
1750	5: 31	12: 50	58: 59	51: 40
1800	4: 28	10: 42	60: 2	53: 48
1850	3: 28	8: 32	61: 2	55: 58
1900	2: 31	6: 21	61: 59	5$: 9
1950	1: 35	4: 7	62: 55	60: 23
2000	0: 41	1: 50	63: 49	62: 40

COUNTER	FEET	HUB	THICKNESS	SPEED
2040	2418.75	2.42	1.03	7.50

no problem, however, because the numbers printed out by the labor-saving Hewlett-Packard 9830 calculator give both. Those under the "SUPPLY" heading apply to Sony-like machines, while those under the "TAKEUP" heading are for Revox types. For convenience, both the time elapsed and the time remaining are listed.

Within the speed-change accuracy of a machine, time values for slower speeds can be found by multiplying tabulated times by an appropriate factor (e.g., 2 for 3¾ ips) or a complete table can be recomputed for each. Again, because a table must be computed for each type of tape and each hub size onto which the tape is wound (using the hub size corresponding to that reel to which the turns counter is geared), several tables must be computed and used if one uses several combinations of tape lengths and hubs. Normally I use only two tables, one for 1800-foot reels and one for 2400-foot reels, each computed for an "average" 7-inch reel hub (about 2.3 inches). Within the computation interval (50 turns) the overall accuracy is about ±15 seconds for custom-computed tables.

Members can obtain copies of the timing table for their specific machine, tape, and hub combinations (up to a limit of four each) by sending (1) a self-addressed stamped envelope and (2) clearly stated values for the total playing time, hub inner diameter, total turns count, and tape speed for each setup. There is a price, however. Each request must be accompanied by some correspondence related to the BAS Speaker—either an article, an informative letter, or a few suggestions for material you would like to see covered in these pages. Suggestions needn't be terribly long—just something for the Publications Committee to consider as each newsletter is planned. Send the above to the P.O. Box 7 address given on page 1. (We may publish a general "1800-foot tape on a 7-inch reel" table in a future issue if there is sufficient interest and space.)—Harry Zwicker

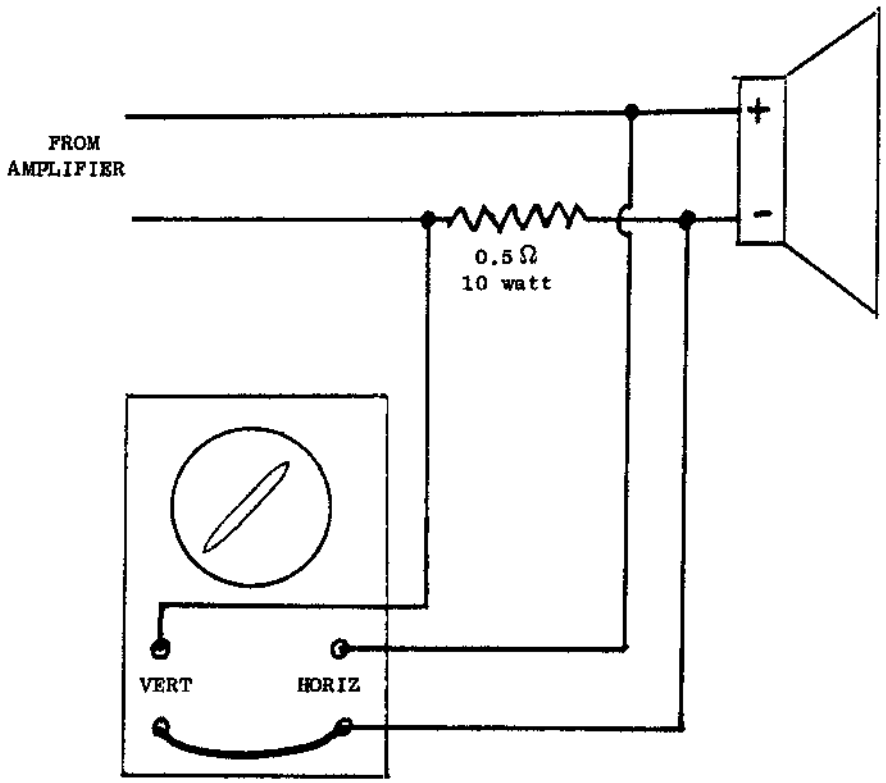
Speaker Measurements

Was your interest piqued by Ron Dunlap's demonstration of the peak current demands of reactive loudspeakers? If you have an ordinary oscilloscope, you can investigate the peak current and the reactive character of your own loudspeakers by using a crude current probe. A 0.5-ohm 10-watt noninductive resistor, wired in series with the ground return side of your speaker (not in parallel with the speaker) serves as a suitable probe, enabling you to measure the current through the loudspeaker to an accuracy of 10% or so. The current produces a voltage drop across the resistor in direct proportion to the flow through the speaker, so by amplifying that voltage a known amount and feeding it to the scope terminals, you can determine peak current demands. If your scope is sufficiently sensitive, you don't even have to amplify the voltage drop, and if you do need some amplification, the 741 headphone amplifier circuit described last month will serve admirably. As you observe the peak voltage (v), you can convert it to peak current (I) through

$$I = \frac{v}{R}\left(1 + \frac{R}{Z}\right),$$

where R is the 0.5-ohm resistor and Z is the nominal impedance of the loudspeaker. If you are interested in only approximate results, you can ignore the term in parentheses. Then you have the simple relation: I (amps) = 2v (volts). Of course you probably won't find the required 0.5-ohm resistor in your neighborhood parts store. The easy approach is to make it by soldering 20 1/2-watt, 10-ohm carbon resistors in parallel, at a total cost of $2.00 or less.

To look at the reactive character of the speaker, leave the current probe connected to the scope's vertical inputs and connect the horizontal inputs across the loudspeaker terminals. In other words, you have the voltage across the speaker appearing on the scope's horizontal axis



and the current through the speaker represented on the scope's vertical axis. Now if the speaker were a truly resistive load, you would see a straight line on the scope, and by adjusting the vertical and horizontal gains, you should be able to make that line have a 45-degree slope. To the extent that the speaker's impedance is reactive, the current will be somewhat out of phase with the voltage, so the scope pattern will broaden into an ellipse. On musical material containing many frequencies, the variation of the speaker's reactance with frequency will tend to scramble the ellipse into a ragged pattern, which nevertheless remains confined within an identifiable oval area oriented diagonally on the screen. The broader this oval area, i.e., the more it departs from a narrow line and approaches a circular scrambled-egg pattern, the more reactive the speaker is. If the pattern were circular, it would mean that the current is 90 degrees out of phase with the applied voltage, a condition that few amplifiers can cope with successfully.—Peter Mitchell

Phono Cartridge Noise: A New Low

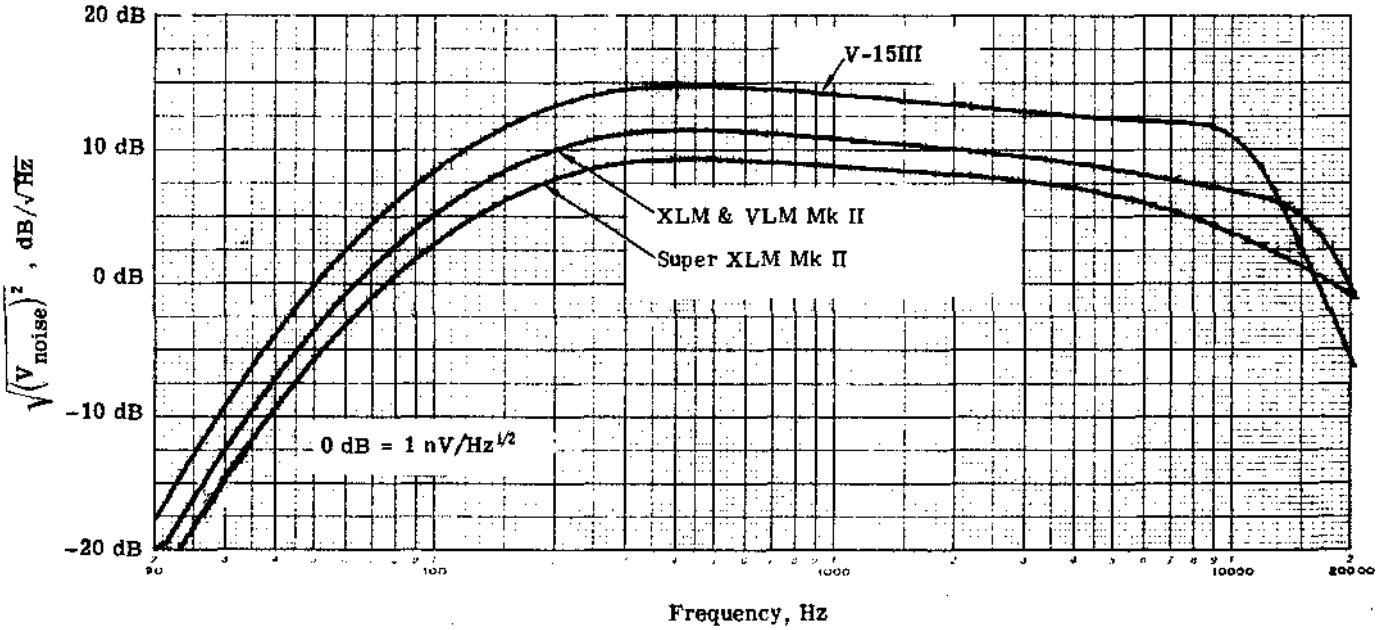
In the accompanying figure, RIAA A-weighted noise curves are plotted for some new ADC cartridges: the Super XLM Mk II, the XLM Mk II, and the VLM Mk II. Data for the Shure V-15III, taken from a previous Speaker, are also plotted for reference.

The equalized and weighted noise voltages for the Super XLM Mk II are 0.24 µV, compared with 0.32 µV for both the XLM and VLM Mk II (both have identical specifications). The Shure reference is 3 to 5 dB noiser at 0.45 µV.

This low noise in the ADC's results from their very low dc resistance, as seen in the table below:

Super XLM: R = 375 ohms, L = 300 mH, and C = 100 pF
XLM and VLM Mk II: R= 635 ohms, L= 350 mH, and C = 450 pF
Shure V-15III: R = 1350 ohms, L = 500 mH, and C = 450 pF.

All use a 47-kohm load.



RIAA and A-weighted phono cartridge noise versus frequency

As suggested by member Chris Moore of Belmont, Mass., one can compute a "maximum" signal-to-noise ratio for these cartridges by taking the output at a standard 5-cm/sec recorded velocity (at 1 kHz) as the signal reference. Using values as listed in the 1975 Buyer's Guide, it seems that nearly all cartridges have nominal 3.5-mV outputs at this level, while the XLM Mk II has been measured at a larger 5.25 mV. As seen in the following S/N ratios, the ADC's are clearly the most impressively quiet line of cartridges to date: Shure V-15III, 78 dB; Micro-Acoustics QDC-1, 79 dB; XLM Mk II, 84 dB; and Super XLM, 83 to 87 dB for 3.5 to 5.25 mV nominal output.—Harry Zwicker.

In the Literature

Current Issues. Just in case you've lost track, we list below the most recent issues of several "periodicals."

Audio Amateur: 1/75, June 1975, Volume VI, No. 1
Absolute Sound: Fall 1974, Volume 2, No. 5
Stereophile: Spring(1) 1975

Audio Amateur, June 1975 (1/75)

- A Proven Transmission Line Loudspeaker: Design, construction, and anechoic chamber evaluation of a quite complete four-driver unit. Any speaker project is ambitious, but this one is a carpenter's nightmare.

- Speaker Evaluation: Ear or Machine, Part I: After a rambling introduction the author describes a simple machine approach, rejecting the ear. This subject cannot be fully discussed in any article or short series and requires more than one man's opinion, but this article and the readers' letters that it will surely evoke might help clear up the subject of speaker testing.
- Two pieces on filters, one on a piece of simple test equipment for RIAA, bias trap, noise-weighting, and high-cut filtering, and the second on designing op-amp active filters (part I).
- Many pages of audio pointers, letters, and a note on multipath scope display.

Audio Engineering Society, Journal of the, March 1975

- A Geometric Model for Two-Channel, Four-Speaker Matrix Stereo Systems: Michael Gerzon describes an imaginative use of spherical geometry to analyze the accuracy and compatibility of matrix quad systems, including those with logic. No applications to existing systems are given. (pp. 98-106)
- Reducing Distortion in Analog Tape Recorders: David Griesinger describes the use of cross-field bias and pre-distortion circuit which reduces tape distortion by about a factor of 10 (e.g., from 1% to 0.1% at +4 VU)! (pp. 107-112)
- NQRC Measurement of Subjective Aspects of Quadrophonic Sound Reproduction, Part II: Reaches the conclusion that of three methods proposed for quad FM broadcasting, the fully discrete methods provide more accurate localization than a semi-discrete/semi-matrix system. Surprise! (pp. 128-130)

Audio Engineering Society, Journal of the, April 1975

- In Situ Measurement and Equalization of Sound Reinforcement Systems: Robert Schulein attempts to evaluate why selecting speakers or equalization to provide genuinely flat energy response at the listener's location usually results in subjectively over-bright sound, both in home hi-fi and in large-hall PA systems. Also describes some of the pitfalls in attempting response measurements (e.g., mike directivity). The most interesting point made in the article is that the human ear's high-frequency response is 5 to 10 dB stronger for side-located sources or in a diffuse field (where much of the energy is arriving from the sides) than in a direct field where the energy is arriving from the front. This explains why the BSO doesn't sound subjectively dull in the diffuse field 100 feet from the stage despite the fact that microphone measurements show the high-frequency energy to be 10 or 15 dB down at that distance due to hall acoustics. It also explains why headphones and ambience-recovery speakers located at the sides of the listener must have their highs rolled off in order to sound natural. (pp. 178-186)
- A Method of Analyzing the Quadrophonic Sound Field: Katsumi Nakabayashi of NHK presents an idea so good that one wonders why someone didn't think of it before. For any proposed quad system, move a sound source in a circle around the listener and for each source location compute the phase difference and amplitude difference between the sound fields arriving at the listener's two ears on playback. For a real source moving around the listener we know what the interaural phase/amplitude curve would be, and for a quad system the curve can be computed from the matrix coefficients of the encoder or decoder. Comparison with the curve for a real source illustrates the accuracy of the four-channel system in question. The article shows how accurately a discrete quad system can reproduce phantom sound images in all directions, and how poorly the RM matrix does. Now, if someone will just apply this analysis to SQ, QS, BMX, etc. . . . (pp. 187-193).
- Horn Theory and the Phonograph: Percy Wilson illustrates some ancient history. (pp. 194-199)

[Subscription information: nonmember rate for this journal is $30/year . Correspondence to 60 E. 42nd St., New York, N.Y. 10017.]

Audio Scene (Canada), June 1975

- Audiolab Test, Six Microphones: Pickup pattern and response tests with a one-page discussion per unit of the AKG D190E, Beyer X1-HL(C), EV-635A, Sennheiser MD413U, Shure 565SD Unisphere 1, and Sony ECM-270. All are in the $100 price range.
- Microphones and Music: Placement suggestions for recording acoustic guitar, piano, drums, brass, vocalists, electric guitar, and electric bass.

The Basic Repetoire, 1975

- The new version is offered in the July 1975 issue of Stereo Review for 25¢ plus SASE. Now revised by Mr. Richard Freed of Lincoln Center, Philadelphia Orchestra, St. Louis Symphony, WE FM in Chicago, and free-lance-record-critic fame. Thirteen pages of recommendations, with about one paragraph for each work.

dB, June 1975

- How Audio is Doing in San Francisco: Lists main equipment used by six studios. List includes Altec 604E, double-pairs of Quads, custom made Westlake, Klipsch, Altec 9845, JBL 2420, other Altec and JBL units as monitor loudspeakers.
- Why Use 15-IPS Tape Speed: Shows that at 7½ ips there is compression above 10 kHz.
- Norman Crowhurst's column Theory and Practice: Large rooms mask musical subtleties. Up close, in your living room, you will be more critical of a loudspeaker than you would be of a "sound reinforcement" speaker system in a large hall.
- Covers Audio Band in One Sweep: A very simple circuit using the 555 timer IC for making a square-wave generator that is tunable from 20 to 20,000 Hz. (p. 32)

dB, July 1975

- Electret Microphones: General background information. (pp. 24-27)

Electronic Design, July 5, 1975

- Focus on Operational Amplifiers: Specsmanship and the lack of standards. FET amplifiers have low input bias, but value increases much more with rising temperature than for bipolars; slew rate and distortion specs lack standard; noise impossible to compare. Good article for the more design-oriented audiophile selecting new "low noise" or FET devices. (p. 44)

Electronic Engineering Times, June 16, 1975

- Consumer RFI Protection Proposed for FCC Control: News story about legislation by C. A. Vanik of Ohio now in committee. Spokesman for Amateur Radio states that such RFI-protection circuitry is needed now. RCA worries about the cost and compares with the over-regulated automobile situation; other TV set makers echo worries about added cost for "second set" market. Speculation on cost ranges from $7 to $100. Aid to Vanik stated that between March 1974 and March 1975, CB licenses grew from 850,000 to 1,200,000 and this number will continue to rise, adding to the urban interference problem.

Electronic Servicing, May 1975

- Servicing Direct-Coupled Audio Outputs: Fairly simple discussion of various forms of output stages, from class B to AB with and without capacitor output. Negative feedback, distortion as a function of bias (too little gives notch distortion, too much gives duplication of output near zero), testing the amplifier, dangers of replacing one component only to have several more blow, and suggestions for keeping the amplifier on the air (lower volume before switching and similar simple warnings). (p. 21)

Electronic Servicing, June 1975

- Op-amps . . . Versatility in Solid State: Another introduction to op-amps. Discusses input bias, offset voltage, frequency compensation, slew rate, and common-mode rejection of hum. (p. 24)
- FM-Stereo Circuits and Adjustments: Simple and short, assumes use of a MPX generator. Good background for those having their tuners checked by the BAS. (p. 26)

[Electronic Servicing is published by the Sams people of Photofact fame (publish current schematics and short testing data on many consumer electronics devices, including component audio equipment; also publish book-form data by subject, e.g., tape units, ideal for repairing your own equipment). Rates are less than $6/10/13 for 1/2/3 years, and one free book with each year's subscription. Subscription information from 1014 Wyandotte St., Kansas City, Mo. 64105.]

Electronics, June 26, 1975

- Microphone Preamp Gets Power Through Cable: Uses Harris HA-911 op-amp with 8-nV/hz $^{1/2}$ noise and 8-MHz gain-bandwidth. (p. 94)
- IC Compresses, Expands Analog Signals: Uses EXAR XR-2216 compander IC listing at $5.60 each. Has 3% distortion, but this might be good for use in an automobile to compress the signal and overcome road noise at much less cost than a mobile dbx.

Hi-Fi News and Record Review (England), April 1975

- Equipping an Amateur Hi-Fi Workshop, Part 3: A millivoltmeter. This is a more complex design than the wide-range audio voltmeter scheduled for forthcoming BAS publication. (pp. 64-65)
- Building Around a Chimney Bass Speaker: On installing a common-bass woofer in the fireplace. (pp. 70-71)
- Quality Monitor: Surveying the best-sounding discs. (pp. 83-85)
- The Sequerra Model 1: A good review, showing outstanding sensitivity, selectivity, and low distortion; but concludes that "audiowise it cannot be regarded as being better than some of the top-flight FM tuners available at far lower cost." (pp. 131-137)

Hi-Fi News and Record Review, May 1975

- FM Diary: Angus McKenzie expresses his low opinion of the stereo imagery in BSO Transcription Trust tapes and adds some arrogant and unnecessarily snide references to Richard Kaye. (p. 97)
- Pickup Cartridges for CD-4: Includes reviews of Pickering UV-15/2400Q, Grace F8/E, Ortofon SL15Q, B&O MMC 6000, and ADC Super XLM, evaluating both two-channel and CD-4 abilities. Results: Ortofon, superb two-channel, first-class CD-4; B&O, excellent two-channel, fair CD-4; Grace, good two-channel, good CD-4; ADC, excellent two-channel (but too compliant, unusable on warped discs), fair CD-4; Pickering, fair two-channel (inadequate tracking ability even at 3 grams), good CD-4.

Hi-Fi News and Record Review, June 1975

- Equipping an Amateur Hi-Fi Workshop: On building your own harmonic distortion analyzer. Looks interesting. (pp. 51-59)

Open Reel Stereo-Log

- Stereo tape supply catalog from a California firm, perhaps of interest to west-coast members. Prices are slightly higher than Barclay-Crocker (e.g., $7.65 versus $7.35 for a $8.95 tape). Advertised in the hi-fi magazines.

Popular Electronics, Aug 1975

- Will Audio Go Digital? in Stereo Scene column: Digital recording, a good basic discussion by Ralph Hodges. Conclusion is that digital fidelity is hard to get, which ensures that analog audio will be with us for quite a while. Good background for use of the bucket brigade delay line in that it avoids many of these digitization problems. (p. 16)
- Electronic Crossover Networks for Hi-Fi: A good discussion of why bi-amplification is desirable, but unfortunately only mediocre passive crossover networks are described. Rather silly when a high-quality active crossover using op-amp IC's is easy to design and inexpensive to build. (pp. 33-36)
- Imitating Musical Instruments with Synthesized Sound: Some interesting figures for the frequency-spectrum and temporal-output of instruments. (p. 37)
- Review of Stanton 8004-H belt-driven, magnetic-suspension turntable with unipivot arm shows low price and high rumble. (p. 66)

Wireless World, June 1975

- Digital Techniques in Recording and Broadcasting: A general survey of BBC and Japanese progress with digital audio agrees with Popular Electronics that the applications are a ways off.
- Wireless World Dolby Noise Reducer: Part II includes the circuit diagram, PC layout, and construction details. Compared quickly with the very inexpensive TEAC AN-50, the WW unit does not appear to be particularly revolutionary although parts quality and noise may be better. It does not use the Signetics IC, but is all-discrete except for a meter preamp and a test oscillator. Anyone have a feeling for distortion, noise, etc., specs among the commercial Dolby units? (p. 257)
- Electronic Circuit Calculations Simplified: First of a series on common, basic circuit-design problems. (pp. 273-276)
- 75 Years of Magnetic Recording: Part four of the history. (pp. 283-286)

Comments on Records, Cleaning, and the Discwasher

The Discwasher record cleaning brush and its DII cleaning fluid have been reviewed in several commercial publications, all with fairly favorable comments (of course) on the utility of the device. But the review in one engineering-oriented newspaper (Electrical Engineering Times , January 27, 1975) was different. It stressed the chemicals added to vinyl during disc manufacture, the danger of using some cleaning agents (e.g., alcohol) on these surfaces, and how the DII fluid is claimed to be safe and based on "scientific research."

Being skeptical of products that stress a scientific foundation—it is a great ploy to snow the customer or impress him with the product's credibility—I wrote to Dr. Bruce Maier, the head of Discwasher, Inc., asking him to provide me with the same sort of information packet that the reviewer in EE Times used as the basis of his article. Soon I received several copies of the booklet "Clean Records and Chemistry," which the company sells through the mail for 25¢; a Discwasher device with its information booklet (12 small pages, but more than you get with some receivers these days); other advertising; and a total of seven pages of single-spaced typed information covering material not included in the other two books. All this to describe a brush to sweep gook and dust off phonograph records.

Quite apart from the merits of the cleaning device, I found much of the material new, interesting, and useful. Rather than print all of the Discwasher text and advertising copy in these pages, the following is a condensation of Maier's letter; the intent is to inform, rather than to sell or review the product. The letter is followed by several comments from users of the Discwasher.—Harry Zwicker

"Relevant to technology, I think it is reasonable to say that I function with the only non-record-industry laboratory which examines both optically and chemically phonograph records sold on the open marketplace. To this objective I have a Skemy Electron Microscope, a gas-liquid-chromatography apparatus, and numerous other significant laboratory apparatus in order to offer documentation in our own product improvement and knowledge of what really goes on with record technology.

"Within the last three years we have seen an alarming change in the chemical composition of phonograph records. I am constrained to say there are many records which are better left dirty than to be played clean. I would like to deal with some of these newer problems for your information and possibly for the information of your readers. You might also be interested in the care and research dollars through which such information became available, for without a real interest in a good product, we would not go to this much trouble.

"We can summarize most of the problems as pivoting about sheer economics. Although good vinyl polymer is available, the best and most pure co-polymer for records costs about one cent more than it did a year ago. That doesn't sound like too much money, but one cent per disc to a

manufacturer is (to him) enough money, in a year's time, to buy the Queen Mary. Please recall this in the perspective of a lighter record as compared to the old ninety-gram records with commensurately larger, more stable block of vinyl to prevent warpage and chatter on the record playing device.

"In addition to the polymer problem, we have the unique and specifically curable manufacturing error of rapid-cooling. That is, after the critical moment of stamper press, during which time heat and pressure mold the annealed vinyl into its incredibly contorted groove channels, there must be a cooling time. This cooling time often takes two forms. The first stage is a water-cooling process in the stamper head to simply allow extraction of the disc from the stamper. The discs are subsequently removed either mechanically or by hand and put onto a spindle.

"At this time most record companies, in effect, turn air-conditioners on them. [This is the second cooling step.] The net result is exactly what happens when you take a hot cookie-sheet out of an oven into a cold room and the thing goes 'klonk' and assumes a permanent warpage—one area of molecular structure has cooled and condensed while another area has remained hot and expanded. This 'cookie-sheet' warp in vinyl discs is not curable.

"Most truly responsible record manufacturers are kept responsible by the buying public. That is, German, English, some Spanish, and Japanese music markets will simply not tolerate poor surfaces. About two years ago DG issued some releases in Germany under the test manufacturing techniques that Americans are now hardened to. The German market rammed them back down their throats, and would not purchase those releases. DG tightened up, and (for example) utilizes approximately a thirty-five second dual cooling cycle on their current releases. I know of some disc manufacturers in this country that use fifteen seconds, and most use twenty-to-twenty-two seconds in their cooling cycle. That difference, between twenty and forty seconds, is the critical manufacturing process difference whereby the fifteen percent vinyl acetate can assume its very, very smooth glass-like surface in the record format we all love. [Emphasis added] To deny the long, graduated cooling process to the heat-stressed plastic is to prevent this superior surface from forming.

"The booklet 'Clean Records and Chemistry' also discusses other things, like the lubricants and/or stabilizers put into 'modern' plastic batches in the United States. Some of these are really neat compounds like epoxyized peanut oil, lead stearate, and other exotic large molecules for the flow-lubricant. The smaller 'migrating' lubricant discussed [in the booklet] is often something like monotanic acid, and/or synthetic oils which facilitate mold release under rapid-cooling procedures. The net result of these compounds is that the record simply has more non-contributing molecules in any given disc. When you are dealing with a surface as exacting as a high-fidelity surface, any product which doesn't contribute will detract from the final quality. If the heating-cooling cycle is just a tiny, tiny bit off, then the lubricants exude in greater proportion, [yielding a pronounced] groove-clogging effect.

"In addition, per the booklet, the incorporation of static charges because of the slurry-type delivery to the stampers is very critical. That is, when the slurry (rather than a preformed puck) is 'delivered,' the internal static charge of the sliding slurry gives most modern records an internal static charge approximating one-hundred to two-hundred volts. Since vinyl is non-conductive, this internal charge will continue to polarize the surface no matter what kind of cleaning or antistatic device is used. My company is in final development of an anti-static device to be used during playback.

"All of this wailing concerning record manufacture has really led to the DII formula. This formula is so critical and so chemically related to record manufacturing problems that it makes all the others look like alchemy. Idiosyncratically, if a fluid can really handle the manufacturing exudates, it can also do unbelievably competent work on fingerprints. The net result of the DII fluid is that at last we have a compounding to help us with production characteristics in the area of phonograph discs.

"There is a real problem, however, in that many record companies are using recycled vinyl, cheaper materials, 'fillers' which shrink on cooling to distort groove paths. The extraneous compounds which exude during pressing will often shield the listener from the poor, rough and erratic surface. Therefore, when the poor surface is cleaned of these covering compounds, an audibly inferior surface is uncovered.

"I would like to suggest a criterion for effectiveness which you might try.

"I suggest you take a 'clean' record which has been exposed to room environments (out of the jacket) for a protracted period of time, then take the Discwasher System and clean the record as follows:

"Put a tiny amount of DII fluid on the leading edge of the pad as defined in the instruction booklet. A tiny amount might best be described as three drops. Take the heel of the bottle and rub this amount of fluid along the entire length of the leading edge of the pad.

"Now with this minutely moist leading edge of the direct-pile brush, clean your record as described in the instruction booklet. (This necessitates cautious reading of the instructions.)

"Now, look at the leading edge of the black Discwasher pad. You will in all probability find a tiny line of gray/white dust picked up off the record even after another modality of cleaning.

"In short, there is no truly perfect record cleaner or cleaning device. We do, however, continue to offer research and development in an area which means a great deal to us: protection and elucidation of the best sound reproduction available."—Bruce R. Maier

Comment. Maier notes that he has an electron microscope, chromatography apparatus, and a laboratory setup to examine discs and surface deposits before and after cleaning. I trust this lab also is used in other pursuits, because, while I can see an equipment manufacturer amortizing his gear on sales of $500 preamplifiers, I cannot see this firm doing so on $15 brush profits. Hopefully, Maier is teaching the record industry something about their products; I wonder if RCA has ever searched their records' surfaces with an electron microscope.

In addition to problems with strict contaminants, Maier claims that discs, especially damp ones, provide a perfect culture medium for fungi-clumps, which in turn produce vinyl-etching enzymes. The DII fluid is said to remove not only solidified manufacturing lubricants and similar home-added greases (fingerprints, for example), but also tobacco tars and fungi.

Unlike soap- or detergent-based cleaners, no dust-attracting deposit is left on the surface by DII, and unlike alcohol and aldehydes, DII will not remove the stabilizers used in plastics nor etch vinyl acetate out of discs ("vinyl" discs are 15% vinyl acetate and 85% vinyl chloride, or PVC). Even water, if used to excess (i.e., playing the disc wet, for example) may oxidize the vinyl, which is much the same as speeding its aging into a brittle rather than a ductile material.

The brush portion of the Discwasher is also claimed to be of advanced design, using capillary action to pull the residue from the surface into the pile rather than simply scraping deposits off the surface and into a clump, hopefully to be collected by the brush (by static attraction?) as with, for example, the Watts Preener. The fibres of the brush are also planted into the holder at an angle so the pile acts somewhat like a shovel rather than like a toothbrush. The instruction manual for the unit stresses the use of only a small amount of fluid and the necessity of at least 10 seconds of cleaning and 10 of drying with a fresh portion of the brush.

As for performance, the Discwasher does beat the Watts Preener in not leaving a line of dust. The unit is very heavy and, although I now use it rather than the Preener, I fear its dropping onto the record surface. It is a very "pretty" accessory, with more walnut than in many "oiled-walnut" loudspeakers.—H.Z.

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Comment. Dr. Maier's comments can leave one with the impression that it is pointless to clean records because removing the manufacturing and filler materials can expose "an audibly inferior surface." Perhaps when the FTC settles the amplifier preconditioning question, they can borrow a page from the FDA and require record companies to list the "ingredients" in their product.

Assuming, optimistically, that peanut oil, etc., records are only a small minority, let us address the more practical question of cleaning effectiveness. I have found that the Discwasher is a useful and effective record cleaning device when used according to the instructions. I followed Dr. Maier's suggestion and exposed a "clean" (new) Philips record to the room environment and then cleaned it with the Discwasher. Indeed, there was a "line of gray/white dust" on the cleaner, but it was not tiny. (This leads to another problem: You need something to clean the Discwasher after each use or you'll have a dirt transfer device.) The record appeared quite clean to my eyes—no visible signs of dust. When played, the record exhibited occasional clicks and pops. I then cleaned the record using my vacuum record cleaner (see Speaker, Oct. 1974). When played, the record was then significantly quieter. Conclusion: The Discwasher is capable of removing a lot of dust in one pass. A good vacuum system can remove more. On the other hand, if you spent 2 minutes (the time required for vacuum cleaning) using the Discwasher, it would probably remove more than on one pass.

We've all seen the Discwasher ad that proclaims its superiority in removing fingerprints from records. This is a bit misleading, since it implies that a vacuum system can't remove fingerprints. The truth is that removing greasy deposits of any kind is not a function of the apparatus used but is primarily a function of the solvent used—and the Discwasher solvent is effective. A water and detergent mixture such as I use with the vacuum system will not remove fingerprints.

But then, if you're reading this, you probably know that you shouldn't put your fingers on records. So the question is, how often do you have the need to remove fingerprints? Granted that accidents happen, and I've even seen a few brand new records right out of their sealed protective vinyl liner that have fingerprints (at no extra cost). If these are surface prints (i.e., not made while the vinyl was still hot and therefore imbedded in the vinyl), the Discwasher, or more exactly the DII fluid, will remove them.

In "Clean Records and Chemistry" and in the Discwasher instruction booklet Maier states that detergent-based fluids adhere to vinyl, attracting dust and promoting fungus growth. This is probably quite true if the residue is not totally removed from the surface. However, I seriously doubt that my vacuum system leaves enough of anything (except nice clean sound) on the record surface to present a problem in this respect.

The Discwasher certainly surpasses the Preener and Parastat and their various imitators when used according to the instructions. I'm not about to replace my vacuum system with a Discwasher, but the Discwasher would be a handy adjunct for those occasions when it is necessary to remove greasy deposits. For those who shun the complexity or expense of a vacuum system, the Discwasher provides a simple, relatively inexpensive alternative.—Bob Borden

As an aside, two items. It was able to meet Dr. Maier in Chicago at this year's Consumer Electronics Show. Both the man—a molecular chemist—and his products made excellent impressions, and the fact that we both are from Missouri swayed me not at all. Second, we are in process of requesting copies of "Clean Records and Chemistry" for distribution to BAS members perhaps at a reduced rate. We feel that Maier's message is sufficiently important that one should read the book even if one dislikes the product or disagrees with Maier's approach.—Jim Brinton

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A B.A.S. Test Report

The Allison: One Speaker

Prepared by Jim Brinton

Back in 1970, while still vice president of AR, Roy Allison studied the frequency responses of a number of AR-3a's in a number of rooms and at a number of locations within each room. When the curves were averaged, there was a noticeable dip in the mid-bass region. Allison didn't think much about the effect until after he had left AR, and being temporarily prohibited from competing with the firm by a c!ause in his contract, he had a year in which to do research into room/speaker interactions.

Most BAS members by now are fairly familiar with the results of his inquiry into the way a woofer's energy couples into a room, first described at the March 1974 meeting of the society and in the April 1974 Speaker. Allison also published his results in the June 1974 AES Journal. From these investigations grew a new method of woofer mounting and speaker placement that is basic to the Allison: One.

The prism-shaped One is triangular when viewed from above. Its two woofers are at floor level in the two forward-facing sides, and the third side is against a wall. Because the two woofers pump in phase, the pressure waves of each form, with wall and floor, two pyramidal solid angles with each woofer at an apex. This adds to the efficiency of the system, as energy is more readily coupled into the room, and also smooths out the mid-bass dip spotted in 1970.

Thus it is not surprising that the bass and mid-bass of the Allison: One sound different from that of other speakers; that mid-bass dip found in the AR-3a, according to Allison, is a function of the shape and placement of standard enclosures in the listening room, and thus isn't limited just to the AR-3a, but applies to all other dynamic speakers to some degree, except the Allisons.

For the mid-range and high-frequency drivers, Allison developed what he calls the "convex diaphragm" radiator. Allison had worked on domes at AR and knew that they had good dispersion, but were lacking in efficiency compared to cones. Cones, on the other hand, were beamy. Allison has synthesized the two types in a new sort of driver which makes a fair claim to being superior to both.

Unlike domes (but like cones), Allison's mid- and high-frequency drivers are center-driven. Unlike either domes or cones, each diaphragm is wholly in front of its mounting plate; this avoids diffraction effects that can inhibit dispersion. The voice coils are half the diameter of the diaphragms; thus, a high proportion of the diaphragm is near the voice coil, reducing the possibility of breakup.

In the tweeter, the diaphragm is bonded to the mounting plate, and thus it flexes when driven. Because of its shape, somewhat like a nipple with concave sides, the diaphragm radiates a great deal of energy to the sides as well as forward; far off axis (90°) the falloff in output between 10 and 20 kHz is less than half that for a typical 0.75-inch-diameter dome, according to Allison. Meanwhile, dispersion is well neigh hemispherical.

The mid-range driver is mostly similar, but because of the need to move more air at lower frequencies, it has a coated-foam surround.

The mid-range and tweeter elements are mounted one each to each side; thus the Allison: One has six drivers, symmetrically placed, woofers at the bottom of each side, and tweeters at the top of the 40-inch-high cabinet.

Listener Responses . Surprisingly, almost all auditors found the Allison: One hard to describe or evaluate at first. There were at least two reasons for this. According to Peter Mitchell, "I found it a difficult speaker to review, and it will probably be a difficult product to properly demonstrate in a showroom. Part of the problem lies in the Allison's naturalness—there is little in the speaker's sound that calls attention to itself on first hearing. If it had a socko mid-range, a bigger-than-life bass, or a sizzling high end, it would be easy to describe. The Allison: One has none of these and in fact, its sound resists characterization."

Mitchell's comment was echoed by most others in the panel; eventually we determined to our satisfaction that the sound coming out the Allison's was neutral, natural, and relatively uncolored, but to such a degree that given different program material, the speaker took on different personalities. Speakers are supposed to operate this way, but it didn't make writing a review any easier.

Second, like other loudspeakers, and perhaps more than most, the Allison repays experimentation with room placement. This speaker is more intimately coupled to the room than almost any other (except perhaps a Klipschorn), and a week or so spent first in gross, then increasingly subtle speaker movement and experimentation will help one approach the speaker's potential. Not all of the panel had that much time (or the instruments which might have substituted for the time) but despite that fact, there were few rooms among the many used in which the speaker didn't come off to good advantage. In each case, there was something unusual about the placement; in one, a large electronic organ console was between the Allisons; in another it was necessary to position them on either side of a fireplace, which tended to disturb the mid-bass and mid-range response a bit. Allison's instructions are clear about placement, noting that the speaker should have about 2.5 feet of unobstructed space around it: it turns out that this is fair warning.

The various listeners set up the speakers and evaluated them in various ways; Peter Mitchell "set up the Allisons and listened to them exclusively for several days (delaying immediate A-B comparisons)." Mitchell also used "a pink-noise source, a Soundcraftsmen 20-12 equalizer, and an SPL meter to try to equalize the Allisons against a pair of AR-LST's—not necessarily to produce flat response, but simply for equal output from both speakers. With both speakers' controls set in their flat-response positions, the LST required about 2 dB of boost above 5000 Hz to equal the Allison's output. The LST (mounted at mid-wall height) also required about 2 dB of boost below 100 Hz to equal the Allison."

These results are interesting in the light of the speaker's sound. On first hearing, it appears to be muted in the upper register, and perhaps a bit thin in the bass. But according to Mitchell's measurements, it is actually capable of putting more energy into the room at the extremes than an LST.

Yet in comparison, most of the auditors, in an A-B session with the LST made comments like these: "The LST sounded forward;" or "The LST is a hotter sounding speaker." Jim Brinton's initial experience parallels this, in that the Allisons seemed lacking in high-frequency output when first heard. After extended listening, however, he found himself using the middle position on the Allison's high-frequency level control (three settings offer nominally flat response, a rolled-off high end for the so-called Symphony Hall sound, and a median position), indicating that there was adequate high-frequency response, and more.

Bass. Their bass was excellent also when the speakers were correctly positioned. Mitchell found subjectively flat response down to about 35 Hz, and noted that it was easy to equalize the Allisons for flat response to about 25 Hz. Jim Brinton's experience was similar, but in his slightly larger listening room he was able to achieve slightly more-extended bass; nor did two minor resonances at 80 and 40 Hz, noted by Mitchell, seem apparent in Brinton's room. In contrast, Alvin Foster felt the speaker lacking in the deepest bass compared to the LST; he also noted that he had trouble finding an optimum position for the Allisons in his listening room.

Mid-Bass. Many at Allison's BAS presentation last year felt that his demonstration made the mid-bass too obtrusive. They will be comforted to know that there is none of the mid-bass "hump" which they might have expected in the Allison: One. Pink noise sweeps showed the Allison to be one of the flattest speakers yet encountered. In Jim Brinton's listening room, they were flatter than his LST's, which had been a sort of standard until that time.

But there is a different character to the mid-bass in the Allisons. Although the sound of the speaker overall is neutral and unforced, there is an increase in detail in the mid-bass compared with other dynamic loudspeakers: "Celli, bass viols, the male voice, and some woodwinds sound far more realistic than they ever have before" (Brinton); "there is a sense of detail in massed orchestral and choral works which is quite revealing and quite realistic sounding" (Southwick); "these may be the best dynamic speakers for the reproduction of chamber music that I have yet heard" (Brinton).

As for the feared hump, it has been designed out, or flattened to the point where Foster can note that some instruments "seem to have been moved back into the hall" (more about spatial effects later).

Treble. It is definitely there, and well dispersed. Noting some dissatisfaction with the presence range of the Allisons (in an admittedly less-than-optimum listening situation), Harry Zwicker added that with "higher-frequency material (bells and percussion) the Allisons were cleaner and ... clearer (than an AR-3a)."

Peter Mitchell had to change some of his preconceptions about loudspeaker slope characteristics; "I have always preferred a speaker whose response slopes downward with increasing frequency, as distortion added to the sound annoys me more than things missing from it, and even with tweeters reputed to be peak-free, such as those in the AR-3a and LST, when the level controls are set for 'flat' operation, I hear a raspy edge in violin sound which I don't hear at concerts. This is not the 'rosin' sound, or the scrape of the bow on the instrument. But the responses of the mid- and high-frequency drivers of the Allison are so smooth that I was able to use a higher than expected slope setting (sometimes even the 'flat' position) without irritation, especially when listening to master tapes free of high-frequency distortion.

"The speaker is not dull; when high-frequency peakiness or distortion is present due to poor miking or phono-cartridge malfunction, it is appallingly audible, and in an uncompressed tape, the sound of cymbals can have an almost physical impact."

Why then does the speaker sound dull compared with the AR's; almost all listeners commented upon this. The answer may lie in several areas: Allison has measured very low distortions from his drivers—perhaps there are distortion products missing in the Allison's output which we have come to accept; alternately, there could be a slight beaminess caused by diffraction in the AR units, and in the case of the LST, interactions between drivers.

Alvin Foster felt, however, that the LST gave more differentiation among instruments than the Allison and that on the LST cymbals sounded more like live cymbals.

Others commented on the Allison's "clean, coherent sound ..crisp but not harsh and very open" (Joel Cohen).

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General Comments . Here are the summary remarks of some who have participated in this auditioning:

Peter Mitchell: "I repeatedly found myself listening to the source material rather than the loudspeaker, which, except for a slight, but identifiable mid-range coloration, has no characteristic sound of its own. (At first,) I was unable to find any respect in which the Allisons were uniquely superior to other loudspeakers ... After a while, though, it became apparent that the Allison reproduces cellos and baritone voices more accurately than any other units (except perhaps the KLH-9).

" ... Revealing of differences in source material or electronics; the best recordings sound better and the deficiencies in mediocre recordings or equipment are glaring ... the Allison would make an excellent monitor loudspeaker, substantially better than the LST.

"I didn't fully recognize the Allison's quality until I again started listening to other loudspeakers; ... the unforced sound of the Allisons was not particularly impressive until I tried to switch back to other speakers and was shocked to discover how offensively audible their defects are by comparison. The slightly gritty upper mid-range of the Advent, the lower-mid-range thickness of the AR-3a, and the peculiar mid-range coloration of the LST were hard to tolerate after listening to the accurate sound of the Allison. In any case the Allison has less coloration than any speaker I've heard . . . and is the best dynamic speaker I have heard. I am selling my AR-3a's and LST's to buy Allisons."

Laurie Cote: "... extremely wide dispersion ... very smooth frequency response. I have lived with these speakers a few months and have found them remarkably accurate and transparent ... they present a broad, spacious, and otherwise natural image ...Very few records in my large collection show how good these speakers are; many that sounded acceptable on my AR-3a's sound ... from disappointing to wretched on the Allisons. But when presented with good material, the Allisons are magnificent, (yielding) sound the quality of which I have never heard before in my home.

"Placement ... be sure that Roy's instructions are followed to the letter; nor is it a good idea to have anything large between them, or to place them near a doorway. Should impress the most critical of audiophiles."

Alvin Foster: "In the sound department, ... the first product of Allison Acoustics is a winner—although according to my wife it is a loser in the aesthetic department; she feels the tall, triangular shape and see-through grill are unattractive ..Some lower-mid-range resonance ... Overall efficiency about 2 dB lower than AR-LST. Opening and closing doors on adjacent wall affects the sound tremendously. Grill cloth comes off too easily—child might damage ... Should use binding posts rather than the connectors used."

Harry Zwicker: "Placed speakers at narrow end of a 20- by 12- by 8-foot room about 3 feet from either side wall, but with a large organ console in the middle, about 1 foot from the speakers ... thus the Allisons were shooting ... out of a cave. Placed AR-3a's atop Allisons for comparison ... found them more similar than different, and could live with either, but placement of Allisons may have been very poor.

"AR-3a seemed to have more of the deepest bass (below 35 Hz). Allisons seemed to have less output in lower mid-range ... range of female voice ... Allisons muted as compared with AR-3a's over-presence. Allisons perhaps clearer and cleaner in range slightly above 1000 Hz; although similar to AR-3a at extreme top end—difference is spatial rather than in apparent output ... didn't like spatial separation between woofer and mid-range drivers (crossover is at 375 Hz). Orchestral music pleasingly dispersed across a wide stage."

Dennis Boyer: "Had doubts at first about high-end ... and about deep-bass reproduction ... After listening to a variety of recordings, however, these doubts were resolved. Copeland Fanfare ... was reproduced with delightful ease and faithfulness ... down to the deepest drum passages. Live recordings made with TE 814 and Nakamichi 500 sounded as if a live performance were indeed occurring. Sheffield II also ... smooth. Many other recordings, though, left negative impressions ... I found myself listening to poor miking or other flaws which the Allisons had faithfully reproduced . . . this is the most striking impression I received.

"Speakers lend almost as little coloration to the sound as might be expected from a superior cartridge, amp, or preamp ... Some of the uncertain reactions to this speaker will be due to this .. Must have superlative program material, or you will end up listening to recording deficiencies. Finally ... stereo imagery permitted by these speakers was excellent."

Joel Cohen: "Allisons are very clean speakers with a spatial effect similar to the coherence one gets with full-range, single-driver systems ... Stereo separation is excellent, but without a hole in the middle ... blends across width of room. Sound is crisp but not harsh. Very open sound ... probably low fatigue factor."

Jim Brinton: "High-frequency reproduction very clear, pure ... Allisons will sell as much on quality of mid- and high-frequency drivers as new bass principle. Dispersion excellent, but ... a narrow null appears directly perpendicular to wall at center of speaker .. . not noticeable unless searched for. Far more detail in mid- and lower-bass than I am accustomed to (regularly use AR-LST's) ... not a hump and not displeasing. All middle and lower strings sound more authoritative and natural.

"Room placement very critical ... true of all speakers, but more so of Allisons. A fireplace between speakers did damage to mid-range and upper bass ... using an unobstructed wall cured problem completely.

"Deepest bass surprisingly present ... for first time heard pressure waves as conductor stamped on podium on Philips record (835 188 AY Berlioz Symphony Fantastique). Stereo placement limited only by separation of associated source and playback material, far less ambiguous than LST, and totally without ping-pong perspective or hole-in-middle.

"Merciless with poor source material. Miking and mixdown flaws become obvious even to untrained ear ... but good material takes on solidity and spatial certainty new to me ... sections of an orchestra disappear and reappear in exactly the same spots without wander or uncertainty. Can make some multi-miked recordings sound as solid as dual-miked recordings.

"Utterly natural ... the best speaker for reproduction of chamber music that I have heard, bar none. And Wagner comes off with elegance too."

(Names withheld): "Very smooth bottom end . open-sounding mid-bass ... voices less present, more distant ... bass is very clear. Some sense of front-to-back perspective ... perhaps due to spatial separation between woofer and mid-range radiators ... very spacious sounding ... in A-B tests, reveals holes in AR-LST mid-range ... made LST sound thick or congested, boxy, almost horn-like."

"Instruments and voice better resolved than with LST ... mid-bass better controlled. More realistic spatial effect than LST. LST sounds forward, but constricted."

"Strings sound utterly real and as rich as in a live performance ..."

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