

THE B.A.S. SPEAKER

EDITOR-IN-CHIEF: Michael Riggs
COORDINATING EDITOR: David Temple
STAFF: Henry Belot, Robert Borden, Joyce Brinton,
Dana Craig, Frank Farlow, Robert Graham, Lawrence
Kaufman, James Lindquist, Peter Mitchell, John
Schlafer, Jack Stevens, James Topali, Peter Watters

PUBLISHER: James Brinton, President, BAS

THE BOSTON AUDIO SOCIETY
P.O. BOX 7
BOSTON, MASSACHUSETTS 02215

VOLUME 5, NUMBER 3
DECEMBER 1976

THE BOSTON AUDIO SOCIETY DOES NOT ENDORSE OR CRITICIZE PRODUCTS, DEALERS,
OR SERVICES. OPINIONS EXPRESSED HEREIN REFLECT THE VIEWS OF THEIR AUTHORS
AND ARE FOR THE INFORMATION OF THE MEMBERS.

In This Issue

Audiophiles are by now conditioned to think of McIntosh as a company that provides reliable service for their components, which are built like battleships. Bob Graham's review of their latest amplifiers raises the curtain on two new McIntosh power amps and makes a strong argument for the use of output autoformers, the McIntosh feature that traditionally has brought forth sneers.

Another bit of good news is part five of Brian Leeming's compilation of recommended recordings from the Penguin Guide.

On the technical side, Scott Kent discusses the characteristics of various frequency weighting networks, and Dan Shanefield returns with something called "S-cubed." -- Mike Riggs

Finally, this month's Speaker begins with some notes about Victor Brociner, a BAS member who may have done more than any other single person to establish high fidelity as such. Victor attended meetings regularly and got a kick out of "our little hi-fi club." We're happy about that because we owe him a lot and his passing last month deprives us of a precious friendship, a warm personality, and a fine technical mind. -- Jim Brinton

Membership dues are \$14 per year (October 1 to September 30) or portion thereof. Dues include a one-year subscription to the BAS Speaker. (Note that almost the full amount of dues is allocated to production of the Speaker. The local activities of the BAS are strictly self-supporting.) For further information and application form, write to: The Boston Audio Society, P.O. Box 7, Kenmore Square Station, Boston, Mass. 02215.

The BAS Speaker

Victor Brociner

More than any other person, Victor Brociner started high fidelity. This statement does not require justification; one has only to ask any of the pioneers in the field to find agreement. Brociner developed the first high fidelity system using broad-band AM (FM was as yet undeveloped), a low-tracking-force record player, and a component speaker system, in the early and mid-1930's after graduating from Columbia University with a degree in mechanical engineering, a Phi Beta Kappa key, and a love of machines. His system now is in the Smithsonian.

Victor Brociner died of a heart attack the day before Thanksgiving at 66. He leaves behind him a trail of rational innovation unique in this industry, one which continued to the present. Unlike many inventive men, Victor Brociner didn't "peak" in his middle years, but continued to be inventive and energetic to the end.

Chronology. In the 1930's he developed the first high fidelity system and later founded the Philharmonic Radio Co. with Avery Fisher and a third partner. After World War II, he founded Brociner Electronics, and in the early 1950's produced one of the first integrated amplifiers, the first practical Williamson amplifier (at 30 Watts, a giant for the time), and some of the first high fidelity components using printed circuits and good industrial design. He also made the Brociner Transcendent loudspeaker system which set a standard for efficiency coupled with high sound quality that still is hard to beat.

When financial problems forced Brociner to close his company, he did not declare bankruptcy. Instead every creditor was paid in full.

Afterward Brociner went to University Loudspeakers, doing much to improve what was, in the late '50's, a poor product line, but when University moved to Oklahoma, Victor Brociner moved to H. H. Scott as Engineering Vice President. In the early '60's Scott was one of the largest high fidelity firms in the country, and until a series of poor management and marketing decisions and intense Japanese competition forced Scott into bankruptcy, Brociner used his engineering skill to improve the Scott line of tuners, receivers and speakers. After Scott went under, Brociner investigated a partnership with Arthur Janzen which might have resulted in a new full range electrostatic speaker, but this was not to be, and after some consulting, Brociner moved to the Avid Corp. as Vice President for Engineering and Stereo Products.

Brociner did the whole job for Avid, from conceptualization and product design, through vendor selection, organization of manufacturing and -- notably, in an industry short of it -- quality control. Avid's speakers made no departures in technique, but using known technology and his skill and experience, Brociner managed to build one of the most popular of today's speaker lines.

It was a tremendous job for any man, and Brociner had a 15-year history of heart trouble and already was in his 60's when he joined Avid. But he never stopped working hard; he never lost his enthusiasm for the new; he was still producing new ideas at his death. Victor Brociner's creativity never burnt out.

The Man. Victor Brociner was a creative engineer; in a profession often viewed as stolid, Victor Brociner was inventive, enthusiastic and witty. He was superbly rational; in an industry more often characterized by its techno-mystics and esthetes, Victor Brociner not only cherished music but sought to preserve its beauty through sensible component design. He was always an erect man, trim in appearance, and youthful in energy and output despite his years and heart trouble.

His favorite tools were the keen edged laws of physics, and with them, he refined every product line with which he came in contact. He was always interested in those he worked with, and eager to help those who came to him with their ideas or simply with problems.

Many of the people reading this will not realize how much they owe to Victor Brociner. If he had a "flaw" it was that he cared less than he might have about "selling" himself; self aggrandizement was not his style.

So far as I was able to determine in the seven or eight years I knew him, Victor Brociner was a man without a dark side. Although he never profited from his inventions as some others did, rather than being bitter, he was, at most, wry. He was a teacher, a force for common sense, and a very human person who always had time for people.

We shall miss him very much here but even though we are denied the man and friend, his positive influence remains. His mark is indelible; his monument is an industry with its roots in the beauty of music.

-- Jim Brinton

Inflationary Dues and Don'ts

Changes of Address. This month we are seeking the whereabouts of more than 19 members -- two percent of the membership! In each of these cases, we learned of a change of address by means of a Speaker "Returned to Sender." In October alone, this cost the BAS \$11.91 (24¢ useless postage plus 39¢ return fee per copy of the Speaker). That's more than \$100 a year! When becoming a transient, send a postcard (or change of address card obtainable free from the post office) to Corresponding Secretary Frank Farlow.

Meeting Notices. It costs the BAS \$1.25 plus labor per year to send out meeting notice postcards to members electing to receive them. To date, these notices have been sent automatically to Massachusetts members. If you are a member and are not receiving meeting notices but would like to -- and would make use of them -- drop a line to Frank. Conversely, if you are currently receiving meeting notices but do not need to, help keep our dues down by sending a postcard to that effect.

Back Issues. Get 'em while they're hot! Only two more copies left of Volume 3 (1974-75), but plenty of Volume 4 (1975-76). Still \$12 per volume postpaid, and back issues still available only in complete volumes. Again, write to Frank Farlow, at Box Seven.

For Sale

- *Pioneer SX-1250 stereo receiver; Pioneer CT-9191 cassette deck; Technics SL-110 w/ SME 3009 S2; 2 AR-LST's. All virtually new with original packing material and full warranty. Also Sony 854-4S 4 ch. sel-sync tape machine; Sony 152sd portable dolby stereo cassette deck, hardly used; new Dokorder cassette deck. Donald J. Forte, (617) 592-5648.
- *Soundcraftsmen PE 2217 preamp/equalizer, less than six months old, with box and papers, \$300; Harmon/Kardon Citation 12 power amp, \$175; AR-LST1 speakers, less than two years old with boxes, papers and blank warranty cards, \$550. Call (617) 648-4191 after 6:00.
- *Beveridge cylindrical sound system, prototype of Model No. 1, complete with amplifiers, \$2,600; Hadley classic 621 transistor preamplifier, \$250; collector's item, 1/2 track stereo tapes. Joe Makray, (805) 682-2024.
- *1 set Stax SR-5 electrostatic headphones; 2 sets Stax SRX-III electrostatic headphones; 1 set Koss Pro-600AA dynamic headphones; 1 pair ADS 200 miniature loudspeakers. All like new; any reasonable offer considered. Call (617) 492-2263.
- *Dyna ST-400M, Soundcraftsmen PE 2217, Sony 2251LA w/ SME 3009 S2 Imp., ADC XLM MK II, Ambient SR-66's. With all packing, full warranty. List \$2,540. Now \$1,600, firm. Call Peter, (413) 665-2920.
- *RABCO SL8E arm, Shure V15 II-improved cartridge (replaced with SME and type III). \$85 or nearest offer (you pay postage). Dave Reiter, Oak Hill Apts. 417N, Narberth, Pa. 19072, (215) 667-4190.
- *Hadley 621 preamplifier, excellent condition. \$250 or best offer. Nick Moy, 535 West 113th St., New York, N.Y. 10025, (212) 222-2485.
- *Ortofon SL15E Mk. II moving coil cartridge one year old, excellent condition, \$40. Harmon/Kardon Citation 12 power amp, perfect condition, \$160. Gary Rancourt, (617) 369-1949.
- *Fulton FMI 80 speakers, \$150 pr. firm; SAE Mk. 31B amplifier, brand new, with warranty, \$200. Brian Gollaher, (203) 429-1570.
- *One pr. Ohm F's, \$650; one pr. AR7s \$75; one pr. Superex electrostatic headphones, \$60. David Doyle, (617) 471-4389.

*Maxell UD35-7" reels of tape. Will mail. Write P.O. Box 7 or call Al Foster, (617) 296-2622.
*dbx 117, \$80; Dyna PAT-5, \$150. Robert Henry, (617) 266-9242.
*Marantz 7C w/ case, \$300; Marantz 125 AM/FM stereo tuner (the least expensive tuner in the supertuner class), \$200; the venerable AR FM tuner, \$125; Dyna Stereo 70 power amp with a solid state rectifier for longer life, \$100. All components have been well cared for and are in choice condition. Andy Petite, (617) 661-9500, ext. 290 or 492-1997.

Berlin Audio

On Oct. 1, after repeated requests for a refund from the Berlin Audio International, I received a check for the full amount. Yesterday my bank told me that the check did clear, and the money is finally mine. Even though I finally received satisfaction (thanks, apparently, to pressure from German authorities), I urge all to avoid this outfit like the plague.

-- Ken Deen (Massachusetts)

Dynaco Correction

The summary of the Ojala meeting in the November Speaker indicates that I returned my Dyna FM-5 twice to the manufacturer without satisfaction. In fact, it was stolen before I ever had a chance to send it back. The last time that tuner (kit) saw New Jersey, it was still in pieces. It is true, however, that, despite realignment efforts at two BAS tuner clinics, my FM-5 never met its specs. I understand that Jack Stevens did send his FM-5 back to Dyna twice and that they never managed to repair it.

-- Michael Riggs (Massachusetts)

Dokorder 8020 Dub-a-Tape Deck

The Dokorder 8020 is an unusual open-reel tape deck that offers facilities for both copying and dubbing via four seven-inch reels and four motors. For some reason this deck was never sold in the U.S. , though some U.S. military personnel bought it in PX's overseas.

I think, and Barclay-Crocker agrees with me, that the decline in popularity of prerecorded open-reel tapes is due in great part to the fact that friends cannot share open-reel tapes (i.e. , copy them) without having two decks. (This "drawback" doesn't seem to have hurt cassette sales. -- Ed.) I think a unit like the Dokorder 8020 would fill a real need and could therefore sell well.

I'd appreciate readers' comments, especially from people who have had experience with this deck. Write me at Box 82, Harwich Port, Mass. 02646.

-- William N. McCarthy (Massachusetts)

An Improved Version of the KMAL Tone Arm

The November issue of Hi-Fi News contains a review of the KMAL M9BA Mk. III Improved tone arm. My curiosity piqued, I called Gary Warzin of Audiophile Systems, the arm's importer, and queried him about some of the points raised in the review. He reports that KMAL has chopped the arm's effective mass by a third, down to about 6 grams, which is lower than that of the fixed-headshell SME (about 7 grams) and competitive with that of the Formula 4 (4.5 grams claimed). They are also using an improved bearing to reduce the already amazingly low friction of the pivot. The lift has improved steadily, he says, from an early failure rate of 80% to the current rate of about 30%. He recommends, as do I in my review (March 1976 Speaker), that those who have problems with the Monks lift use the Supex AL-2 instead. Unfortunately, the antiskating mechanism still is not adjustable.

Anyone with an older version of the arm (the new one has been around since June) can upgrade

it by buying the new carrier arm, which costs \$50, plus \$15 for the appropriate counterweight. Unless there's been some change recently, the local dealers are Suffolk Audio in Cambridge and Natural Sound in Framingham. For information or to order direct, write: Audiophile Systems, 851 W. 44th Street, Indianapolis, Indiana 46208.

Another item of interest to KMAL owners is Warzin's contact cleaner. I have some on hand and will report on my experiences with it in a later issue. Warzin says he developed it because he found it necessary to clean the contacts on his arm every day to get proper performance with moving coil cartridges. Nineteen weeks have now passed since he last found it necessary to perform that little chore. The stuff is definitely worth looking into.

-- Michael Riggs (Massachusetts)

A Second Look at the Heil Headphones

Because I was the only participant in the evaluation of the ESS Heil-driver headphones (BAS Speaker, October 1976, pp. 11-12) who really liked them, I want to clarify my position. I find most headphones excessively uncomfortable and therefore am not easily pleased. They have to sound good and feel good for me to like them. I cannot abide Koss, Superex and a few others just because they are bloody uncomfortable.

My initial impression of the Heils was also thumbs down; it was only after more patient listening that I discovered the optimum way to use them. They sound best with a little midrange boost from an equalizer and when connected to the amplifiers speaker terminals rather than to its headphone jack. With those provisos, I still maintain that they are good headphones (and several non-member friends agree).

Finally, I've checked with my doctor, and he says that though my ears may not be golden, they're not tin either.

-- Bob Graham (Massachusetts)

Old Colony Electronic Crossovers

Here is information about the Audio Amateur crossovers and amplifiers that Bob Sellman wanted. I have used several of the crossovers (12 dB/octave, Butterworth) for a number of systems over the years. They are quite satisfactory.

I suggest getting the kits from Old Colony as the parts are very high quality (mica and polycarbonate capacitors, metal oxide film resistors). The circuit boards are not glass epoxy, but they are adequate. Frankly, I felt that the 12 dB/octave slopes were not enough, and I was also concerned that the 741 IC's were not adequate, as their open loop bandwidth is only 2 Hz! So I bought (for \$72) some DeCoursey 18 dB/octave crossovers with the 60 kHz IC's -- note that that price was just for the boards -- no chassis or power supply (although they are available from DeCoursey). The DeCoursey units are extremely high quality and include glass boards and resin encapsulation.

So what was the sonic difference? Essentially none. If one is concerned about price it is obvious that the Old Colony kit (for about \$6/channel) is the way to go. There is no graininess with either of them, and each sounds three-dimensional. (I have a very exotic custom electrostatic system, so such problems are readily apparent.)

-- Roger Sanders (California)

B&W and Beveridge Speakers

I recently auditioned the B&W's at my local KEF dealer. The KEF 104 was a speaker I greatly admired, but in a side-by-side comparison the B&W DM-2A wiped it out in clarity, balance, and general musicality. However, I could not get too excited about the top-of-the-line DM-6, so highly touted by the British press. I could not justify paying almost twice the price for the

DM-6's over the DM-2A's. True, the DM-6 has a deeper bass, but it appears to also be a fatter bass than the 2A's. The midrange of the 6 seems less forward than the 2A, but that may or may not be an improvement. The high-end of both speakers seems identical, no doubt owing in large part to their both using the same tweeter. In fact, I believe all the B&W's use the same tweeter, and a fine one it is, too.

I haven't heard the Snell speakers but I have heard the Beveridge's. The Beveridge is, as expected, excellent. It is certainly the most detailed speaker I've ever heard and among the best in imaging. But its cost is staggering, even with its own amplifiers. And have you ever tried positioning these things in a real room? They're designed to be placed on opposite walls, a situation seldom practical in average rooms. Also, the deep bass must still be augmented by a subwoofer for fullest range and realism.

Finally, a point about realism. My only reference in the past few years has been live music. I attend weekly, paid concerts of all types of music, and, as a high school teacher, I have the opportunity to hear almost daily concerts -- marching band, symphonic band, etc. The result of all of this listening is that I now feel that most high-end speakers and systems sound more detailed than live music. Real music in most halls (even from the front few rows) can actually sound "dull" in comparison with the super-transparency and close-up sound of today's "better" speakers.

My question, then, is: Are today's super-speakers (J's, Beveridge, Magnaplanar, Infinity, Dayton-Wright, KLH-9, etc.) really duplicating the live experience; or are audiophiles becoming more and more devoted to the pursuance of the "perfect" sound, whether or not it is attainable in the real, live concert hall?

I think we're spending more time comparing speakers with each other, rather than with live music. "How'd you like the new Quantums?" "Well, they certainly were open and full; and they had a real sock at the low end. " Okay. But compared to what? Generally, the person will be making a comparison based on his experience with either his own speakers or others he has heard. How much "real sock" does one hear at a concert hall? Very little, actually. And how much "detail?" Cymbals, perhaps, and solo drums. -- John Puccio (California)

DQ10 and SP3a-1 Modification

Owners of Dahlquist DQ10s (with serial numbers below 4134) should know about a crossover modification that increases midwoofer damping. The modification consists of adding a 4 ohm/15 watt resistor to the crossover board, and is available from Dahlquist on request.

A new modification to the Audio Research SP3a-1 preamp is now available. It increases gain by 3.5 dB. (This supersedes the 6 dB modification The Absolute Sound, cited in a recent issue.) The modification is purported to improve transient response (an improvement I consider subtle) and tighten bass (a more audible and welcome improvement). Audio Research has incorporated this modification in all units manufactured after June 1, 1976, but will perform it on older units for \$15. Audio Research suggests that units with the older, 6 dB modification would benefit from this newer, 3.5 dB modification. -- Nick Moy (New York)

RFI Problems

Despite what some hi-fi manufacturers suggest, a transmitter does not have to be operating in an illegal manner to produce radio frequency interference (RFI) on electronic equipment. The towers near Route 128, around Boston, cause many complaints, as do WBUR and numerous roving CB's.

How much you paid for your equipment and where it was made does not guarantee you freedom from these maladies. The problem is, in part, that it is difficult to plan for all interference conditions, and apparently some designs do not take RFI into account at all, though manufacturers will deny this.

Records

Penquin Stereo Record Guide 1976

Top Selections, Series 5, compiled by Dr. Brian Leeming

Rodrigo, Joaquin
CONCIERTO DE ARANJUEZ
Spanish National Orch. de Burgos
DGG Privilege 135117

Rossini, Gioacchino
STRING SONATAS 1-6
Academy of St. Martins-in-the-Fields, Marriner
ARGO 2R9 506

Sarasate, Pablo
CARMEN FANTASY
Perlman, violin
Royal Philharmonic Orch. , Foster
HMV ASD 2782

Schubert
1) PIANO SONATAS 13 and 14, 12 WALTZES, D, 145
Ashkenazy, London 6500
2) PIANO SONATA 21, Scherzo in Bb
Kempff DGG 139323
3) WINTERREISE (song cycle)
Pears, Peter Britten, piano
2-London 1261

Schumann
SCENES FROM GOETHE'S FAUST
Harwood, Elizabeth Pears, Peter
English Chamber Orch. , Britten
2 London 12100

Shostakovich
COMPLETE STRING QUARTETS
Borodin Quartet
6-HMV SLS 879

Strauss, Johann
DIE FLEDERMAUS (highlights)
Vienna Symphony Orch. , Boskovsky
HMV Q4 ASD 2891

Strauss, Richard
1) ALSO SPRACH ZARATHUSTRA OP30
Berlin Philharmonic Orch., Karajan
DGG 2530 402
2) FOUR LAST SONGS
Schwarzkopf, soprano
Berlin Radio Symphony Orch. , Szell
HMV ASD 2888

Strauss, Richard
DER ROSENKAVALIER (COMPLETE)
Philharmonia Orch. and Chorus, Karajan
(Schwarzkopf, soprano; Ludwig, mezzo)
4HMV SLS 810

Records

Penquin Stereo Record Guide 1976

Top Selections, Series 5, compiled by Dr. Brian Leeming

Rodrigo, Joaquin
CONCIERTO DE ARANJUEZ
Spanish National Orch., de Burgos
DGG Privilege 135117

Rossini, Gioacchino
STRING SONATAS 1-6
Academy of St. Martins-in-the-Fields, Marriner
ARGO 2R9 506

Sarasate, Pablo
CARMEN FANTASY
Perlman, violin
Royal Philharmonic Orch. , Foster
HMV ASD 2782

Schubert
1) PIANO SONATAS 13 and 14, 12 WALTZES, D, 145
Ashkenazy, London 6500
2) PIANO SONATA 21, Scherzo in Bb
Kempff DGG 139323
3) WINTERREISE (song cycle)
Pears, Peter Britten, piano
2-London 1261

Schumann
SCENES FROM GOETHE'S FAUST
Harwood, Elizabeth Pears, Peter
English Chamber Orch. , Britten
2 London 12100

Shostakovich
COMPLETE STRING QUARTETS
Borodin Quartet
6-HMV SLS 879

Strauss, Johann
DIE FLEDERMAUS (highlights)
Vienna Symphony Orch. , Boskovsky
HMV Q4 ASD 2891

Strauss, Richard
1) ALSO SPRACH ZARATHUSTRA OP30
Berlin Philharmonic Orch., Karajan
DGG 2530 402
2) FOUR LAST SONGS
Schwarzkopf, soprano
Berlin Radio Symphony Orch. , Szell
HMV ASD 2888

Strauss, Richard
DER ROSENKAVALIER (COMPLETE)
Philharmonia Orch. and Chorus, Karajan
(Schwarzkopf, soprano; Ludwig, mezzo)
4HMV SLS 810

Unusually Realistic Recordings

Tchaikovsky, FIFTH SYMPHONY, Haitink, Philips 6500 922 offers metallic trumpets, defined multiple violins, plenty of bass and reverb, wide dynamic range, and low noise. You might have to turn down your treble controls to avoid shrillness in the violins, since the high frequency content is strong. (This seems to be a trend with some recent European recordings, but it is easily taken care of, and the potential result is a superb signal-to-noise ratio.) The disc was given an A+:1* rating by the British magazine Hi Fi News & Record Review (February 1976, p. 113), which in my experience has been a reliable indication of truly superb recordings.

Beethoven, SEVEN BAGATELLES, Bishop, Philips 6500 930 has a very stringy, woody piano sound. Great for showing off your system. (In fact, it even sounds good on lousy systems!) Recommended by Stereo Review (May 1976, p. 112) and Sound Advice (Number 2, p. 8).

Bach, CELLO SUITES, Starker, Mercury SRI 3-77002 has exceptionally stringy sound. I think this is one of those oldies that has been reissued. Judging from discussions at recent meetings of the Audio Engineering Society, nobody really knows why the old Mercury recordings are so good. Some people speculate that it was the simple miking techniques (no "mics mix tricks"). But others disagree, since modern multi-miking can sound just as good, particularly in the hands of Philips and DGG engineers. Recommended by Sonex Audio (a "high end" store) in Rocky Hill, N. J.

THIS ONE'S FOR BLANTON, Duke Ellington and Ray Brown, PABLO (RCA) 2310-721 is another reissued oldy, with superb piano and bass viol sounds. With my system, I have to take a cut in the mid-treble with a graphic equalizer, on this one. Recommended by Stuart's Audio (store) in Somerville, N. J.

One important aspect of Lincoln Mayorga's Sheffield Lab recordings seems to be the engineering assistance of Doug Sax. Three records which are available from ordinary distributors (at ordinary prices) were mastered by Sax and are listed below. They have a large measure of that good sound that we associate with Sheffield, particularly in the percussion sections. The noise level is very low. These discs were recommended by Stuart's Audio in Somerville, N. J.

Michael Franks, THE ART OF TEA, Warner Bros. MS 2230 has very woody acoustic guitar sounds.

George Benson, BREEZIN', Warner Bros. BS 2919 has good percussion (cymbals, sticks, bells), in the midst of what I would call pleasant jazz-rock, but the guitar is strictly electric.

Ambrosia, AMBROSIA, 20th Century T-434 is middle-of-the-road rock, with good percussion and deep electronic bass. -- Dan Shanefield (New Jersey)

West Coast Recommendations

Two new direct-disc recordings from Sheffield Lab; THE KING JAMES VERSION, Lab 3, Harry James and his orchestra; includes "Sweet Georgia Brown," "Don't Be That Way," "Cherokee," and others; \$12. BRAHMS - VARIATIONS ON THE THEME OF HANDEL, Lab 4, Lincoln Mayorga, piano; \$10.

Direct Disco CCS 5002, a collection of top disco hits featuring Gino Dentie and the Family, which includes "Movin'," "Happy Music," "The Hustle," "Sexy" (cover certainly is), "Express," and "Get Down Tonight;" \$12.

Sessions, a two record album; you are at the studio while a recording is being made. "An excellent record to test a loudspeaker's ability to reproduce music with detail and definition of each instrument within a group. A great album for listening to how recordings are made," said one reviewer.

The Oryx records listed on page 14 of August issue of The Speaker are available from Chesterfield Record Shops, 12 Warren Street, New York 10007, at \$3.49 per disc, or three for \$9.99, from a flyer just received.

I recently received record catalogs from two new (to me) sources, Grammy's Attic, P.O. Box 181, Bluffton, S. C. 29910, and tape catalog of opera copies from Ed Rosen, 66-33 Saunders St., Rego Park, N.Y. 11374. I have never dealt with these firms. Have any members? What were the results?
-- Nate Garfinkle (California)

Previn's Planets

The EMI version of Previn's performance of Holst's Planets is as fine as its reputation, but individual pressings leave much to be desired. I have had two unplayable copies, and an angry British reader of the September Hi Fi News reports he has encountered five bad ones. Previn's version of Alexander Nevsky is a sonic delight, fully comparable to a good Planets.
-- Larry Hardin (New York)

ABC's of Weighting

There is some understandable confusion regarding "A," "B," and "C" weighting characteristics because there is one set of response curves for sound level meters and another for noise measurements of electrical instruments. According to ASA standard S1.4-1961, response curves of sound level meters are not specified above 10 kHz. Also, response curves at higher frequencies have widely differing patterns (on-axis vs. off-axis vs. random incidence) depending on the microphone used. PZT types, while rugged, generally don't have usable response above 10 kHz as do condenser types.

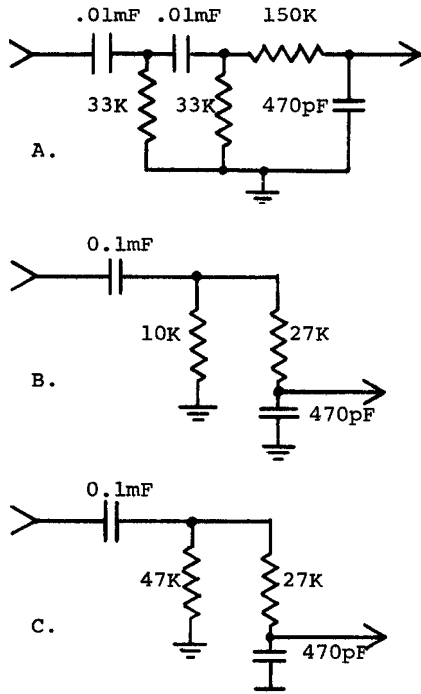
Dan Shanefield (August/September 1976 Speaker) refers to a C-weighted noise measurement curve of -6 dB at 20 Hz, -2 dB at 50 Hz, flat 90-3000 Hz, -4 dB at 10 kHz, -12 dB at 20 kHz. Perhaps this is a newer ASA standard (of which I'm not aware) which takes into account the increasing use of condenser microphones in sound level meters. Ampex (circa 1967) used a network with this response called an "unweighting network," perhaps to imply that it was not favorably weighting the noise measurements made with it. These numbers agree with the presently used electrical "C" network except at high frequencies where often a 20 kHz noise bandwidth is used, giving a -3 dB point at 12.7 kHz and -5 dB at 20 kHz. The only standard I'm aware of is RMA TR-105-B which specifies 50-15,000 Hz \pm 2 dB. Some manufacturers use a 30 kHz noise bandwidth with no stated low frequency rolloff.

ASA electrical weighting, sometimes referred to as "A" weighting, is the same as sound level meter "A" below 1000 Hz. Above 1000 Hz a substantial rolloff occurs to -15 dB at 20 kHz as indicated by the graph. This is the standard presently employed by most reviewers and manufacturers for measuring the S/N of high fidelity equipment. This can be very misleading, particularly with tape recorders, where 60 Hz hum or its harmonics may be present unless an unweighted S/N is also quoted. For a phono preamp, ASA weighting could also hide subsonic 1/F noise (popcorn noise, flicker), yet a completely unweighted measurement would over emphasize its importance.

"B" weighting is generally known only as a sound level meter response. However, RMA standard SE 101-A (established for broadcast equipment in 1949) suggested that weighted noise levels of amplifying equipment (if measured at all) should be "weighted with the 70 dB equal loudness contour in accordance with curve "B" of ASA Specification Z24.3 - 1944," and measured with a meter "having a response of \pm 1 dB from 50-15 kc. " As the sound level meter curves are not specified beyond 10 kHz, I've shown the same curve as "C" electrical, rather than an almost identical curve being -1 dB at 15 kHz.

It would seem, for high fidelity equipment, that a weighting curve based on a 70 dB equal loudness contour makes far more sense and corresponds better to what a serious listener hears than does ASA or "A" weighting which is based (approximately) on the Fletcher-Munson 40 dB equal loudness contour. Assuming loud passages to average 95 dB SPL on playback and assuming a noise floor of 35 dB SPL in the listening room, there is a usable dynamic range of 60 dB. For example, a unit claiming a S/N of -75 dB ASA could have an actual 60 Hz hum level of -45 dB from "0" reference. If the "0" were 95 dB SPL as would be the case for a tuner, phono preamp, tape recorder, or possibly a power amplifier, 60 Hz hum would be quite audible at 50 dB SPL, assuming

The Nuts and Bolts of the ABC's of Noise Weighting Networks:



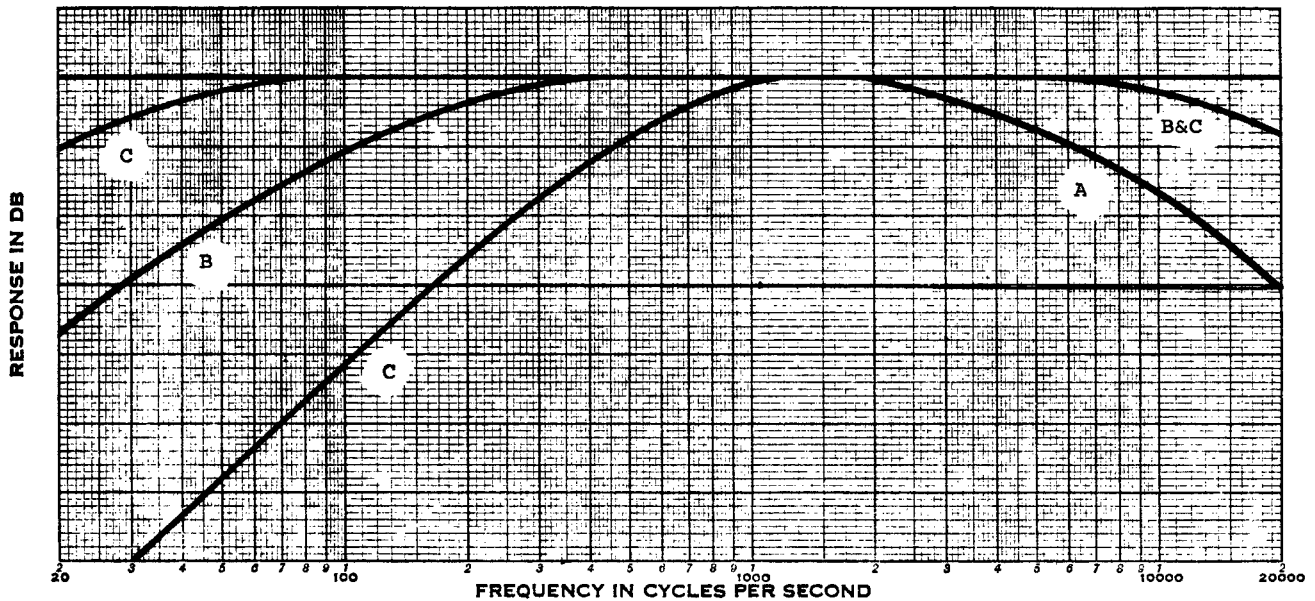
About these networks. These networks are not lossless despite the fact that their response curves as shown below all rise to a nominal zero level. Instead, the curves are normalized for equal response relative to about 1500 Hertz. In practice, for example, the A-weighting network shown has an attenuation of about 7.5 - 8 dB at 1000 Hz, the frequency most often used for reference. Those who wish might easily develop a simple op-amp circuit to achieve lossless performance; indeed, for those measuring excellent signal-to-noise ratios, a 20-dB gain stage might also be desirable because of the sensitivity limits of many available AC voltmeters.

A set of these filters makes for a simple audiophile project. Since all the networks are useful, they might well be combined on a single perf- or circuit board in a single steel minibox.

Either switching or separate connectors should be used to isolate the networks from each other. RCA phono jacks are the logical choice for inputs, but RCAs might well be paralleled with BNC connectors at the output as BNCs are so widely used on the better AC voltmeters; eg. the H-P 3400 A.

For best results, the networks should 1) be built with 5% components, and 2) be used with true-RMS-measuring AC voltmeters. Five-percent parts will keep the curves shown below to within about 0.5 dB or better. Use of a true-RMS voltmeter will yield more accurate results than possible with a sine-wave calibrated meter which will be less accurate with complex or random waveforms.

--Jim Brinton



Response curves for A-, B- and C-weighting networks. Heavy line at top of graph is normalized "zero," or equal attenuation level at 1500 Hz. Vertical scale is 5 dB per centimeter (darker horizontal lines). Thus, at 30 Hz, C-weighting filter attenuates by about 3 dB, the B-weighting filter by about 14.5 dB, and the A-weighting filter by about 35 dB. The B- and C-weighting curves both are down by about 4 dB at 20 kHz, with A-weighting down 15.

speakers with linear low frequency performance.

The more current Robinson-Dadson hearing threshold vs. frequency curves explain why people are bothered by sounds the Fletcher-Munson data implied were inaudible. In addition, the various tape recorder noise-reduction systems reduce masking hiss to relative levels well below the noise floor of the listening room on both tapes, and often on records produced from such tapes.

Most critical listeners would hear 60 Hz hum at 40 dB SPL or 120 Hz hum at 30 dB SPL in a listening environment having a noise floor of 40 dB SPL "C," composed of random noise. Considerable amounts of hum can be masked by a nearby refrigerator or air conditioner or a standing wave null, or enhanced by a standing wave peak. Hum is less easily masked by white or pink noise hiss, and barely hidden by random room sound where the predominant energy is subsonic.

-- Scott Kent (Massachusetts)

The Cheapest Ambience System in Town

If you can't afford a delay line or a quadraphonic system right now, you might still be able to get a large measure of the "ambience" or "spaciousness" feeling that they convey, at a pretty low cost. All you need to add to a stereo system is two extra loudspeakers. (Also, this might be a logical first step toward accumulating a more complete setup in the future.)

One way to hook up the extra speakers is to use an ordinary two-channel amplifier, with the left front speaker paralleled with the right back speaker. The back speakers are aimed at the ceiling. If the speakers have less than six ohms impedance, they should be put in series instead of in parallel. The back speakers can be of lower quality than those in the front, without much degradation in the sound, and they don't have to be from the same manufacturer. The attenuators can be obtained from Lafayette Radio or Radio Shack, etc. They usually are listed in catalogs as "L-pads."

In this setup, most of the back sound is reflected off the ceiling and walls before reaching the listener's ears. Multiple reflections increase the effective reverberation time of the room, giving the feeling of a bigger space. Another part of the effect derives from the time delay between the arrivals of the front and back sounds. Surprisingly, some of the back sound can arrive before the front sounds and still provide a satisfactory big-room feeling. The front sound is considerably louder (because of the attenuators at the back), and it overwhelms the difference in arrival times, so that the music still seems to be coming from the front.

If the difference in arrival times for most of the sounds is kept below about 20 milliseconds (20 feet difference in path length), the ear/brain system fuses both the front and the back signals into one virtual sonic image at the front, and the back speakers are not perceived as being separate sources. Their effect is only felt as a sort of large-space ambience in all directions, not as a back-speaker sound. In other words, there is an illusion of being in a much larger room, with sounds reflecting from lofty walls and ceilings.

This is particularly evident when the back speakers are suddenly turned off, and the apparent source of the music seems to collapse into a much smaller area at the front of the actual listening room.

I found that crossing the wires over from left to right at the back (as shown in the diagram) tends to break up the back sound image and prevent the listener from being directly conscious of the back speakers. This is really necessary to allow a reasonable volume at the back and still not have it be intrusive.

Another possible way to hook up the back speakers was described in an article I wrote for Audio magazine (November 1975, page 44). The back speakers in this setup are aimed at opposite side walls instead of the ceiling. The listener should be near the middle of the room, and, although this seems to be slightly more effective soundwise, it is not compatible with most people's interior decorating configuration.

Over the last two years I have conducted many comparison tests of these setups, which I call "S-cubed" (S³) systems, versus true quadraphonic systems. It is really a pain to run the tests because six loudspeakers of the same model are required: two at the front, two at the back for S³ and two at the back aimed directly at the listener for true quadraphonics. Most of my tests have been in hi fi stores, where customers with very little knowledge of audio subjects were asked to judge which system sounded more spacious. I found it necessary to use such people because more sophisticated listeners quickly grasp the situation and then make prejudicial value judgments, depending on whether they are pro-establishment, pro-innovation or whatever.

Another innocent party was usually asked to operate the switches. This makes the test essentially double blind, and it prevents me from saving the best passages of music for the S³ part of the comparison. But I have to say "essentially" here, because I still can't be sure there is absolutely no influence or prejudice, especially under circumstances such as these.

As you can see, one has to be a real experiment freak to go to all this trouble rounding up bodies for such tests. I'm going to have to stop for a while, to allow various tensions around here to dissipate.

The majority of listeners said that S³ and true four-channel were equally spacious! There are a few music passages in QS and SQ recordings where the spaciousness effect is very strong, and true four-channel clearly won. (Two such recordings are listed in the [Audio](#) article.) However, I personally think that those few sounds are more reminiscent of caverns and tunnels than of concert halls. A better optimum level of quadraphonic recordings seems awfully hard to find, if it exists at all.

Of course, I am being quite subjective myself, by trying to disqualify those few cases where S³ loses the contest. Calling it "cavernous" versus calling it "concert-like" is strictly a personal matter. You would have to listen for yourself. About all that I can say for sure about this is that there are damned few commercially recorded passages that would require this distinction.

The Hafler/Dynaquad system works quite well with a few recordings where the phase relationships seem to be just right. However, for most recordings, the back speakers come on too loud or too soft, and even with adjustments it doesn't please my ears at all. (Note that the British magazine [Hi Fi News & Record Review](#) occasionally mentions those discs that sound good with the Hafler system. Examples are on pages 69 and 93 of the July 1976 issue.)

Electronic delay systems seem to be better than straight S³, because you can adjust the delay and the reverbs to exactly the level that suits your fancy. However, I can't resist adding that the [combination](#) of electronic delay with the S³ configuration is better than having the back speakers aimed directly at your ears, at least in my opinion. (I have not tested this on other people yet.) The blending effect lets you turn the volume up higher at the back. In fact, aiming the speakers upward works pretty well at the [front](#), as long as it is a large orchestra that you are trying to reproduce.

This opens up a bewildering variety of possibilities for aiming the loudspeakers in any of these formats. It seems likely to be an important subject for future study -- if it doesn't totally boggle our minds.

-- Daniel Shanefield (New Jersey)

In the Literature

Audio, December 1976

*Microphone Sensitivity Ratings (p. 32)

*Time Delay for Ambience: Len Feldman analyzes the Sound Concepts and Audio Pulse units. Has some good scope pictures. (p. 40)

*Test reports on Onkyo TX-4500 receiver, JVC CD-1970 cassette deck, Kenwood KA-3500 integrated amp, BSR FEW-3 equalizer, Technics RS-630US cassette deck, and Harmon-Kardon Citation 16 power amp. (p. 58)

*European Records: A new quarterly column devoted to European releases. (p. 91)

The Audio Amateur, No. 3, 1976

- *A White Noise Generator & Pink Filter (p. 3)
- *A -Z Tape Recorder Set-up 1 by Craig Stark, Stereo Review columnist. (p. 6)
- *Modifying the Rabco SL8E (p. 10)
- *Audio Mixers, Part 3 by Ed Gately. (p. 13)
- *Design and Build a High Efficiency Speaker System: corner-mounted design using the Altec 604-8G high efficiency coaxial driver. (p. 17)
- *Kit report on the Aries System 300 electronic music synthesizer; Aries is located in Peabody, Ma., for those interested. (p. 26)
- *Classic Circuitry this issue of the schematic for the Audio Research EC-3 Crossover. (p. 35)
- *Plus the usual miscellaneous stuff, 48 pages in all; it looks like Ed Dell is approaching a normal publishing schedule. Hear that, J. Gordon Holt?

Audiogram, Volume 1, No. 7

Editor Robert Bryant has given up trying to produce a monthly and now aims to publish bi-monthly. This issue begins with a look at the summer CES show and discusses briefly why good belt driven turntables may be superior to their much touted direct-drive cousins. Reviews of the Audio/Pulse Model One, the Ace Audio Zero Distortion preamp, the Rotel RA -1412 integrated amp, the Polk Model 10 loudspeaker, the Audionics PZ3 II power amp, the I. M. Fried Model H and Model Q speakers, and the Promethean Grado, Power Research-modified Shure V15-III and Goldring G900 Super E cartridges. The closing article discusses the ins and outs of buying used KLH 9 electrostatic speakers.

db, November 1976

- *Theory and Practice Column is on woofer impedance. (p. 14)
- *Three articles on studio automation (pp. 30., 32, 34)

FM Guide, December 1976

- *Profiles in High Fidelity: The Bose Story (p. 46)
- *Feldman Lab Reports on the BGW 250B power amp and the Yamaha CA-400 integrated amp. (p. 48)

Hi-Fi News & Record Review, September 1976

Articles on American music and on the effects of loudspeaker cabinet resonances. An article on a "pilot" tone arm discusses a fascinating technique for relieving the stylus suspension of its usual support functions, thereby reducing the effective mass it sees and the amount of stylus overflexion in response to warps. Thorough reviews of five headphones and of two amps and a tuner by Trio (Kenwood).

Hi-Fi News & Record Review, October 1976

This issue contains a complimentary article on the dbx noise reduction system, followed by a construction feature on building a simple compander around 741 IC op-amps. Raymond Cooke of KEF discusses loudspeaker measurements and how, unless care is taken, they can mislead. Excellent and very interesting reviews of the Strathern STM-4 turntable with arm, of the Fons CQ-30 and Linn Sondek LP-12 turntables, and of the Micro-Acoustics QDC-1e cartridge.

High Fidelity, November 1976

- *Test reports on the Marantz 510M power amp, Shure M-24H CD-4 phono cartridge, Onkyo TX-2500 receiver, Stanton 8004-II turntable, Satin M-117X moving-coil cartridge (\$190), Technics RS-630US cassette deck, Ohm C-2 speaker, Sennheiser HD-400 headphones, Garrard 990B turntable, and Schober Recital Organ kit (\$2850). (p. 57)
- *Four-Channel Sound Today: A Very Lively Corpse: The latest in quadraphonics. (p. 74)
- *Caruso cum Computer: Fascinating article on Soundstream's digital reprocessing of Caruso's recordings, continued from last month. (p. 98)

High Fidelity, December 1976

- *Test reports on Sansui 7070 receiver, Empire 2000Z phono cartridge, Sony SSU-2000 speaker, Phase Linear 200 power amp, Stanton Stereo/Wafer Model XXI headphones. For the first time HF is printing manufacturers' comments on test reviews and rebuttals, after the fashion of the Stereophile, The Absolute Sound, et al. (p. 51)
- *How I Choose a Component System: Six experts choose their systems within specified budgets (two each at \$1000, \$3000, \$5000). BAS treasurer (I-IF editors take note!) Harry Zwicker selects a \$5000 one. (p. 60)

Popular Electronics, December 1976

- *Stereo Scene: Evaluating Four-Channel (p. 24)
- *Roundup of TV Electronic Games (p. 32)
- *Build a Universal Four-Channel Matrix Decoder: \$75 kit uses Sansui integrated circuits. (p. 37)
- *Understanding Active Filters: by Don Lancaster. (p. 69)
- *Test reports on Technics SA-5460 receiver, Shure M24H phono cartridge. (p. 74)

Radio-Electronics, December 1976

- *Brief test report on Heathkit AP-1615 preamp. (p. 34)
- *TV Games: Good article on operation of games and a detailed two-page comparison chart. (p. 39)
- *Projection TV Roundup: Advent is probably the best known, but there are several other manufacturers as well. (p. 44)
- *All About Digital Multimeters, Part II (p. 48)
- *What's New in Car Stereo (p. 51)
- *Test reports by Len Feldman on Nakamichi 600 cassette deck, Heath AD-1305 equalizer. (p. 59)

The Sensible Sound, Volume 1, No. 1

At \$10 for four issues, the twenty-three page magazine that rates equipment solely on a price/performance basis is no bargain. Reviews of the Lafayette 2005, JBL Decade L36, Klipsch Cornwall, Dahlquist DQ-10, Janszen ZVS-2, and Fried Model Q speaker systems; the Technics SL-1350 turntable; the Advent 400 radio; and Discwasher. Impressions of the Acoustat, Jennings Vector One, Ezekial FRL, B&W DM-4, and ESS AMT-10B loudspeakers; the Onkyo TX-4500 receiver; and the Nakamichi 610 cassette deck. Also included are record reviews and a recommended components listing, with rankings according to price class. A good idea, as yet imperfectly carried off. For subscriptions write: 403 Darwin Drive, Snyder, New York 14226.

The Stereophile, Winter (4), 1975/1976

- *Like the famous Mark Twain quote, reports of the death of the Stereophile or Mr. Holt have been premature. Perhaps to compensate for the first issue of this quarterly since January (that's January of this year, at least), Ye Editor has produced an 80-page issue, the largest ever, I believe.
- *As We See It ... Late Again!: The apologies that have become de rigueur, though, one should note, not only for JGH, but also competing quarterlies that had originally pledged to avoid such sins. (p. 2)
- *The All-Pass Filter (p. 3)
- *Full reports on the Otari MX-5050 tape deck; the Yamaha C-1 preamp, B-1 VFET power amp, and NS-1000 speaker; Audio Research Dual 150 power amp; and GAS Thaetra preamp. (p. 7)
- *Shorties (sic) on the Speaker Stand and Quad 405 current-dumping power amp. (p. 20)
- *Quickies on FMI/Pro-Musica Phono Unit, dB Systems preamp, Formula 4 tone arm, Bravura preamp, Micro-Acoustics cartridge, GAS Son of Ampzilla, Stax preamp. (p. 21)
- *Finally, there are quite a few record reviews, letters, and the usual random other stuff.

Stereopus, Vol. 1, No. 4

This late but large issue contains, among other interesting items, a very favorable (though somewhat incomplete) review of the Davis-Brinton phono preamp. Full reviews of the Koss Model One loudspeaker; the Pioneer RT-1050 tape recorder; the ESS 500A power amp, AMT-1AM

speaker system, and 2240 electronic crossover; the Stax SRX-III and Audio-Technica AT-706 headphones; the Audio-Technica AT-20SLa, ADC-XLM Mk. II, and Sonus Blue and Red Label cartridges; the Grace 707, Stax UA -7M and Formula 4 tone arms; the Luxman PD-121 and B&O 4002 turntables; the Fried Model R and Model Q loudspeakers; the Janis W-1 infrawoofer; and the AGI, Stax, Paragon, and Levinson preamps. Short reports on the DW XG-8 Mk. III loudspeaker and the Micro-Acoustics 2002e cartridge. "Constructor's Corner" discusses crossover networks and a Speakerlab equalizer kit reminiscent of the Mark Davis bass-boost filter.

-- Dana Craig, with contributions from Michael Riggs

Note: Member contributions are solicited for this column. Some periodicals (e. g. , Stereo and Stereo and Hi Fi Times) presently elude coverage because the reviewers either do not get them or do not have copies available for review. If you have access to any interesting magazines you haven't seen mentioned in these pages, just write out a brief review of the pertinent contents (preferably typed, but legible handwriting is acceptable), and mail it to Box 7. We gratefully accept and acknowledge all contributions. The only caution -- a small one -- is that material should be kept current, the March issues of most magazines having by now lost their zing.

Also, because the main reviewers happen now to be engineers, the column exhibits a noticeable bias to hardware and technofreakish items. It would be nice to have reports on worthwhile items about music as well. I don't know what the relevant music journals are or even whether there are any. Those with expertise in this area are invited to write to the above.

For several reasons, my philosophy is not to give extended summaries of articles. I don't have time to read everything thoroughly enough to write a fair synopsis, and were I to do so it would take up much more space. In addition, my prejudices would to some extent color the reviews; people should form their own opinions. Another danger, perhaps more serious, is that detailed summaries might cost consumer-oriented magazines, such as The Audio Amateur, subscription revenue they both need and deserve. Many others are so readily available at libraries as to make long reviews rather pointless. In short, I see my function as that of making known articles which might otherwise go unnoticed. If you agree or disagree strongly with this view, let me know.

-- Dana Craig

November BAS Meeting

The November meeting was held at Boston University and the speaker was A. R. Groh, Development Engineer for Shure Brothers, Inc. He was assisted by C. Roger Anderson, Assistant Chief Engineer, and Gary Rogers, Sales Engineer.

Mr. Groh began with a brief summary of how moving magnet cartridges are made. He pointed out that while purely vertical movements of the stylus are out-of-phase information, lateral movements generally are in phase. Because rumble is principally a vertical movement, mono information is cut laterally on stereo discs. A common practice is to mix low frequency stereo information to mono, reducing performance demands on cartridges; most cartridges have higher lateral compliance than vertical at low frequencies. It is not unusual for a popular record to be remastered with lower bass amplitude if tests of an initial release show many low cost cartridges are unable to track it properly.

Fig. 1 shows allowable groove velocities as a function of frequency following the guidelines of the RIAA. The left sloping line shows the limit imposed by the physical amplitude of the groove excursion. Higher velocities would require wider groove deviation than the standard two-mil limit (and result in lower playing time). The flat section in the midrange is imposed by the geometry of the cutting stylus of the record lathe. Fig. 2 shows the stylus has a small burnishing facet right at the edge where the groove is cut and a 45° relief angle on the trailing side (CD-4 lathes use 35°). If the excursion of the cutting stylus were increased, the burnishing facet and the trailing surface would start to interfere with the groove walls. The burnishing facet and relief angle are needed to produce a smooth groove wall.

The sloping line at the right in Fig. 1 is the groove velocity limit imposed by the size of the playback stylus. If the groove velocity at high frequencies were increased, the stylus would be too large to follow the grooves. A smaller stylus would push this third line limit upward and to the right. Fig. 3 shows this for a 0.2 mil biradial stylus. Outer grooves of a record also allow higher groove velocities than inner grooves at high frequencies.

Although most records show maximum groove velocities within the safe cutting area, some high performance records such as the Sheffield direct-disc records may exceed these limits. Shure has measured 104 cm/sec at 7.25 kHz -- slightly distorted -- on side one, band two of Verve V-8558 (Woody Herman recording; the muted trumpet sound produces the high velocity). A recent Sheffield record -- "Pressure Cooker" -- has an 11 kHz sibilance recorded without distortion at 40 cm/sec on the beginning of side one.

Tracking Limits

Having explained the limits on groove velocity and frequency imposed by cutting practices, Mr. Groh went on to show the limits of cartridge trackability. This is also a three part analysis.

At low frequencies, the stiffness of the stylus assembly imposes a limit: if the groove amplitude is too high, and compliance too low, the stylus tip will tend to leave the groove wall. Fig. 4 shows the region that can be reproduced without distortion. Here, the less stiffness, the better.

In the midrange, the damping factor of the stylus assembly imposed by the bearing element limits tracking. The less damping, the better. The rubber-like bearing element holds the stylus assembly in place.

At high frequencies, trackability is limited by the effective tip mass. The inertia of the tip can cause it to leave the groove wall at excessive velocities. The mechanical resonance of the stylus assembly also is a factor. Most cartridges have a resonance in the 15-30 kHz range; at resonance, trackability is at a minimum. This resonance can be controlled by increased stiffness and higher damping. But this tends to degrade low and midrange performance. As Groh repeatedly observed, cartridge design is a compromise.

Increasing the tracking force raises the trackability curve, Fig. 5. The needed tracking force can be summed from all the different requirements, as shown by the following equation:

$$\text{tracking force required} = Kx + R\frac{dx}{dt} + M\frac{d^2x}{dt^2}$$

low frequency
midrange
high frequencies

Where K is a constant
 R is the damping of the stylus assembly
 M is the mass of the stylus assembly
 x is the stylus displacement
 $\frac{dx}{dt}$ is the stylus velocity
 $\frac{d^2x}{dt^2}$ is the stylus acceleration

Warp

There are two common types of warp; a low-frequency warp from bent records and a higher frequency pinch warp caused by picking up the record too soon from the press. Problems due to the latter sort of warp are controlled by stylus compliance and the effective mass of tonearm and cartridge.

To deal with the lower frequency warp, low mass arm/cartridge combinations are desirable. There are some lower limits to this mass, caused by the need for cartridge shielding, etc. If mass is too small, arm/cartridge resonance can move into the audio range. The ideal resonance lies between 7-15 Hz. Fig. 6 shows the warp envelope -- the maximum measured warp as a function of frequency. Designers want to keep resonance above this envelope.

Fig. 7 shows the amplitude of the arm/cartridge resonance as a function of frequency. Increasing stylus compliance will push the resonance peak farther left; stylus damping will lower the Q of the resonance. Adding arm damping will reduce the Q and change the slope of the left side of the curve. See Fig. 8. Too much damping -- like uncontrolled warp -- will produce FM modulation of the signal, heard as wow on sustained notes and if severe will cause the stylus to leave the groove.

Groh feels it best to roll off the frequency response of normal stereo cartridges above 25 kHz for normal stereo cartridges, to prevent unnecessary loading of amplifiers at supersonic frequencies.

As with amplifiers, there is a trade-off between output and bandwidth. For a given configuration, increasing output requires reducing bandwidth and vice versa. Amplifiers use extra stages for more gain with wide bandwidth, and Shure uses the mechanical analogue of this, more complex construction.

To produce the new Shure M24H cartridge (for CD-4) the tip mass resonance was changed to a much higher frequency. This was done with stiffer bearing construction and the use of a damped, dynamic vibration absorber. Although this gives the desired frequency response, the stiffer bearing also reduces trackability in the midrange and frequency response in the audio band is not flat, having a 3-5 dB rise in the high frequencies. This rise however helps the CD-4 demodulator, giving it a healthy signal level. If the cartridge is loaded with 20k ohms, then the audio band response is approximately flat. Fig. 9 shows the complete spectrum recorded on phonograph records.

Q and A ...

In response to questions, Mr. Groh made a number of points:

1. For normal stereo recordings, the Shibata and similar styli do not yield measurably better performance than biradials.
2. Compliance should be the same in the vertical and horizontal planes except in the very

low-frequency warp range where horizontal tracking capability is preferred to vertical.

3. Individual units of some low cost stereo cartridges give adequate CD-4 performance simply because there is so much variability in cartridge manufacture (there will, of course, be other disadvantages).

4. Shure has looked into other types of cartridge designs, but all designs have similar problems. The moving magnet, they feel, is the simplest, most direct design.

5. Much of the high performance development work at Shure is carried out with the non-detachable headshell version of the SME arm. The effective mass is 12 grams at desired tracking force -- about the lowest available.

6. The biggest difference between cartridges is trackability. If the frequency response is flattened there may be little audible difference on music, although many small differences can be heard with noise signals (i.e., pink noise).

7. There are no present plans to produce industry wide standards for plug-in cartridges (to reduce total mass).

8. Errors in vertical tracking angle cause 2nd harmonic distortion. The new DIN standard is $20^\circ \pm 5^\circ$. This increase from the older 15° standard allows more clearance for stylus assemblies.

9. For some amplifiers designed to work with CD-4, it may be desirable to add a small capacitance across the input when using a Shure V15 cartridge.

... and Demo

TTR The demonstration which followed Groh's talk illustrated the use of Shure test record 103. The bands with simultaneous 400 Hz and 4000 Hz signals check the 400-Hz point on the trackability curve.

(Note, though, that the force required to track a tone at a given groove velocity is less than that required to track that tone and another tone simultaneously. The contribution of tracking force to trackability is distributed over the recorded frequency spectrum at each instant. This is yet another good reason for keeping the arm/cartridge resonance at a relatively high frequency and for keeping the groove velocities on discs to reasonable levels. - - Ed.)

Errors in tracking will be heard as high frequency IM distortion, therefore increasing treble boost will help to make mistracking audible. The 1 kHz test is similar.

At high frequencies, such as 10 kHz, it is difficult to generate an audible tracking test, because the system will not reproduce the even-higher frequency distortion products. However, the TTR-103's pulse test, 10 kHz pulsed at a 270 Hz repetition rate, will play back as clean pulses of 10 kHz if tracked correctly. Mistracking will produce distortion at the repetition rate of 270 Hz which is easily audible.

Possibly the only useful application of record warp is to establish the borderline tracking force -- that used when the cartridge tracks properly for (perhaps) half a revolution of the record. (But badly warped records will need still more tracking force.) -- Cary Lu

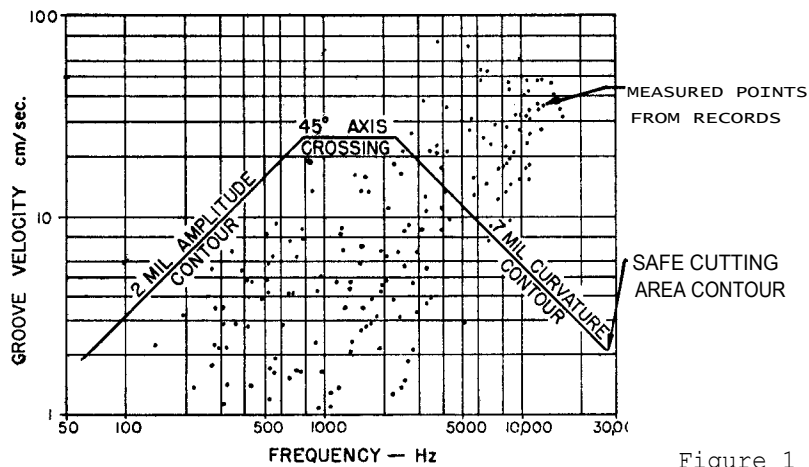


Figure 1

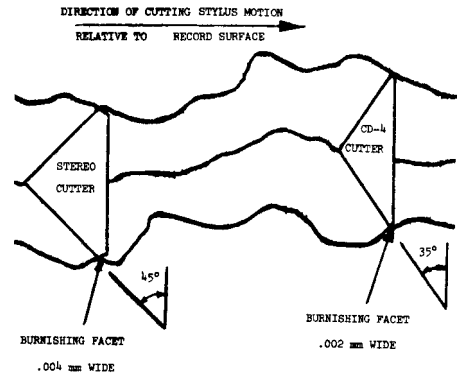


Figure 2

TRACKABILITY AND RECORDED SIGNAL RELATIONSHIP

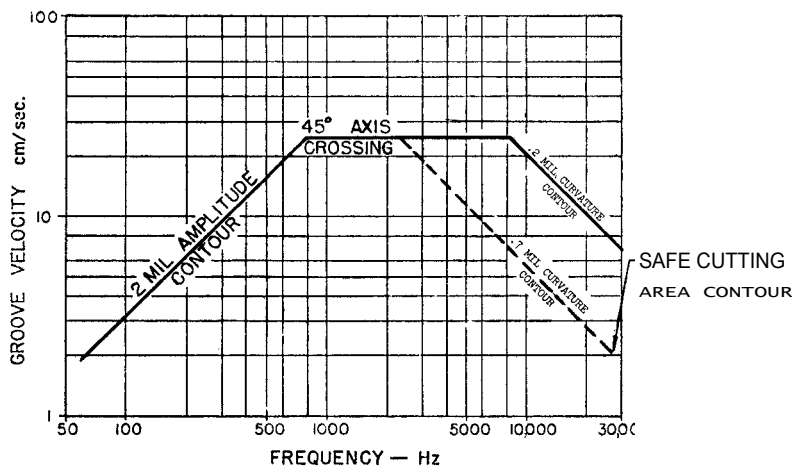


Figure 3

$$Kx + R \frac{dx}{dt} + M \frac{d^2x}{dt^2} < \text{TRACKING FORCE}$$

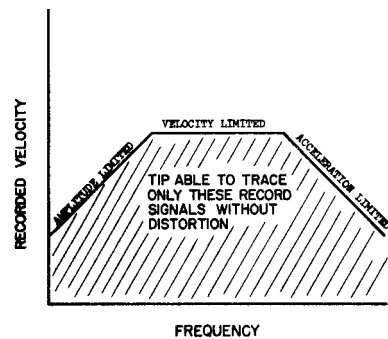
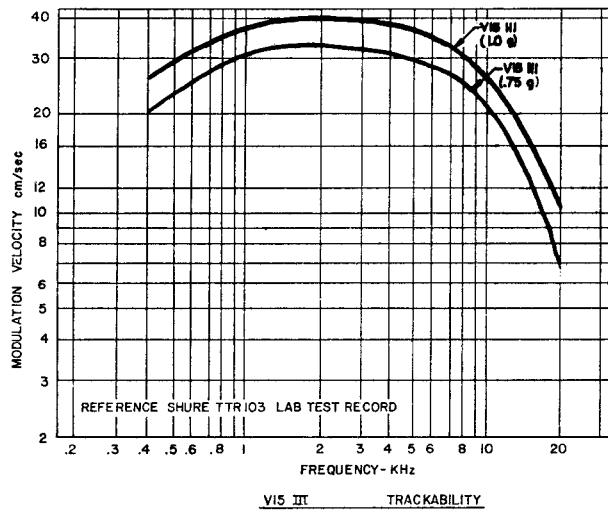


Figure 4

TRACKABILITY AND RECORDED SIGNAL RELATIONSHIP

Figure 5



Figures. ONE -- the real world: measured velocities vs. the "safe" velocities defined by the physics of figures two-four. TWO -- cutter stylus geometry defines ultimate groove shape. THREE -- play stylus geometry can vary the area under the "safe" contour line. FOUR -- tracking requirements differ with frequency and so force design tradeoffs. FIVE -- V-15/III trackability; compare with figure 1.

Figure 6

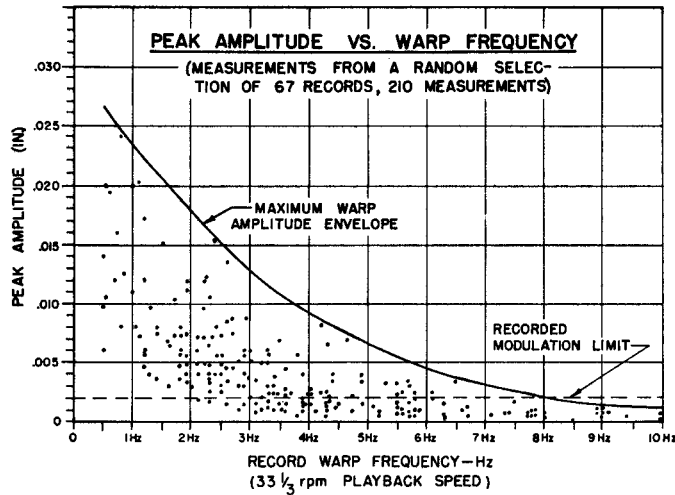


Figure 7

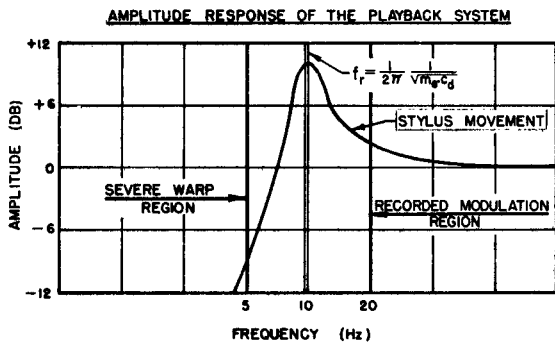
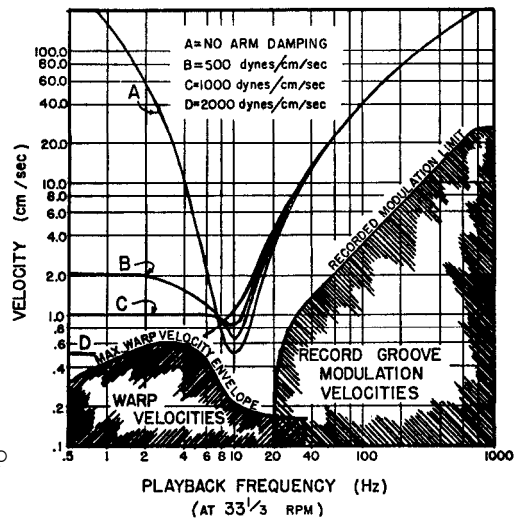


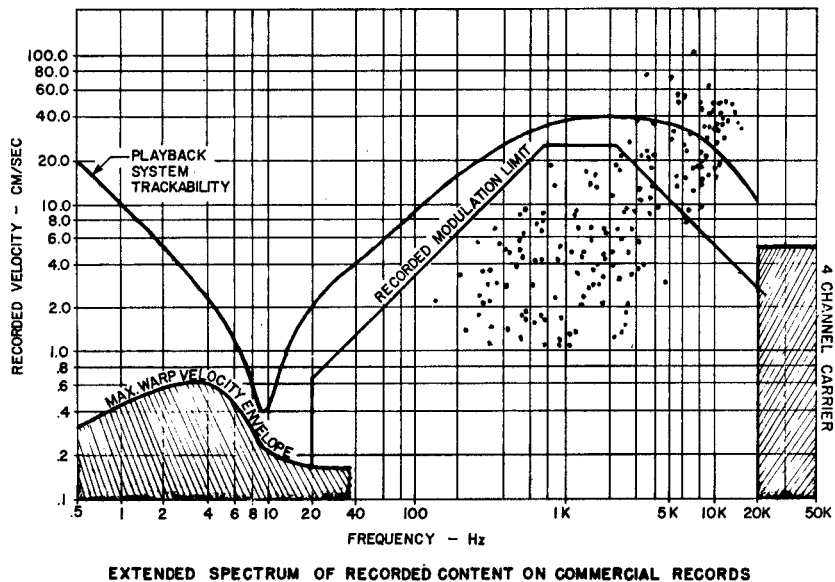
Figure 8



LOW FREQUENCY TRACKABILITY WHEN VISCOUS DAMPING IS APPLIED TO THE TONEARM

Figures. SIX -- measured warp amplitude on 67 records; most points exceed audio modulation limits. Don't confuse warp amplitude with warp velocity. SEVEN -- An appropriate resonance curve for an arm/cartridge combination, and... EIGHT -- how its Q changes with damping: an argument for optimal damping. NINE -- whole ugly picture with warps, excessive velocities and CD-4. All figures courtesy of Shure Bros.

Figure 9



The Boston Audio Society does not endorse or criticize products, dealers, or services. Opinions expressed herein reflect the view of their author and are for the information of the members.

A BAS Test Report

The McIntosh MC 2205 and MC 2125 Power Amplifiers

Robert J. Graham

Introduction

When this project was started in April, it was to be only a review of the new MC 2205, a 200 watt per channel power amplifier. During the course of the listening tests, the second amplifier in this series became available in limited quantities: the MC 2125, rated at 120 watts per channel. The amplifiers are essentially identical, both electrically and in appearance, and most of my comments apply equally to both units. The main differences between the two are these: the 2125 has the same face-plate size as the current McIntosh preamps and tuners and is smaller than the 2205. Also, the 2205 has 78,000 μF of filter capacitance in the power supply and has six output transistors per channel; the 2125 has 40,000 μF of filter capacitance and four output transistors per channel. Both amplifiers use the same type of output transistors and identical plug-in circuit cards. The price of the 2205 is \$1199, and the 2125 is \$999. McIntosh has just introduced non-metered versions of these new amplifiers for approximately \$200 less per model. These are designated the MC 2200 and MC 2120 respectively and each has an aluminum front panel with the "Power Guard" indicators (referred to in the review) on it, as well as front panel level controls and a power switch. An optional handle-rack mount extension is also available for the non-metered versions.

[The Stereo Shop in Newton, Massachusetts, lent these units to me for evaluation. The store will, depending on the circumstances, lend the amplifiers to individuals who are interested. They are very knowledgeable and friendly and will go a long way to satisfy you. They have, I think, the best turntable/cartridge test set-up in the Boston area, as well as extensive electronic test gear on display for on-the-spot checking of equipment. I highly recommend them.]

Both the MC 2105 and MC 2300, the two previous top-of-the-line models, have been around for many years, while advances in transistor technology have brought new power amplifiers from other manufacturers. Some of these have been rated highly for their clean sound and low distortion, but, depending on the reviewer, the observed differences between the best models ranged from "essentially inaudible" to "a bit deeper in the bass" or "more transparent on some material," and so on. The differences in the opinions of the various reviewers (even in the same magazine) indicated at least one thing to me: the very best amplifiers (and preamps) do sound similar. Night-and-day differences are evolved more slowly, with the availability of improved semiconductor devices, as can be demonstrated by comparing the best of today's "second generation" transistor power amps to those of five or ten years ago. The merit of one over the other is then dependent, I think, on other factors, such as reliability, the warranty, special features, and personal preferences regarding general design.

The MC 2205 has to be one of the heaviest amplifiers made, checking in at a healthy 85 pounds. (Add the optional walnut case, and it's over 100.) The 2125 is 65 pounds. They are very sturdily built, to say the least! The 2205 occupies the same space as the older MC 2105, so it's directly replaceable in wall mounting installations. Similarly, the 2125 will fit where the older 2505 does.

The amp's outward appearance is similar to that of the older designs, but better. The front panel is a combination of glass, anodized aluminum and rear-illuminated lettering that looks gold in the daylight when the unit is off, yet glows turquoise blue when the amplifier is on. The glass is there for more than good looks, by the way. Glass lasts just about forever under normal handling, and finger marks and the like can be cleaned off with a damp cloth with no chance of permanent stains. The appearance is thereby preserved, which helps keep the unit's value up.

The meters are larger than before and incorporate important new features. There are front panel controls for input level, meter function, speaker "on-off", and AC power, plus a headphone

jack. The knobs are redesigned to be less noticeable than those on previous models and have an elegant touch that's not even mentioned in the advertising. Most knobs are either straight or taper to a smaller front. The McIntosh knobs are machined aluminum, indented slightly at the middle, like a Coke bottle. This rather tricky bit of machining results in a knob that feels particularly precise in handling -- a nice touch. These and other features add up to what must surely be one of the most elegant and best looking amplifiers on the market.

The Circuit

The signal goes first to an input buffer amplifier, which provides the proper impedances for the input and power amplifier stage. The front end of the power amplifier stage has a differential input, and the second stage is a Class A voltage amp. The signal next passes through the pre-driver, driver and output section, which is made up of complementary epitaxial-based power transistors in a single-ended push-pull configuration, operated Class B. The driver transistors are operated full-on, and the bias of the output devices is such that they are just on the verge of conduction. There is local feedback in the output section, and bias stability is achieved by three separate temperature sensors in each channel. The bias setting is adjustable and can be set by the user with an AC ammeter or power meter. I can personally attest to the efficacy of this method of adjustment, as I was able to improve the 2205's performance slightly by resetting this control. (The unit was a demo that had been bumped around quite a bit, probably causing the misadjustment.) Heat sinking for the output transistors and drivers is exceptionally good. The sinks remain absolutely cool, except at maximum dissipation, when the temperature gets all the way up to lukewarm. I was never able to make either amplifier get even remotely hot in normal use. The exceedingly cool operation of these amplifiers, together with the low operating voltages of ± 42 volts (one of the advantages of having autotransformers at the output) should go a long way to assuring long, trouble-free performance.

A two-second delay relay eliminates turn-on thump and switches a thermistor into the AC line during turn on, so your house lights won't dim when you start up your hi-fi. Both amplifiers have various protection circuits to save the transistors from a wipe-out in case of a gross failure somewhere, but I think the best single feature is the Power Guard attenuator. Briefly, this is a relatively simple (and therefore reliable) circuit that compares the output waveform to the input waveform. When the distortion of the output (usually caused by excessive input drive) exceeds 0.5%, a red "Limit" indicator lights up on the front panel. (Usually the green "Normal" indicator for each channel is on.) If the distortion increases to 1%, a control voltage in a comparator circuit turns on an LDR network (an internal LED, which operates a light-dependent resistor) in the base circuit of the input stage. This reduces the input drive level, thereby lowering the output level momentarily.

In other words, these amplifiers cannot be driven into hard clipping, even with considerably excessive input levels. It is well known that a major cause of tweeter burnouts is amplifiers that clip, so these new amplifiers will immediately remove the danger of that particular disaster, not to mention the fact that a sine wave, even a compressed one, is better to listen to than a square wave. (Note that this is not an output current limiter circuit, like some other designs. The full rated output is always available; it's just never a square wave.) I have heard both amplifiers when they were deliberately over-driven, so that the Power Guard circuitry was in and out almost constantly, and they still sounded beautiful. The actuation time for the Power Guard is, on average, 100 microseconds (which corresponds to two cycles of a 20 kHz signal), and release time is 50 milliseconds (one 20 Hz cycle).

The meters are of new design and have three ranges of decibel scales, a direct-reading watts scale, plus a "HOLD" function on the watts scale. With the speaker(s) hooked up to the correct output terminals the meters show the wattage to the load, either in real time or in an extended "hold" function, where the meters continue to indicate new peaks as they occur, but the decay rate is 10 dB per minute. The meters are peak-reading and have stretching circuits so that even 100 microsecond peaks will be indicated.

With regard to the frequently leveled criticism concerning the price of meters on any power amp, you may like to know that in the McIntosh units, at least, you are getting your extra money's worth. The circuitry that operates the meters is of a sophisticated time-stretching design, mounted on a fiberglass plug-in circuit board. Rear-illuminated lettering, in colors, tells what function

has been selected. The meters themselves are made by Modutec and are expensive, highly damped taut-band devices. The taut-band design does away with the bearings and coil springs of conventional meter movements, and replaces them with tightly stretched bands of spring material which support the meter movement. This eliminates the friction build-up of the cheaper bearing design, as well as providing a meter that always returns immediately to zero when the signal is removed, something regular movements don't always do. I have examined the unmounted meters of the McIntosh 2125 and also those of a well-known competitor. The competitor's meter is also a Modutec -- it looks somewhat similar from the front -- but is of a needle and bearing design. When I shook both meters the other meter flopped all over, while the McIntosh meter indicator hardly moved off the rest-pin. Several other amplifiers that I have seen have this same kind of floppy movement, even when installed in the amplifier, which should dampen this movement. Try shaking a power amp or two to see this for yourself.

On the basis of the above observation, one might expect the Mac meters to be somewhat slow in responding, but, in the A-B tests, it was the competitor's meters that were sluggish, while the taut-band McIntosh meters, set for the least sensitive dB scale to read the same way as the others, seemed almost alive with the music, but with no wild bouncing or overshoot. Taut-band meters do not come inexpensively, but if you want the best, they are it.

Similarly, McIntosh is putting extra-high quality components in the rest of the amplifier (a 35 amp bridge rectifier, for instance, where a much smaller one would suffice) to assure component reliability and long life. Wiring and construction are of the best quality and are among the things for which the company is renowned. Wiring is neatly routed, tied with nylon tie-wraps and squared off before going to a connection point. All the circuit boards are fiberglass connector types, and even the complete output sections can be quickly changed without so much as putting a soldering iron to them. In a situation where repair is needed, it can be done quickly simply by exchanging the defective section.

The Great Transformer Debate

Probably the biggest single point of controversy about the McIntosh design is its use of an autoformer output. There seems to be a great deal of misinformation and a general lack of knowledge about the design of autoformers in these heated debates, so I'd like to touch on this subject.

In the days of tubes, transformers were generally necessary because tubes are high impedance devices, and speakers need to see a low impedance voltage source. In addition, critical balancing of the tubes was necessary, because the plates of the output tubes were generally connected to each end of the center tapped primary. Transformers of various brands and designs had their followings as did different kinds of tubes. It is interesting to consider that the tube units owed much of their goodness and popularity to the output transformer.

Now suddenly, with low impedance transistors, the transformer has fallen out of favor. True, its use is not mandatory any more if the loudspeaker load is the optimum one for the output design. Frequently, however, speakers do not provide the load the output transistors want to see, and that doesn't even count the installations where people are paralleling two or more speakers per channel. True, some amps will produce increased power at lower impedances, but that power has to come from somewhere (there are no free lunches here), and that source is current times voltage (power) which translates directly into heat. Lower impedance loads, such as multiple speakers, cause output heat dissipation to increase greatly, and heat is harmful to transistors and other components. The rule of thumb is that for every increase of 10° Centigrade, the component life is halved.

McIntosh's solution to this problem is to use an autoformer at the output. The autoformer differs from a regular transformer in that the primary and secondary windings are not isolated from each other. This design yields smaller size, tighter coupling and greater efficiency. It permits lower DC voltages while maintaining high currents, which moves the transistor characteristics further into the safe operating area. This permits the use of higher frequency transistors for better performance. These same transistors could not be used in a regular high voltage circuit because they would then be in a not-safe operating area of high current and high voltage. In the case of the 2205, the output transistors are designed to work into a 2.1 ohm load, and it is an easy matter to connect into the autoformer primary at this impedance. The output taps are 8, 4, 2 and 1

ohm, and the amplifier will produce full output at any of these taps. (For the 2125, the outputs are 2, 4, 8 and 16 ohms.) In other words, the 2205 will deliver a minimum of 200 watts per channel to eight AR-3a's, sixteen Allison: One's or thirty-two KLH-9's.

The autoformer also provides an important margin of safety for the speakers. The DC resistance of the primary is a fraction of 1 ohm. In the event of a catastrophic failure in the amplifier (very unlikely, given the way it's built), the autoformer primary shunts the DC current to ground and protects the speakers. The amplifier does not rely on trick circuits (which could cause distortion) to offer this protection; the autoformer is always there, and DC just can't get to the speakers.

But is the autoformer a detriment to performance? Obviously, if any manufacturer uses inadequate or poor components the reliability of the equipment and the quality of the sound deteriorates. Cheap resistors generate noise, as do inferior transistors. Bad capacitors can leak, and poorly designed transformers can cause distortion. The point here is not what the particular component is but rather what its quality is. The McIntosh autoformers are heavy, noise-free, expensive devices with five-section trifilar windings. (That's a method of making a transformer to keep internal losses and similar difficulties near zero.) The core is grain-oriented silicon steel, which allows for a very high input impedance at low frequencies (very desirable) and which does not saturate, even at 20 Hz. It also has a very linear flux density to voltage characteristic.

Electrostatic speakers are generally held in very high regard, and all (except one, as far as I know) have transformers at their inputs. A few well regarded dynamic speakers also use autoformers, and, in any case, the average record has already seen over twenty transformers of different types and of varying quality in its mastering. In my opinion, the inclusion of an autoformer in a design is certainly not a weak link in the reproducing chain. The McIntosh autoformer is, very probably, of better quality than many of the other transformers referred to.

If I have labored over this point it is because I have read or heard too many discussions of design techniques that were abundant in misinformation. How many people, for example, understand the current hot topic of slew rate? We are told that a given amplifier has a slew rate of Warp Factor 8, and is therefore the best. [Non-Trekkies may find it interesting to know that speeds quoted in Warp Factors are interpreted by means of the formula $v=2wc$, where "v" is velocity, "c" is the speed of light and "w" is the Warp Factor. This is no Tawdry Turtle, friends. Ed.] So far, this area seems to be a numbers race, with no one defining the actual requirement from a mathematical standpoint. Remember the damping-factor race a few years back?

The use of autoformers is a typical subject in these debates. I suspect that many people are not really aware of the design concepts and fail to recognize that the use of them does not automatically degrade the rest of the amplifier. The mere existence of low impedance transistors does not ipso facto mean that properly designed autoformers are outmoded. On the contrary, their use provides a worthwhile measure of reliable protection for the transistors and speakers and makes possible the application of various types of loads, which might otherwise be unacceptable to the amplifier circuitry.

Some Numbers

The specifications for the 2205 and 2125 are impressive, and it is well known that McIntosh's figures are usually very conservative. They have a money-back guarantee (the only one in the industry), which states, among other things, that the amplifiers will produce their rated output at no more than 0.1% IM or 0.1% harmonic distortion and that the frequency response will be flat +0, -0.25 dB from 20 Hz to 20 kHz.

I had an opportunity to test the 2125 with a Sound Technology 1700A generator, a General Radio wave analyzer and a General Radio 1521B chart recorder. All measurements surpassed the specifications with ease: the frequency response was flat from 20 Hz to about 2.3 kHz, rolling off smoothly to -0.1 dB at 20 kHz. Both channels measured virtually the same in the tests, indicating a high degree of quality control in manufacture. Harmonic distortion was 0.035% at 20 kHz (worst case) and was typically 0.015% or less at other frequencies. Hum and noise was -100 dB at rated power and -102.5 dB at lower settings (McIntosh claims -95 dB). Power output is specified as 120 watts per channel, any impedance; I measured nearly 160 watts before the Power Guard activated.

I did not measure the IM distortion.

Take Him to the Rack!

I wanted to verify the durability of the design under stress, so a 2205 was deliberately tortured. First, an oscilloscope was connected to the output so that the signal could be monitored. Test frequencies of 100 Hz and 1 kHz were used and the amplifier was turned up to deliver 200 watts into an 8 ohm load. Then a 50 μ F capacitor was connected to the output. (Don't try this with cheap capacitors; they'll pop!) On the scope, the signals still looked perfect, and the amplifier delivered a full 200 volt-amps into this disrespectful load.

Next in line was a 2205 output autoformer winding with only a few laminations in place. The amount of core used was adjusted so the inductive reactance was 4 ohms. (At 100 Hz the inductance was 6.4 mH and at 1 kHz it was 0.64 mH.) The DC resistance of the winding was less than 0.4 ohms. This was placed across the 8 ohm output tap of the 2205 along with the capacitor. The signal remained perfectly clean. Just for kicks, an assorted screwdrivers, pliers and other metal objects within reach were placed in the center of the coil where the laminations normally would be. This mess of metal was left in there until the tools heated up to the point of being too hot to touch.

Finally, the full output of one channel was directly connected to the input of the opposite channel, with the aforementioned load still connected. The Power Guard was switched out for awhile, and the 2205 made unhappy noises and began to get pretty hot. (I was beginning to wonder if the amp ever got hot.) During this activity, a pair of long-nose pliers was placed across the output terminals and remained there until the plier tops got hot enough to discolor! Finally, after about 30 minutes of this kind of punishment, the 2205 got hot enough for the thermal sensors to shut it down. After the unit cooled off, it was switched back on and performed perfectly, with no ill effects from the testing. I think more than a few other amplifiers could not begin to stand up to that kind of abuse.

The Brass Tacks

My initial impression when listening to the 2205 (and later the 2125) was highly favorable. I did not manage to compare either amplifier directly with any of the older McIntosh amplifiers, but there was no doubt in my mind that these new models were considerably cleaner and more solid sounding (better definition) than the MC 2105, which is, after all, a ten year old design. I made a few faltering starts at A-B testing by listening to one amplifier and then switching all the connections to a second amplifier for comparison.

All I could conclude was that really meaningful comparisons had to be made under strictly controlled conditions, with precise adjustments of each amplifier's output level.

I then constructed a simple switch-box, which allowed either of two amplifiers to be instantly switched to a common speaker system. All further testing was completed using this box. The set-up procedure was to connect both amplifiers to the switch-box and then, with an AC voltmeter at the output of the box, to adjust the gain of one or the other amplifier until they produced the same output level, using a 1 kHz tone as the reference. In the case of amplifiers with no level control, the McIntosh units could easily be matched, because, in addition to the front panel level controls, there is a rear panel sensitivity switch which allows full output at either 0.75 V or 2.5 V input drive. During the tests, various people took turns operating the switch-box so that the results would not be biased.

The associated equipment included an AR turntable with a damped SME Improved arm and a Sonus Blue Label cartridge. (The latter is a good choice for amplifier testing, I believe, because it elicits so much inner detail and definition.) My differential-input IC phono preamp was located in the base of the turntable for improved signal-to-noise performance. The output of this fed the high level inputs of an equalized McIntosh C-26 preamplifier, which was driving the two amplifiers under test. The speaker system consisted of an AR-1W woofer, JansZen 130 electrostatic mid-range and Ionovac tweeters.

The first comparison was between the two new McIntosh amplifiers themselves. Switching back and forth between the 2125 and 2205 yielded no audible differences. Both amplifiers sounded

clean, with excellent detail and solid bass that extended down to the very bottom. Played at high listening levels, there still was no noticeable difference, even though the 2125 was probably approaching its limit. This was due, I suspect, to the Power Guard circuitry; there was no clipping from either amplifier, even when overdriven.

The next test was between the 2205 and the Ampzilla. This unit is owned by BAS member Lewis Dalven, who purchased it as an assembled version of the original kit. This is the same vintage as the Ampzilla that was highly praised in The Absolute Sound in 1974 and had just returned from being adjusted by the GAS Co. , where it presumably was brought up to specs. After connecting both amplifiers to the switch-box, the 2205's level was adjusted to the same output as that of the Ampzilla. At first listening the differences seemed slight, with some varying opinions as to which was better.

After listening for five minutes or so, however, the Ampzilla (whose identity was known only after opinions were in) started to sound somewhat better than the McIntosh, with what seemed to be better midrange detail. Though I was quite prepared to acknowledge any results of this testing, I was surprised to find differences that large. Just on a hunch, I rechecked the output levels of the two amplifiers and found that the Ampzilla had increased in output by a couple of dB over the McIntosh. I reset the levels again and repeated the test. The differences noted before immediately disappeared, and again there was no agreement as to which was better. The opinions varied and even shifted back and forth sometimes. The problem of level changes occurred once or twice more in the testing, and it seemed clear that the Ampzilla needed to be run for a half hour at least before it could be accurately evaluated. (A later test of the McIntosh showed that it was not the one that had changed levels. This incident also points up the meaninglessness of results obtained when the tests are not controlled.)

After finally deciding that the two amplifiers were very close, the smaller 2125 was then pitted against the 200 watt Ampzilla. Some of the same records were used as before, and again it was not easy to tell which was playing. There were some slight differences, I thought, with the 2125 being somewhat more detailed. (Perhaps someone else would say it was "brighter," if that word means anything.)

Then came the surprise. I played a new record, not used in the previous tests, of Bach's Toccata and Fugue in D Minor (Nonesuch H-71252). Now I definitely heard more detail in the 2125 (Lewis agreed), with more pipes seeming to appear when it was switched in. (During the testing, of course, the identity of the amplifier in the circuit was unknown.) On the final chords., where there are a lot of deep pedal notes, switching between the two amplifiers was dramatic. There was unanimous agreement that the "B" amplifier was deeper and more solid. "B" turned out to be the 2125. I could best describe the differences this way (and thus avoid ambiguous adjectives): when the Ampzilla was playing these pedal notes it was if they were being played on 8 foot pipes; when the 2125 was playing it was if the organist had suddenly switched on the 16 foot couplers. The bass differences were that dramatic! And yet the frequency response curves of the 2125 showed clearly that this difference was not due to any peaks in the response of the amplifier. (I have since spoken further with Lewis about this and he informs me that, according to other testing of the Ampzilla design, it appears that when low frequency tones -- such as organ pedal notes -- are played at 10 to 15 watt levels, the upper frequency distortion increases. This may help to explain the differences noted.)

At this point the 2205 had to be returned to The Stereo Shop, so all further comparisons were made against the 2125. The next contender was the Phase Linear 400, owned by BAS member Harry Zwicker. Harry was not able to be present during the auditioning, but I did have another audiophile friend, BAS member Dean Eshleman, over to listen to this test. We played a variety of music for about a half hour and we both agreed it was very close. The dramatic bass differences noted between the Ampzilla and the McIntosh were not evident here. After taking repeated turns at the switch box, our final conclusion was that the 2125 is slightly more neutral in the midrange, i. e. , the brass instruments seemed less shrill. Bear in mind, however, that these differences were small, and that both amplifiers sounded very good.

The fourth test was with the Epicure Model 1, a 125 watt per channel amplifier owned by BAS member Jim Finlay. I have a particularly high regard for Jim's opinions and also for the Epicure, which has a very clean, neutral sound quality, with good inner detail and profoundly solid bass. (The Model 1 is frequently chosen for the bass end of bi-amp installations.) After about a half hour

of listening to both amplifiers, including organ music, we agreed that there was no discernable difference in sound between them. Jim later commented that he would rank the McIntosh 2125 among the select, small group of really neutral amplifiers. (He is, by the way, not easily moved to such compliments.)

The final test was against the Son of Ampzilla. I elected to try this test because I had been told that the 80 watt "Son" was actually better in sound quality than the 200 watt Ampzilla I had tested earlier. I did not have direct access to a Son of Ampzilla, so with the kind cooperation of BAS member Bill Juch and friends at Natural Sound in Framingham, we compared the McIntosh 2125 against the Son of Ampzilla. (Natural Sound is not a McIntosh dealer.)

The speaker system used at the store for this comparison was the IMF Model TLS 50, and the DB Systems preamp was used to drive the amplifiers. The switch box was set up and the levels adjusted as before. After about five minutes of listening, it was agreed that the Son of Ampzilla sounded better somehow. Reminded of my earlier experience with the larger Ampzilla, I re-checked the output levels. The same thing had occurred here: the gain of the Son had increased noticeably, and this had been perceived as better sound. After allowing the amplifier to warm up further and then resetting the levels that difference went away.

Without recounting the whole listening session, the conclusion from one Ampzilla enthusiast was that he had "never heard any two amplifiers sound so similar." Another listener, not knowing the identity of either A or B thought the 2125 perhaps had better midrange detail. This was my opinion also and, in addition, I felt that the bass from the 2125 was a bit more solid and well defined. The McIntosh is, however, over twice the price of the Son of Ampzilla and, in any case, both amplifiers were excellent performers.

Conclusion

It will be obvious to even the most casual reader that this somewhat lengthy review has been quite favorable. After living with the amplifiers for some time and studying at length the design principles, I was indeed left with an enthusiasm for these new products. I have not tried to elaborate too much on the sound of the amplifiers, because descriptive adjectives are subject to varied interpretations. I would summarize the sound quality by saying that I feel the new McIntosh power amplifiers are certainly in the state-of-the-art category and would urge any interested people to listen for themselves. There will be little doubt that these amplifiers are of the best quality.

There are many excellent amplifiers on the market, such as those tested in this report, and others such as the highly respected Dunlap-Clarke, Dynaco, etc. However, given the state-of-the-art performance, the superb construction, the virtues of the autoformers, the Power Guard circuitry, the extremely conservative operating characteristics and cool running temperatures, the warranty, which must be one of the best in the business (though unwritten, it frequently is for the life of the unit), the higher than average resale value, and the "fair-play" reputation of the company, I think the new McIntosh power amplifiers achieve a particularly high overall rating.

A final note: I sold my seven year old, \$650 McIntosh 2105 for \$500, chipped in the \$499 difference and purchased from The Stereo Shop the 2125 reviewed in this article.