SYNERGETIC
SYN AUD CON
AUDIO CONCEPTS

newsletter

Volume 15, Number 3
Spring, 1988

EXCHANGE OF IDEAS

I met a man with a dollar
We exchanged dollars
I still had a dollar

I met a man with an idea
We exchanged ideas
Now we each had two ideas

SYNERGETIC
SYN AUD CON
AUDIO CONCEPTS

Synergetic: Working together; co-operating, co-operative.

Synergism: Co-operative action of discrete agencies such that the total effect is greater than the sum of the two effects taken independently.

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The information conveyed in this NEWSLETTER has been carefully reviewed and believed to be accurate and reliable; however, no responsibility is assumed for inaccuracies in calculations or statements.

To receive a subscription to the Syn-Aud-Con quarterly Newsletters and Tech Topics for one year, your cost is $32.00 in North America. All other countries $38.00 airmail payable in U.S. Funds, by Mastercard or Visa.

If you attend a Syn-Aud-Con Seminar during the year, your subscription will be extended one year. (You receive a subscription for one year as part of the registration fee.

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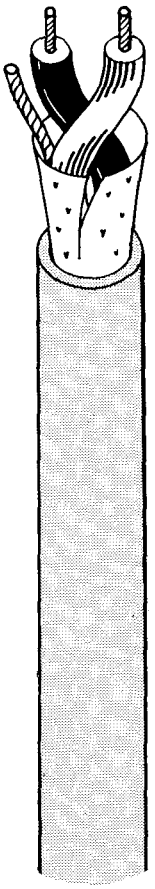
WPW WEST PENN WIRE



We are truly pleased to welcome West Penn Wire as a Syn-Aud-Con sponsor. We like the people involved in the company, and we appreciate their carefully considered desire to support educational efforts directed at audio professionals. We're always pleased when we visit sound contractors during our travels to see West Penn Wire as part of their inventory. For those Syn-Aud-Con grads not familiar with this excellent supplier, here's your chance to write for their latest catalog.

Wire sometimes seems so omnipresent in our lives that its easy to develop an attitude "that a wire is a wire, is a wire, is a wire." When the chips are really down, it's nice to know that your supplier made your cable with audio in mind and that they are sensitive to your problems and interested in your feedback to them. Syn-Aud-Con sponsorship by a manufacturing company signifies in the clearest possible way that they want the user to know the truth about all things in audio and they have put their money into that effort.

WPW
WEST PENN WIRE CORP.
P.O. Box 762
Washington, PA 15301
Toll Free (800) 245-4964
Pennsylvania (800) 222-8883

Preliminary Home Listening Room Requirements

Charles Bilello has been devoting intensive thinking as well as active participation in furthering the application of the LEDE™ concept in the home listening room for serious audiophiles.

Charles has put forward in the box at the right a suggested list of requirements. Please note carefully that his suggestions are being printed here for comment by all interested parties and are not official as yet. We will be issuing such requirements and applications at a later date as many home listeners desire such certification.

We'd like to hear from you if you are interested in helping develop what this technology should be:

1. Should we even care what kind of loudspeaker the home listener chooses to use in his room or merely treat the room to the best of our ability and let them live with their choice of psychoacoustic illusion?
2. If we establish criteria for the loudspeakers, what should that criteria be? (Charles has suggested several in his requirements.)
3. We are developing spatial geometry test tapes. Should loudspeaker—room combinations be required to pass such listening tests as well?
4. Listeners vary dramatically in their training, aural acuity, freedom from auto suggestion, and motivations for having their listening room corrected. Should we measure and qualify listeners via pinnae transform recordings?
5. Should we build a list of approved products—both Hi Fi and room treatment?

It is our basic belief, at the moment, that these home listening rooms while being built for the end user are not really a part of a mass consumer market place, but rather a speciality consumer item much like fine English double barrel rifles ($30,000 a piece) or 959 Porsches ($295,000 a piece). Incidentally all 25 Porsche 959's sold out in a week and owners put down a non-refundable $60,000 downpayment to hold their place in line. The cars are not racers—Porsche 961 racers cost $500,000—and the owner signs a statement acknowledging that his 959 cannot use public roads in the U.S. In other words, these owners have to tow the car to the nearest available private road course in order to drive it.

$750 per day to TEF listening rooms for such individuals amounts to spare pocket change and we are reliably informed that they number in the thousands. I'll be sure of that when I'm offered a fine English double to design and test an ultimate home Hi Fi listening system including environment.■

"APPLYING the L.E.D.E.* CONCEPT in the HOME LISTENING ROOM" label may be applied to a listening room that satisfies the following criteria. Permission to use the label is granted by individual letter to each applicant satisfying these requirements:

Note: Typical ETC Time Span.....50 Sec.
Sweep Range.....0 Hz. to 80 kHz.
Sweep Rate .....1000 Hz./sec.

ETC's: 0-4000 Hz, 4000-8000Hz, 8000-12,000 Hz, 12,000 -16,000 Hz

If possible, please include an energy time curve (ETC) measurement of the room before treatment.

1. Proof by means of ETC measurements that the initial onset of diffused energy arriving at the listening position is from the rear sides of the room, (use polar ETC's) and allows an Initial Signal Delay gap (ISD) of at least ten (10) milliseconds to be introduced.
2. Proof by means of ETC measurements that within the ISD, there are no early reflections arriving at the listening position within 20dB of the direct sound from the monitor loudspeakers.
3. Proof by means of ETC measurements that there is no early-early sound (EES) generated by unexpected flanking paths possessing higher transmission velocities than air, i.e., improper mounting of the monitor loudspeakers.
4. Proof by means of energy frequency curves (EFC), phase frequency curves (PFC), and ETC measurements that the monitor loudspeakers associated with the listening room are not grossly out of signal synchronization, i.e., absence of comb filtering capable of masking the inherent benefits of APPLYING the L.E.D.E.* CONCEPT in the HOME LISTENING ROOM.
5. Two (2) photographs. One showing the front (including the ceiling and floor), and the other showing the rear of the listening room.

Once a home listening room has been authorized to use the APPLYING the L.E.D.E.* CONCEPT in the HOME LISTENING ROOM label, any changes must be checked with us in order to maintain the use of the label. Any unauthorized changes will result in withdrawal of the privilege of using the label.

L.E.D.E.* is a registered trademark of Synergetic Audio Concepts

A Tour de Force in Small Room Acoustics or Now you see it, now you don't by Charles Bilello

Libra Digital Productions

Libra Digital Productions represents a "showcase" of the most up-to-date advances in the field of small room acoustics. The design goal was to create a neutral environment, free of the usual anomilies, i.e., corruption by early reflected energy competing with the direct sound of the monitor loudspeakers at the listening positions. To achieve this goal we applied the Live End-Dead End (LEDE®) criteria.

The front end of Libra Digital's control room is by definition a "dead-end" from the perspective of the listening positions—but achieved by the creation of a Reflection Free Zone (RFZ®)—*no absorption is used.* A Reflection Free Zone is a volume of space surrounding the listening position that is kept free of early reflected energy by properly splaying the speaker boundaries. Inside this zone, the direct sound from the monitor loudspeakers is isolated by an anechoic time period, called an initial signal delay gap (ISD). Psychoacoustic research suggests that the duration of this time period be at least 10 milliseconds, allowing the ear-brain combination the necessary time to accurately process spatial clues. This initial signal delay gap is then terminated by the onset of a diffused sound field created by a Reflection Phase Grating (RPG®) Acoustical Diffusor System mounted on the rear wall, effectively triggering the Haas effect as it decays exponentially.

"What is absolutely unique about Libra Digital's control room is that the walls are covered with mirrors"

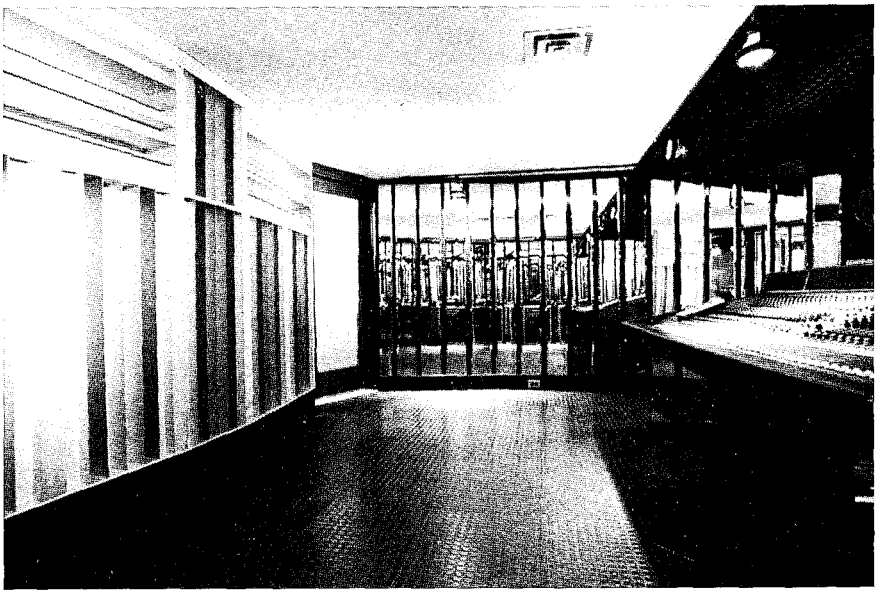
What is absolutely unique about this control room is that the walls are covered with mirrors! If you stand at the rear of the control room, in front of the D'Antonio RPG Diffusors, you can see the flush mounted loudspeakers in almost every mirror "feeding" the diffusors like "paper shredders". As you walk forward and approach the console, you enter the Reflection Free Zone and can no longer see the loudspeakers in any of the mirrors—truly optical proof of the RFZ technique protecting the listening positions and stimulating the RPG Diffusors.

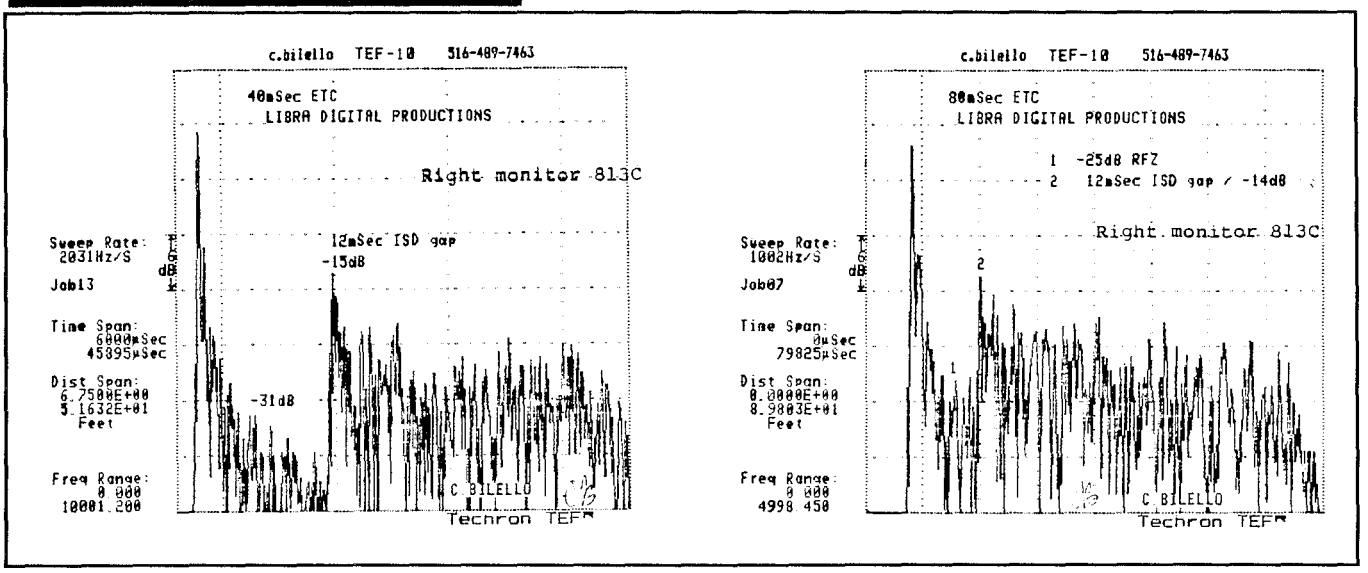
If you want to "see and hear" this technique for yourself, visit Libra Digital Productions, Inc. 32-74 Steinway St., Astoria, NY 11103. 718-956-1604■

LEDE is a registered trademark of Synergetic Audio Concepts
RFZ and RPG is a registered trademark of RPG Diffusor Systems, Inc.

Editor's Note

Charles Bilello has designed a "tour de force" exercise in small room acoustics in Libra Digital Production in Astoria, New York. We are reproducing Charles' description of the studio plus his excellent measured data on the control room. We are particularly impressed with the clear evidence of excellent diffusion.




c.bilello TEF-10 516-489-7463
40mSec ETC
LIBRA DIGITAL PRODUCTIONS
Right monitor 813C
Sweep Rate:
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Time Span:
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12mSec ISD gap
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C.BILELLO
Techron TEF
c.bilello TEF-10 516-489-7463
80mSec ETC
LIBRA DIGITAL PRODUCTIONS
1 -25dB RFZ
2 12mSec ISD gap / -14dB
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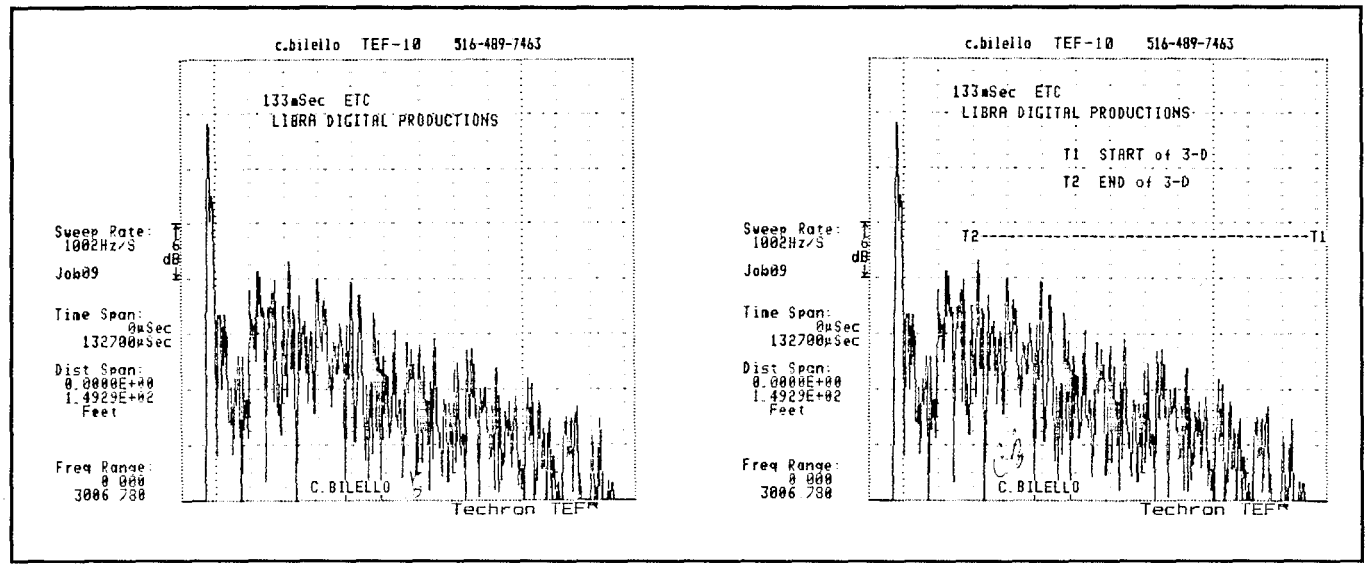
C.BILELLO
Techron TEF


c.bilello TEF-10 516-489-7463
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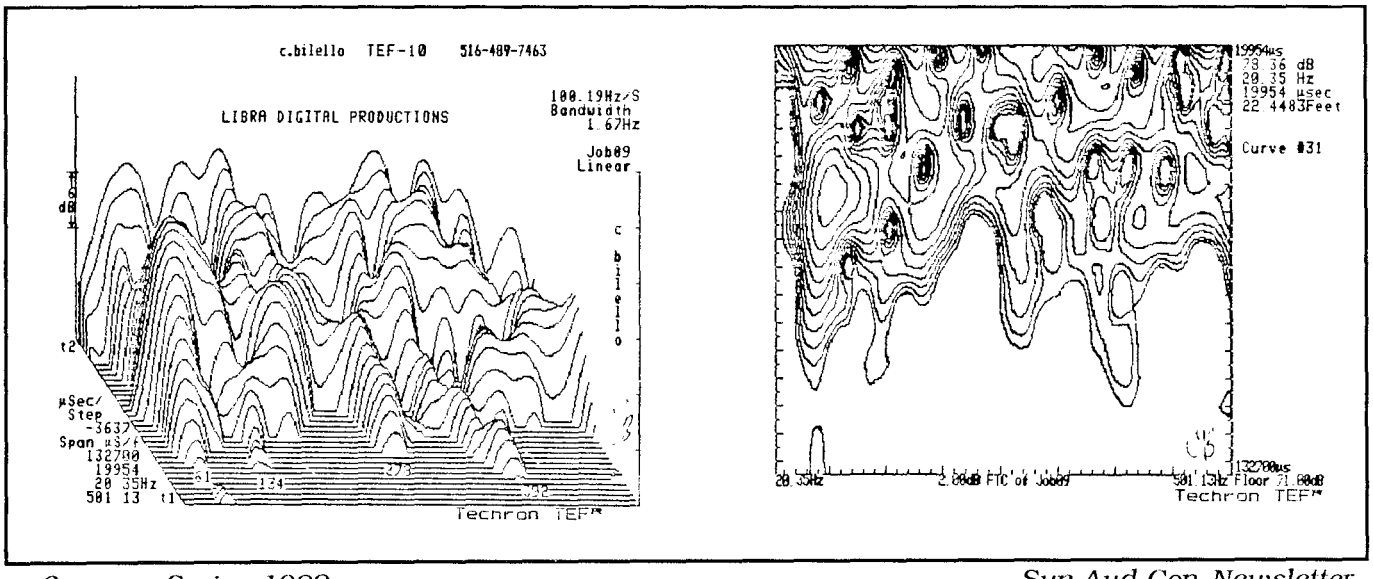
Techron TEF


c.bilello TEF-10 516-489-7463
LIBRA DIGITAL PRODUCTIONS
100.19Hz/S
Bandwidth
1.67Hz
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Linear
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Step
-3637
Span µS/
132700
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Techron TEF
19954µs
78.36 dB
20.35 Hz
19954 µsec
22.4483Feet
Curve #31
Techron TEF

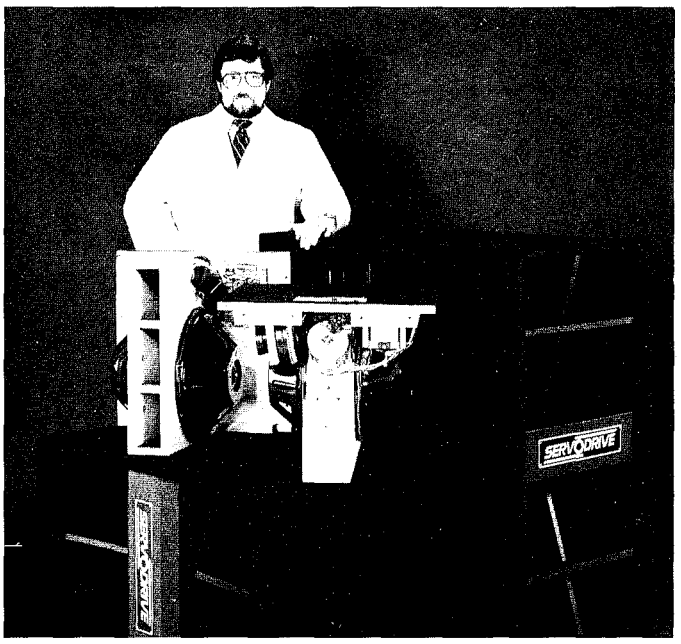
SDL Subwoofers Provide an Elephant Mating Call

There are rare occasions when I am left speechless and this is one of them. The letter we have reproduced here has further reinforced my reasons for keeping my Weatherby 460 magnum. It seems that disco dancers and aroused elephants have more in common than we realized. Dr. Boner used to say "put low frequencies into church systems and the parishioners will make larger contributions" but he failed to say of what.

The effect of 108dB at 14Hz on the elephants' sphincter muscles is dramatic. It is our belief that we will be the only safe low frequency test lab in Indiana, and we'll be prepared to use the 460 on any elephants or aroused loudspeaker designers who may accidentally stumble onto our test of high fidelity loudspeakers this summer.

I always knew if I stayed in audio long enough something like this would happen.

On a more serious note I truly believe that Tom Danley's comments regarding the effect on regular music is well taken and that one of the significant differences between typical reproduced sound of a classic orchestra and the live orchestra is centered here. This sub-bass must be (1) high enough in level , (2) enveloping the listener. When that occurs, you feel the energy in the space not as a "kick", such as contemporary musicians and listeners often seek, but as Mr. Danley so aptly puts it, "a weight" or mass.



Tom Danley, Acoustic Engineer at Intersonics Inc.

Letter from Thomas Danley

INTERSONICS INCORPORATED

Dear Carolyn and Don:

Greetings from Northbrook. We have had an application for our SDL Subwoofers that is pretty unusual and I thought you folks might get a kick out of hearing about it.

It seems that African elephants, eager to mate or locate their troops, communicate over long distances (over 5 miles) using very low frequency sound. The low frequencies are able to penetrate the heavy jungle easily—while higher frequencies are more rapidly absorbed by the flora and humidity.

We were asked by the scientists researching this long distance communication if we could build a speaker that:

(1) Could produce a minimum of 108dB down to 14 Hz;
(2) Was less than 14 cubic feet in exterior volume;
(3) Weighed less than 150 lbs.;
(4) Was rugged enough to spend the next six months bouncing around in an ISUZU "Trouper" (the area of the test site is an 8-hour drive from Mombassa, Kenya).

They had been looking for such a system for three years, and had tried numerous conventional speaker systems. Our system resulted in a cabinet 36" tall, 28" wide, by 24" deep, and consisted of two 15" driven cones (X-max .5"), driven by one Servo-motor and four heavy 18" passive radiators. Producing the maximum of 112dB at 14 Hz required the driven cones to have an excursion of approximately 3/4 inch peak-to-peak, while the 800 square inches of passive radiators moved two inches peak-to-peak.

After the performance measurements were completed, (TEF data included, for your info) we began the fun part—the listening test. As one might expect, the unit did not lack extended bass response, reproducing the lowest organ pedal and synthesizer sounds effortlessly. We did however "bottom" the passive radiators at a modest level while playing the Telarc 1823 C.D. which has strong components around 10 Hz. The most interesting part of this listening test was the effect the unit had on most "regular" music. It seems that when you are able to produce very low frequency sound loud enough to be audible, there is a noticeable improvement in sound quality, even using FM radio (with some LF EQ). The sensation of "weight" is the best word I could think to describe this improvement.

I guess I should go back to work now. We've had a request from NASA to build an acoustic source for atmospheric testing. They would like a minimum of 55dB at 5 miles between 10 and 30 Hz. I hope there won't be any elephants in their vicinity!

Transmission Museum

Syn-Aud-Con now has in its test rack the three greatest examples of transmission test sets or Gain sets. They are:

1. The Daven Company Type 10A, from Ray Rayburn
2. The Cinema Engineering Type 6343, from Bob Reid
3. The Altec Type 9704, from Bob Davis & Paul Spranger.

In addition to the above, we also have the Ralph Townsley wide range VU instrument and the Ralph Townsley peak reading instrument.

A few years back we found a Marion Electrical Instrument Co. level instrument with 0dB at 6 milliwatts and calibrated for use across a 600 ohms line.

Finally Posey Bowers from New Orleans sent us what is perhaps the most unusual item in our collection—a Weston Model 525 level instrument that is transparent and was made to insert into a slide projector so it could be projected on a screen. It, interestingly, has two scales, one running in each direction, so that either gain or attenuation could be read directly in dB. It is constructed like an oversized slide with the instrument sandwiched between two metal plates. It had belonged to Western Electric, 1111 S. Broad St., New Orleans, LA.

The Daven Gain set was sent to us by Ray Rayburn and the Altec Gain set was the object of an emotional moment for me when Bob Davis and Paul Spranger, then of the old Altec, made a surprise presentation to me during one of the Anaheim classes.

With all this generous help we can truly say Syn-Aud-Con is on the level.■

"Yippie Ai Aay"

Viv and Ernie Pence of Boise, Idaho are going to travel to many of this year's Syn-Aud-Con classes. Ernie, often known out west as "Pistol Pete Pence," after his famous encounter with the notorious Loring "Frenchy" Primeaux, who actually passed himself off as a judge at one time, will be Syn-Aud-Con's new security officer. There are only a few real westerners like Ernie still left. Ernie won Viv in a poker game in Wells, Nevada after admiring her fine singing voice in the saloon there. Too modest to allow all his exploits to be discussed, we can only hint at his service with the Canadian NWMP and the border patrol. To those who know the names Elmer Keith, Skeeter Skelton, and Tom Threepersons, Ernie will be a revelation. We are pleased to welcome Viv and Ernie to our traveling Syn-Aud-Con team.■ Don Davis April 1, 1988

SOUND ADVICE
INSTITUTE
301 S W 26th Avenue P.O. Box 53 Willmar, MN 56201 (612) 231-2122

The Sound Advice Institute in Willmar, MN is providing a valuable Newsletter service to sound contractors. Sound Advice writes, prints, and mails out a Newsletter to all the churches within the market area of the subscribing Sound Contractor. The Newsletter is mailed with your company's name, address and telephone number. It is mailed quarterly to churches and existing customers in your chosen protected market area.

Russ O'Toole of Audio Electronics in Romeoville, IL sent us the following:

Enclosed is a copy of the Sound Advice newsletter that we have just sent out to over 7,000, that's right seven thousand, churches in the greater Chicago, northern Illinois and northwestern Indiana area.

After being in the mail for only two days, we received one request for a sound system survey and the enclosed letter from a Pastor friend that I felt I must share with you.

Responses like this make us feel great about being in this business.

Rev. Kurt W. Simon wrote Russ O'Toole:

Yesterday we received Vol. 1., No.1 of SOUND ADVICE. Because of time commitments during the day I was not able to read it until late in the evening. When I had finished reading it—and I read it all—I said to myself, "Write to Russ about this tomorrow."

My friend, let me tell you that this is the most informative literature I have ever read about microphones! I surely bless you for having sent it. And if you wrote it (and the style of writing makes me think that you probably did), then double blessings upon you.

Over the years I have read different articles about sound systems, microphones, etc., and they all used the same terms you have used. Terms such as flat frequency response, Z, high and low impedance, equalization, and many others, have always been esoteric terms used by the writers of the articles and specification sheets, but they have meant absolutely nothing to me....

SOUND ADVICE, however, has removed the mystery from these expressions and explained them in terms the uneducated and uninitiated can understand. How delightful, and how helpful! Thank you very much, for in reading this one publication I have learned the elusive answers to questions that have made me curious for years. Believe me, this is one document that will not be tossed into the round file.

We talked to Chris Olsen of The Sound Advice Institute. He told us that they have 40 subscribers now. Eighty to 100 will be the maximum number they will accept. We asked Chris what the typical cost would be for a subscribing sound contractor. He estimated approximately $1,200 for a mailing of 3,000 Newsletters (before the increase in postage.) at an average cost to the contractor of 40 cents, including postage.

We have known Ron Huisinga from New Life Communications for many years (Sound Advice Institute was formed by New Life Communications). The idea of the Newsletter was developed for their own use and they found it so successful in generating new business (350% increase in two years) that they felt that other sound contractors would benefit from sending out the Newsletter to their potential customers. Most likely this Newsletter is just a start of a much broader program from Sound Advice.■

Gain Set and Memories

In the process of moving our Bedford office out to our 105 year old main house at the farm, I came across a collection of photographs showing some of the remarkable mentors I was privileged to apprentice to and be taught by. These men were true masters of their crafts and literally originators of entire portions of the industry.

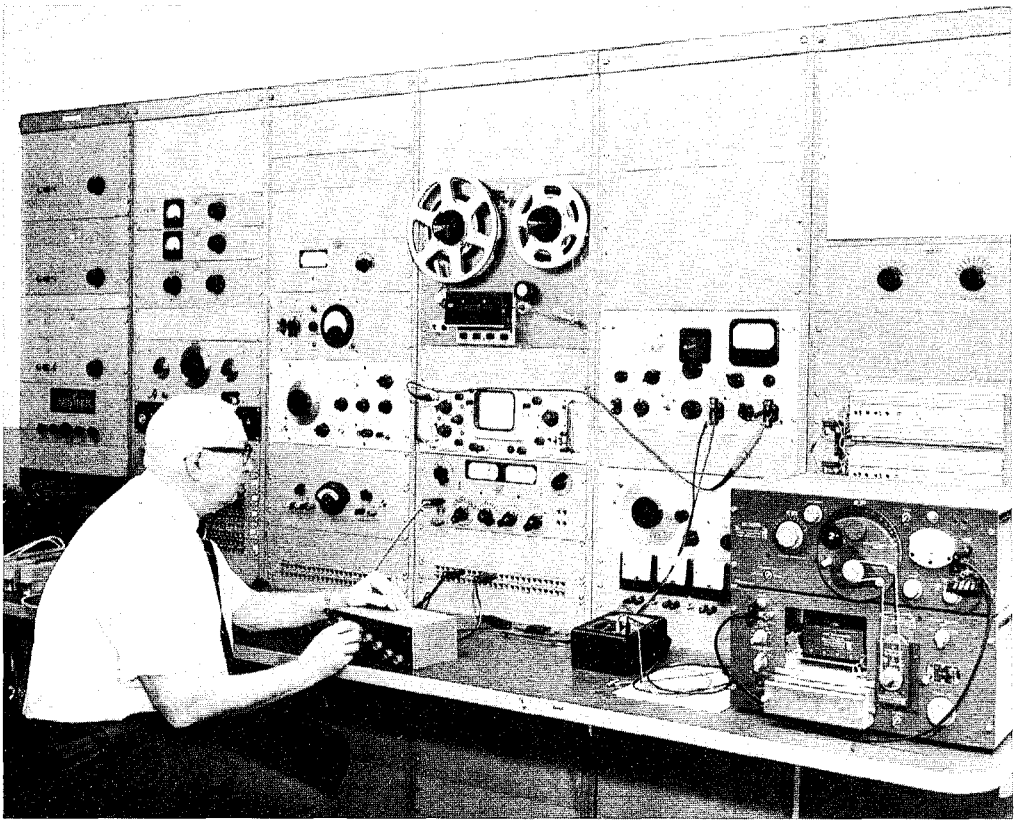
What made me so receptive to these memories was Bob Reid of Joybob who chose the Anaheim class in January to present me with Art Davis' personal Gain Set from his original company, Cinema Engineering. See photo.

For many years the long transmission test rack shown below was a familiar daily sight to me when I worked for Art at Altec in the Audio Controls division. We worked in a separate totally enclosed building inside the Altec factory which had its own tool making machine shop, laboratory and drafting space, and a private office/library for Art. It was called the "key club" because it required special keys to get in since Art was engaged in designing brand new products no one was to see until he emerged from the building and set up an entirely new product line and trained personnel to operate it.

Alex Badmaieff, the famous Altec loudspeaker designer from Prussia, had a key because he and Art had sued each other once. When they met in court, they became fast friends and dropped the suit. Alex came in one day, beating his chest, proudly showing off a new Accutron watch he had purchased. He said, "I, Alex Badmaieff, have the most accurate watch at Altec." Art held out his Rollex. "Not so," says Art, "I've set mine by Greenwich mean time." Alex, being European, was overawed by this appeal to higher authority and said, "How did you do that?" Art quietly said, "Oh, I sent them a letter and they sent me the time." Alex walked out of the laboratory totally defeated only to return in a few seconds yelling, "You can't get the time by a letter."

People have often asked me what it was like to live with these giants of audio and I've always felt this incident described it as well as any. Art Davis, by example, set many

patterns in my life. One of the greatest privileges ever granted me was the collaboration with Art during the development of 1/3 octave equalization. The eventual output of that effort is represented here at the Syn-Aud-Con laboratory in the original Acousta-Voicing master test set and the 1/3 octave real time analyzer built specially for Altec by Hewlett Packard. Even today turning one of Art's precision attenuators reminds us that precision, accuracy, and repeatability was here long before the digital age.



For those of you who have never seen a transmission testing rack before, looking at the picture here it may be hard to realize that a 40lb TEF analyzer outperforms the entire wall of equipment. It's also important to know that the wall of equipment had to exist first and that someday other engineers will look at what we do now and say "well it was the best they had available then."■

CLASSIFIED

BOOKS WANTED

Speech and Hearing in Communication Systems, Fletcher, 1929
Architectural Acoustics, Knudsen, 1932
Acoustics of Studios and Auditoria, Mankovsky, 1971
Noise Control for Engineers, Lord, 1980
Neil Thompson Shade, 6813 Glenmont St., Falls Church, VA 22042

FOR SALE

Ivie IE-30A real time analyzer. Make an offer. Albert G. Duble, 16765 NE Kings Grade, Newberg, Oregon 97132. Ph (503) 538-8044

FOR SALE

2112 B&K audio freq. spectrometer $700
1014 B&K frequency oscillator $500
2107 B&K audio frequency analyzer $700
4170 B&K probe microphone $800
2305 B&K level recorder $750
7003 B&K FM recorder $2,500
2209 B&K SLM with 1613 & 1616 filters, pistonphone, accessories & carrying case $3,500
1551C General Radio SLM $300
1558BP General Radio octaveband noise anal. $500
1900 General Radio wave analyzer $500
1564A General Radio sound & vibration anal. $900
1650B impedance bridge $400
1933 General Radio SLM in tourister carrying case with 1502 calibration $1,500
8050A Altec/HP RTA (weak CRT but usable) $400
Plus many other items such as output meters, oscilloscopes, noise generators, decade boxes, etc.
Edward Knight, 25125 Kingshire Rd., Southfield, MI 48075, Ph (313) 557-4180

POSITION AVAILABLE

in Los Angeles: Sound and video system design consultant with national practice needs assistant who wants to learn to design systems for auditoriums, concert halls, sports palaces, audio visual facilities, studios and other high-tech venues. He/she should be computer literate, have basic typing and drafting skills, understand decibels, have high proficiency in spoken and written English, and have a good ear for high-quality sound. Some travel, some long hours, some hard work, lots of grunt work, fair pay, and an outstanding opportunity to learn the consulting business from a pro. Long-term career possibility. Full-time position, but would consider part-time student with outstanding qualifications. Equal opportunity employer: gender/orientation, race/religion/etc, but must be a non-smoker. Send resume, references and salary expectations to Rolly Brook, RB Systems, 5715 Calvin, Tarzana CA 91356. Please don't call.

POSITION AVAILABLE

Multi-disciplined communications contractor seeks experienced Audio Systems Sales Engineer to promote audio systems effort. All major audio lines, administrative, engineering and secretarial support, fully equipped shop and installation crew. Limited travel. Salary DOE. Contact Tom Zorn, Diversified Concepts, Inc., Marcellus, NY to receive details. All inquires totally confidential.

POSITION AVAILABLE

Holmes & Narver Inc needs an audio and acoustics consultant. Suite 342-West, 1050 E. Flamingo Rd., Las Vegas, NV 89119-7439. Ph (702) 295-7135.

POSITION AVAILABLE

Sonics Associates is looking for a design engineer. 237 Oxmoor Circle, Birmingham, AL 35209. Ph 205-942-9631

POSITION AVAILABLE

Ron McKay of MCB is looking for a really qualified architectural acoustician. 5811 Kentland Ave., Woodland Hills, CA 91367

POSITION WANTED

Sound system designer with an electronic technician degree (BSEET-1975) looking for a job. Bob Hagenbach, 8419 Annwood Rd., Largo, FL 34647, Ph (813) 393-6873 (home) (813) 397-8946 message.

SYN-AUD-CON SPONSORS

Syn-Aud-Con receives tangible support from the audio industry. Sixteen manufacturing firms presently help underwrite the expense of providing sound engineering seminars. Such support makes it possible to provide the very latest in audio technology while maintaining reasonable prices relative to today's economy and to provide all the materials and continuing support to all graduates of Syn-Aud-Con.

Personnel from these manufacturers receive Syn-Aud-Con training which provides still another link in the communications circuit between the ultimate user and the designer-manufacturer of audio equipment. They are "in tune" with what a Syn-Aud-Con grad needs.

Their presence on this list as a Syn-Aud-Con sponsor indicates their desire to work cooperatively with you in professional sound.

Altec Lansing Corporation
Benchmark Media Systems, Inc.
BIAMP Systems, Inc.
Community Light & Sound, Inc.
Crown International
Eastern Acoustic Works
Electro-Voice, Inc.
FSR, Inc.
HM Electronics, Inc.
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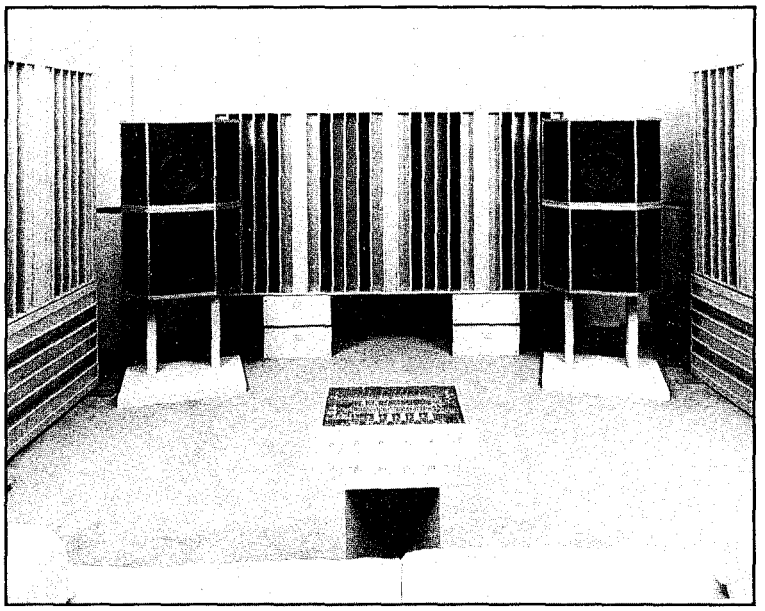
JBL Professional/UREI Electronics
J. W. Davis Company
Shure Brothers, Inc.
Switchcraft, Inc.
TOA Electronics
West Penn Wire Corp.

INDUSTRIAL
RESEARCH
PRODUCTS, INC.
A Knowles COMPANY
RESEARCH AND PRODUCT DEVELOPMENT

Dr. Diffusor, the Miracle Worker and The RPG Home Concert Hall

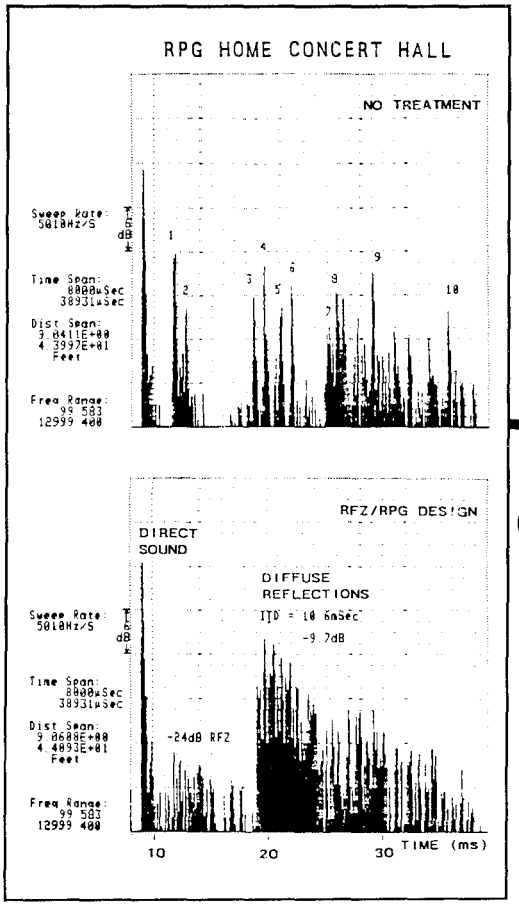


The title represents the first thought that came to me as I looked at the TEF measurement that Dr. D'Antonio sent us of a real listening room before and after treatment. Treatment means RPG Diffusors™, Abffusors®, Floor Foils ™, RPG Reflectors ™—products that Dr. D'Antonio has designed for the RPG Home Concert Hall ™.

Dr. D'Antonio has a right to call his new concept The RPG Home Concert Hall. Look at the room with treatment. Then look at the measurements in Tech Topics Vol. 12, No. 9, the Musikverienssaal in Vienna, and Tech Topic Vol. 12 No. 12 of the Troy Savings Bank Music Hall—two really great concert halls.

The RPG Home Concert Hall is the new passion for Dr. D'Antonio, what he does in his spare time, after working a full time job as a senior scientist pushing atoms around at Naval Research, personally involved in every aspect of a manufacturing facility, exhibiting at no less than 6-7 shows a year, etc. I say "etc." because that isn't all Dr. D'Antonio does during a seven-day week.

Like Heyser, whose hobby was audio, we are getting the crumbs off the table that comes from their main work. (Heyser at JPL and Dr. D'Antonio at Naval Research.) We are indeed fortunate that audio is a first love of such great men.



Before (top) and after (bottom) time response measurements on an actual home listening room, using the Techron TEF analyzer. The predominant problematic reflections are numbered. Reflections 1 and 2, for example, are due to the floor and ceiling, respectively, between speaker and listening position. Application of the RPG Home Concert Hall optimizes the listening room by establishing a reflection free zone (RFZ) 24 dB below the direct sound, with an initial time delay of about 11 ms. The sparse reflection pattern of the untreated room is transformed into an exponentially decaying diffuse sound field providing a heightened sense of envelopment.

We've Moved

For the first time in 39 years of married life and 16 years of Syn-Aud-Con, Don & Carolyn Davis have a "permanent home address" with emphasis on HOME.

Our farm in Indiana now has our home, laboratory, and office all on the same property. All the necessities of our life are here—horses, goat, dogs, cats, barns to contain them and entertain them, and room to shoot elephant rifles.

New address:
Syn-Aud-Con
R.R. 1, Box 267
Norman, IN 47264

New Business Phone:
812-995-8212

Effect Of 1/3—Degree Azimuth Error on Frequency Response

by Joe Mitchell

A playback head, when azimuth is misaligned, acts like a time domain "shorting bar" by sampling the recorded waveform continuously over a time interval "t"

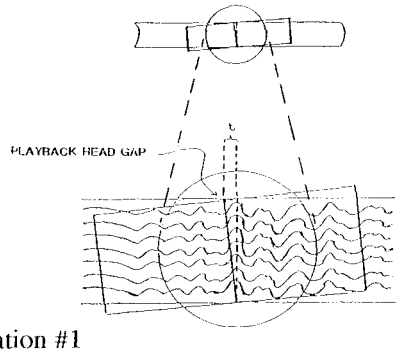


Illustration #1

The resultant frequency response is as follows:

$$A = 20\ LOG_{10}\ Sin\frac{\left(\frac{\Pi\ W\ f\ \tan O}{S}\right)}{\left(\frac{\Pi\ W\ f\ \tan O}{S}\right)}$$

Where
- A = Loss in dB
- W = Width of sound track in inches
- O = Angle of misalignment in radians
- S = Tape speed in inches/second
- *f* = Frequency of recorded signal

See "Standard Tape Manual" by Robert Morrison, (and special thanks to Dr. Eugene Patronis for his help).

See following example:

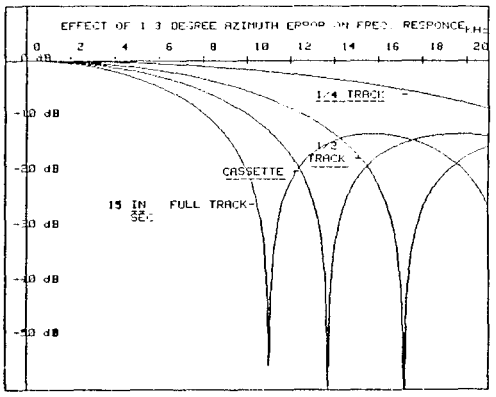


Illustration #2

SYN-AUD-CON SEMINAR AND WORKSHOP SCHEDULE

SEMINARS

Toronto, Canada
June 23-24

Syracuse, NY
June 28-29

Chicago, IL
September 22-23

Minneapolis, MN
September 27-28

St. Louis, MO
October 6-7

Anaheim, CA
November 1-2

WORKSHOPS

FARM WORKSHOPS
July 21-23
August 18-20

We will be working abroad during much of May and early September; therefore, we will only hold two workshops at the farm this summer.

Grounding & Shielding
In the West
November 17-19

Concert Sound Reinforcement
In the West
January 17-19

Price increase for seminars:

1 participant	$450
2 participants	$425 each
3 or more	$400 each

Electro-Comm Loudspeaker System by Dr. Patronis

Dr. Eugene Patronis is always full of surprises when it comes to product design. What is not a surprise from Dr. Patronis is accuracy, completeness and integrity. When we get data from Dr. Patronis, we know we are seeing the no cosmetic, warts and all, view of whatever it is he is examining.

More and more Syn-Aud-Con grads are finding that hiring Dr. Patronis to assist them in difficult jobs by redesigning available devices is a remarkable bargain.

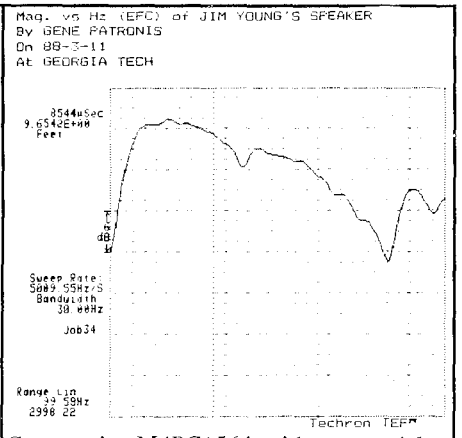
Witness Jim Young's problem. (from American Audio in Ruston, LA). Jim wanted to have a high Q, full range system for a super large church but lacked space to put it in. Dr. Patronis' solution was to use the Community M4PC1564 combination and then mount an EV HP 640 or HP 940 horn with an EV DH1A driver inside the Community horn to convert it into a coaxial unit.

Dr. Patronis gave us a copy of the TEF measurements made during the development of this system.

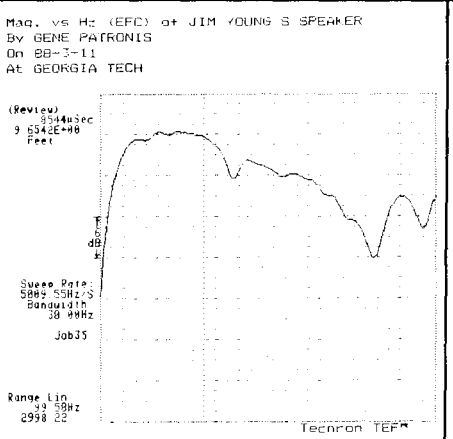
Note how Dr. Patronis determines how the Community system measures by itself, not only on-axis but at multiple points off-axis as well. Then he inserts the second unit down into the throat of the first unit and once again measures the effect on the Community system with the EV system in its throat. (EV system not connected at this point.)

Finally the measurements of the two systems operating at the same time and using the delay line and crossover network as designed and adjusted by Dr. Patronis. The measurements speak eloquently for themselves. Elegant measurements, elegant performance, elegant solution to Jim Young's problem.■

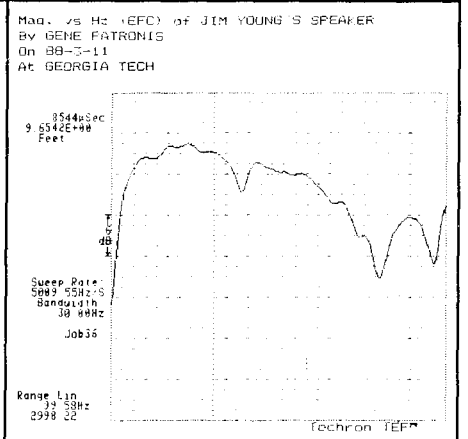
Don Davis talking with Dr.Patronis at an early Heyser TEF workshop



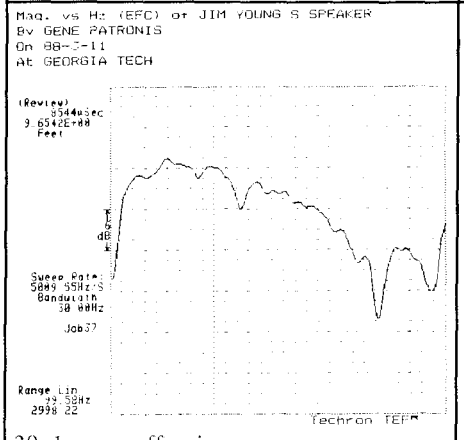
Community M4PC1564 without coaxial



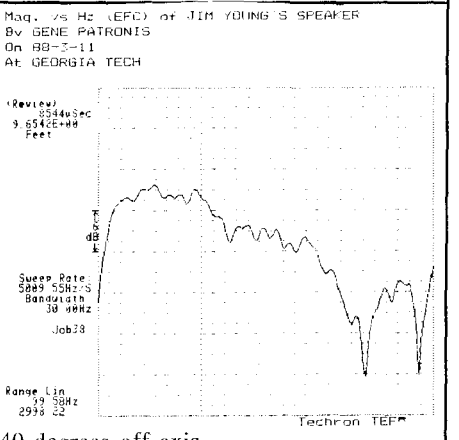
10 degrees off axis



20 degrees off axis



30 degrees off axis

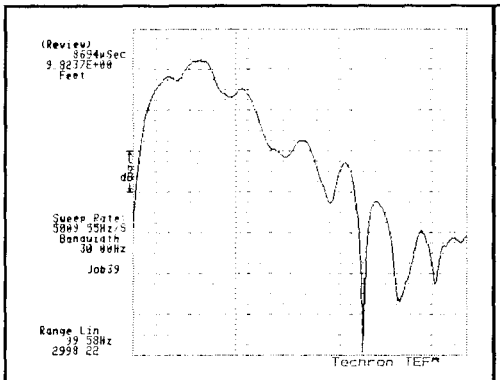


40 degrees off axis

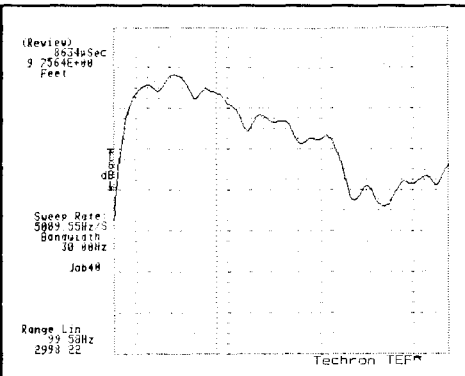
Vertical scale 6dB per division
Horizontal scale 100Hz to 3,000Hz

Frequency resolution 166Hz
Measurements made at 10 feet

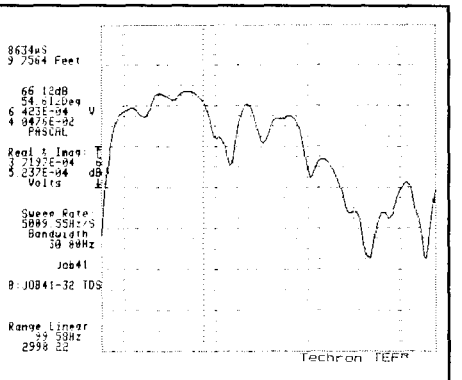
Electro-Comm Loudspeaker System



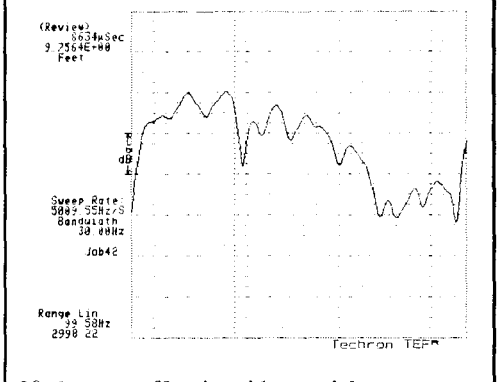
On axis with coax



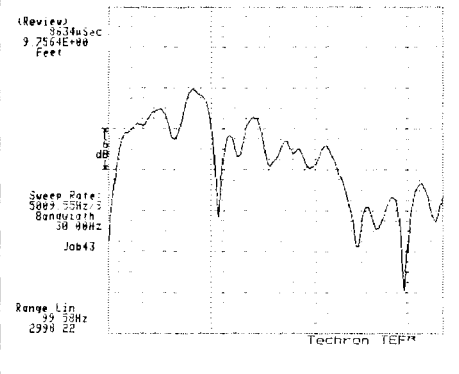
10 degrees off axis with coax



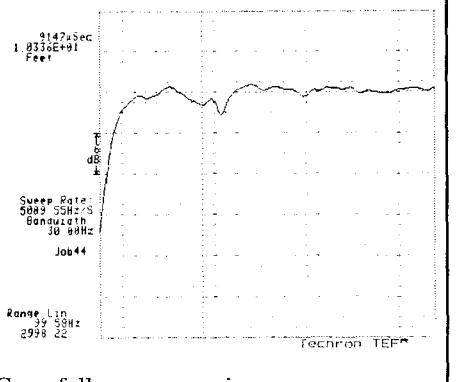
20 degrees off axis with coax



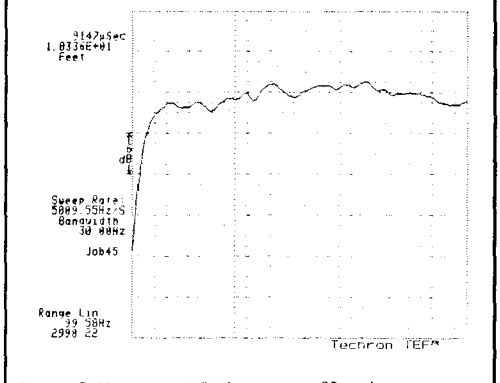
30 degrees off axis with coaxial



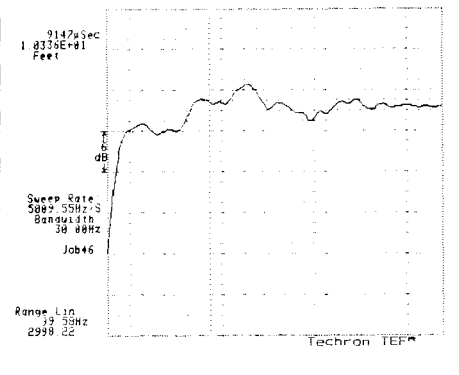
40 degrees off axis with coaxial



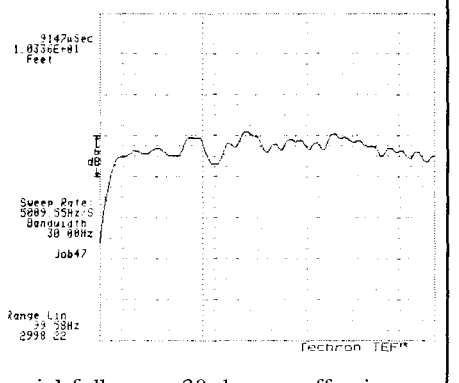
Coax full range on axis



Coax full range 10 degrees off axis



Coaxial full range 20 degrees off axis



Coaxial full range 30 degrees off axis

Advice to Would-Be Consultants

Business Week Magazine recently wrote an article: "Before You Hang Out a Consultant's Shingle".

It contained a few interesting points that we feel are accurate:

❒ Have enough money saved to last at least six months, if not a year, while you get established. Only one of every three earns a living at it full-time.

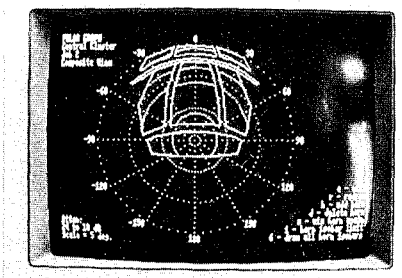
❑ Don't plan to go solo as a consultant right away, because nine out of ten who take that route fail within two years.

We have had the opportunity to watch many become consultants in the years that we have been active in audio. Most have entered the profession through the apprentice method, that is, work for an established firm. It is very difficult on any other basis. As *Business Week* points out, nine out of ten fail going solo.■

PHD 3.2 Now Being Shipped

PHD 3.2 is now being shipped. The order form is included with this mailing. If you are ordering the PHD program for the first time, make out a check for $300 or more to the Heyser Scholarship Fund ($50 or more if an update). Send the order form to Heyser Scholarship Fund, Sound & Communications, 25 Willowdale Ave., Pt. Washington, New York 11050. Sound & Communications will send your check to the AES, who is administrating the program. Be sure to specify on which computer you will run the program.

Ambassador College, for whom John Prohs works, is donating the program and all proceeds to the Heyser Scholarship Fund. Sound & Communications is advertising and distributing the program. David Andrews of Andrews Audio Consultants has volunteered to copy the programs for each order.



The PHD program is a very accurate acoustic design and mapping program. ***There is no longer any need of a separate sphere as all layout is done on the computer screen.***

Purchasing this program puts your money in the Heyser Memorial Fund in your name. Your contribution will be acknowledged by Mrs. Richard Heyser.

March 1988 marked the end of the first year AH (after Heyser). John Prohs, one of Heyser's closest friends, has chosen to offer this program as a gift to this fund.

We sincerely hope all Syn-Aud-Con grads needing a design program will take advantage of this opportunity. Many contractors tell us that the way they check new computer programs offered them is to cross check it with the PHD because of its known accuracy.■

ORLANDO CLASS

Waterpipe Ground

Ted Uzzle used to write for the Syn-Aud-Con Newsletter; we called his column, Uzzle Utterances. That was before he discovered that his wit was worthy of pay. Now he writes book reviews for various magazines that are worthy of collecting.

The January issue of *Sound & Communication* had a review of Bruce Bartlett's new book, **Introduction to Professional Recording Techniques.** Generally, Ted praised the book but he did object to Bruce's numerous suggestions of making electrical connections to water pipes (to achieve an earth ground).

Ted wrote in his review:

First, this is expressly forbidden by many local electrical codes, and the prohibition will probably be universal in a few years. Secondly, many local water utilities are routinely using sections of vinyl pipe where the water service enters a building, in order to make these shenanigans useless. Thirdly, and most importantly, utility workers can be (and sometimes are) electrocuted when repairing water pipes that also serve as part of the electrical system. Don't do it! You keep those wires off that waterpipe.

In the latter part of 1987 *PC Magazine* published two Letters to the Editor on the subject of Waterpipe Grounding. An article in PC suggested bonding to the water pipe. The next issue carried a Letter to the Editor from Mr. Colglazier expressing concern over advice they gave on grounding a LAN cable to a cold water pipe. An editor's note followed the letter explaining that this was a commonly accepted practice.

■ The incorrect use of three-conductor to two-conductor AC adapters is probably the most common cause of electrical accidents.

In the next issue the editor acknowledged his error and published a letter from Thomas Forbes which we think worthy of sharing here:

I think the people you consulted made the assumption that the cold water pipe was bonded to the main wiring system. However, Mr. Colglazier's point was that you should never ground to anything "not directly bonded to the main grounding system that is part of the power distribution wiring."

There are several common ways this could occur. One example is using a three prong to two-prong "cheater" adapter to fit a modern plug into old-style receptacles. If the short green wire from the adaptor is not properly terminated and a coax shield or other grounding point of the equipment is connected to a cold water point not bonded to the building bond point, the building circuit breaker might not operate properly.

Another example is when a piece of equipment with two-wire cord is used. If there is an internal short to ground and the equipment is grounded to an unbonded water pipe, then the equipment circuit breaker or fuse might not open. This could also place a lethal voltage on the equipment case.

I believe the incorrect use of three-conductor to two-conductor AC adapters is probably the most common cause of electrical accidents and fires.■

New TEF Owners

Arwen Producciones SA
Lerida, 9 28020
Madrid, Spain

Dennis Cockran
Carpenters Home Church
777 Carpenter's Way
Lakeland, FL 33809

Steven E. Durr
6216 Bresslyn
Nashville, TN 37205

John Farmer
2265 Shadow Lake
Virginia Beach, VA 23454

Dr. R.A. Greiner
University of Wisconsin
Dept. of Elect. & Comp.
1415 Johnson Drive
Madison, WI 53706

Jay Kingery
RCI
1310 Apple Ave.
Silver Spring, MD 20910

Omnimedia Corporation
9653 Cote De Liesse
Droval, Quebec, Canada H9P1A

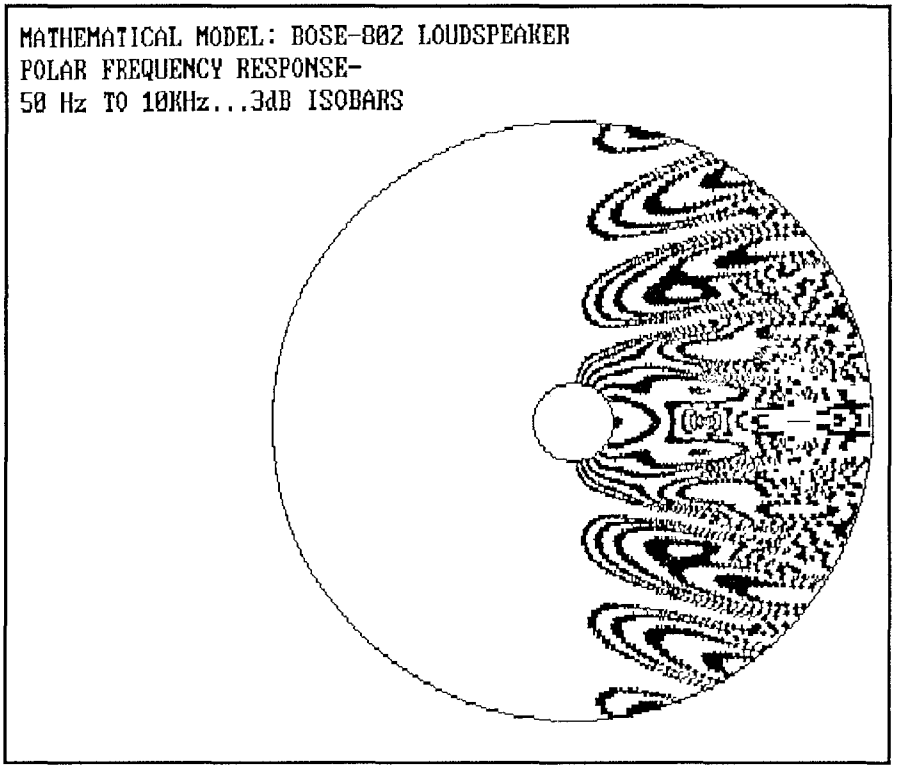
Russ O'Toole
Audio Electronics
46 Abbeywood Drive
Romeoville, IL 60441

Renkus-Heinz
17191 Armstrong Ave.
Irvine, CA 92714

A PROGRAM FOR PREDICTING ISOBARS

by

Joe Mitchell



Joe Mitchell is no stranger to these pages, thanks to a very creative capability with the computer. Recently, at our request for use in evaluating new loudspeaker designs, Joe developed a program for predicting polar responses from a physical description of the loudspeaker.

To test the program he chose a loudspeaker we already had measurement data on, the Bose 802, and plotted from a set of drawing dimensions the predicted performance.

To read this plot you need to know:

1. That the lowest frequencies are at the center and the highest frequencies are at the circumference,

2. The angle from the center to any point on the plot is the polar angle,

3. The intensity contours are in 3dB steps.

Looking from the center 50 Hz to the circumference 10 KHz along the zero degree axis (the center to the right side) you can clearly see the multipronged polar response at mid frequencies and the very wide side lobes well off axis.

We have also printed a small sample of the calculations output that is provided in addition to the graphic display. (One of 4 pages of printout.) If you should want to talk to Joe Mitchell about his programming, call 312-882-7400. He has done remarkable work. We will be printing more of his output in future issues of the Newsletter.■

DATA:BOSE 802

PS#	Xin.	Yin.	Zin.	Eleva	Windg	Q	Lsensi(4')
0	-6.93	3.47	1.81	0.0	28.8	4	80
1	-2.40	3.47	0.00	0.0	14.4	4	80
2	2.40	3.47	0.00	0.0	-14.4	4	80
3	6.93	3.47	1.81	0.0	-28.8	4	80
4	-6.93	-3.47	1.81	0.0	28.8	4	80
5	-2.40	-3.47	0.00	0.0	14.4	4	80
6	2.40	-3.47	0.00	0.0	-14.4	4	80
7	6.93	-3.47	1.81	0.0	-28.8	4	80

FREQUENCY RESPONCE ON AXIS: R = 30 ft.

```
F=   50,relang=  -1.37,ss=  0.793562,cs= -0.440277,Lr=  0.0,Lt= 79.15708 dBSPL
F=  100,relang=  -2.73,ss= -0.769449,cs= -0.479986,Lr= -0.0,Lt= 79.15104 dBSPL
F=  150,relang=  -4.10,ss= -0.046373,cs=  0.904645,Lr= -0.0,Lt= 79.14096 dBSPL
F=  200,relang=  -5.47,ss=  0.812234,cs= -0.397677,Lr= -0.0,Lt= 79.12685 dBSPL
F=  250,relang=  -6.84,ss= -0.740233,cs= -0.516247,Lr= -0.0,Lt= 79.10867 dBSPL
F=  300,relang=  -8.21,ss= -0.092095,cs=  0.895440,Lr= -0.1,Lt= 79.08643 dBSPL
F=  350,relang=  -9.58,ss=  0.825192,cs= -0.352780,Lr= -0.1,Lt= 79.06009 dBSPL
F=  400,relang= -10.95,ss= -0.706308,cs= -0.548541,Lr= -0.1,Lt= 79.02964 dBSPL
F=  450,relang= -12.32,ss= -0.136522,cs=  0.880218,Lr= -0.2,Lt= 78.99504 dBSPL
F=  500,relang= -13.69,ss=  0.832231,cs= -0.306204,Lr= -0.2,Lt= 78.95627 dBSPL
F=  550,relang= -15.06,ss= -0.668125,cs= -0.576396,Lr= -0.2,Lt= 78.91327 dBSPL
F=  600,relang= -16.44,ss= -0.179027,cs=  0.859156,Lr= -0.3,Lt= 78.86603 dBSPL
F=  650,relang= -17.81,ss=  0.833213,cs= -0.258588,Lr= -0.3,Lt= 78.81448 dBSPL
F=  700,relang= -19.19,ss= -0.626185,cs= -0.599392,Lr= -0.4,Lt= 78.75858 dBSPL
F=  750,relang= -20.57,ss= -0.219005,cs=  0.832499,Lr= -0.5,Lt= 78.69828 dBSPL
F=  800,relang= -21.96,ss=  0.828072,cs= -0.210580,Lr= -0.5,Lt= 78.63351 dBSPL
F=  850,relang= -23.34,ss= -0.581030,cs= -0.617167,Lr= -0.6,Lt= 78.56421 dBSPL
F=  900,relang= -24.73,ss= -0.255881,cs=  0.800558,Lr= -0.7,Lt= 78.49031 dBSPL
F=  950,relang= -26.12,ss=  0.816815,cs= -0.162833,Lr= -0.7,Lt= 78.41172 dBSPL
F= 1000,relang= -27.51,ss= -0.533239,cs= -0.629421,Lr= -0.8,Lt= 78.32837 dBSPL
F= 1050,relang= -28.90,ss= -0.289118,cs=  0.763704,Lr= -0.9,Lt= 78.24017 dBSPL
F= 1100,relang= -30.30,ss=  0.799517,cs= -0.115997,Lr= -1.0,Lt= 78.14702 dBSPL
F= 1150,relang= -31.70,ss= -0.483423,cs= -0.635918,Lr= -1.1,Lt= 78.04882 dBSPL
F= 1200,relang= -33.11,ss= -0.318224,cs=  0.722367,Lr= -1.2,Lt= 77.94544 dBSPL
F= 1250,relang= -34.52,ss=  0.776328,cs= -0.070707,Lr= -1.3,Lt= 77.83678 dBSPL
F= 1300,relang= -35.93,ss= -0.432213,cs= -0.636492,Lr= -1.4,Lt= 77.72271 dBSPL
F= 1350,relang= -37.35,ss= -0.342755,cs=  0.677027,Lr= -1.6,Lt= 77.60307 dBSPL
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F= 1450,relang= -40.21,ss= -0.380257,cs= -0.631046,Lr= -1.8,Lt= 77.34651 dBSPL
F= 1500,relang= -41.64,ss= -0.362323,cs=  0.628210,Lr= -1.9,Lt= 77.20925 dBSPL
F= 1550,relang= -43.08,ss=  0.713210,cs=  0.012792,Lr= -2.1,Lt= 77.06575 dBSPL
F= 1600,relang= -44.53,ss= -0.328207,cs= -0.619554,Lr= -2.2,Lt= 76.91582 dBSPL
F= 1650,relang= -45.99,ss= -0.376599,cs=  0.576483,Lr= -2.4,Lt= 76.75924 dBSPL
F= 1700,relang= -47.45,ss=  0.673912,cs=  0.049857,Lr= -2.6,Lt= 76.59577 dBSPL
F= 1750,relang= -48.93,ss= -0.276717,cs= -0.602063,Lr= -2.7,Lt= 76.42516 dBSPL
F= 1800,relang= -50.41,ss= -0.385318,cs=  0.522444,Lr= -2.9,Lt= 76.24713 dBSPL
F= 1850,relang= -51.91,ss=  0.629975,cs=  0.083100,Lr= -3.1,Lt= 76.06139 dBSPL
F= 1900,relang= -53.41,ss= -0.226433,cs= -0.578691,Lr= -3.3,Lt= 75.86761 dBSPL
F= 1950,relang= -54.93,ss= -0.388284,cs=  0.466719,Lr= -3.5,Lt= 75.66545 dBSPL
F= 2000,relang= -56.46,ss=  0.581860,cs=  0.112052,Lr= -3.7,Lt= 75.45452 dBSPL
F= 2050,relang= -58.00,ss= -0.177982,cs= -0.549625,Lr= -3.9,Lt= 75.23440 dBSPL
F= 2100,relang= -59.56,ss= -0.385367,cs=  0.409950,Lr= -4.2,Lt= 75.00466 dBSPL
F= 2150,relang= -61.14,ss=  0.530075,cs=  0.136299,Lr= -4.4,Lt= 74.76479 dBSPL
F= 2200,relang= -62.74,ss= -0.131968,cs= -0.515120,Lr= -4.6,Lt= 74.51425 dBSPL
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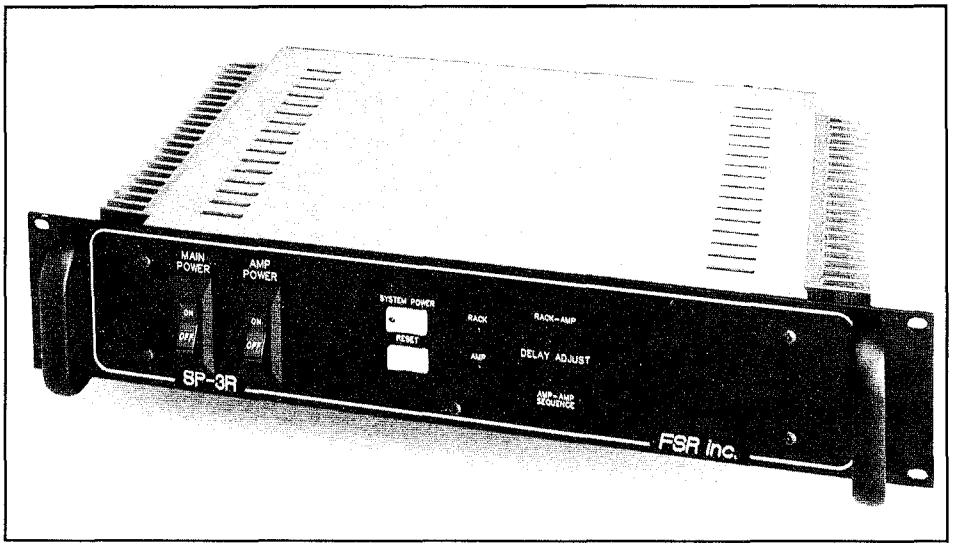
Solid State Switcher from FSR



It has been our observation that leading sound contractors are sufficiently innovative and that they often have to design and build their own equipment for the control of components within a system. We hear this especially among the contractors who design and build teleconferencing and audio visual systems. In discussing FSR with some of these contractors one shortcoming they felt FSR had was the inability to provide solid state switching. Imagine our pleasure to receive new literature from FSR announcing that they had an elegant solution to the problem. The SP-3R features a rack power and amplifier sequencing on system turn-on and turn-off; a 24 VDC 2.5 amp, fully regulated power supply; the 24 VDC and ground are available switched or unswitched, on 5-way binding posts.The SP-3R saves the contractor and the electricians time and money because it's fully wired—just plug in your AC lines and it's ready to operate.

FSR got a toe hold in this industry by listening and being very responsive to the needs of the contractor. They are still listening.■

ANAHEIM CLASS

Pulse Generator Used For Microsecond Signal Alignment

by

Herbert Chaudiere

Editor's Note

Several respected sources have enthusiastically endorsed the practicality of a pulse generator designed by Herb Chaudiere of Towne, Richards, and Chaudiere in Seattle. Steve Olszewski of Dimensional Sound Communications in Mount Vernon, WA and Richard (Jim) Fullmer of Acoustical Engineers, Inc. in Salt Lake City have both shared with us their successful experience with this generator. Steve reminded us of the article written by Tom Lubin and Don Pearson back in 1978 wherein by using a pulse generator they noted "*other effects the authors have observed are that as you make the original sound more coherent (read synchronized), the reverberation will become less apparent.*" They unfortunately failed to realize, at that time, that the delay paths actually were changing the polar response but they certainly accurately described the end result. They had cautioned elsewhere in this same article that:

It should be noted that the speakers should not be tipped or tilted as this movement will alter the polar response. Also too much movement could put a reflective surface in the path.

Jim Fullmer writes:

You should get Herb Chaudiere to tell you about his pulse generator/ delayed sweep trigger device. We have built one, and have found it a simple and every effective tool in setting up delayed arrays, and quite revealing as to cluster alignment.

We are including Herb's schematic and a parts list for those of you interested in an inexpensive (about $20) way to set signal delays and look at crossover areas.

Jim Fullmer summed it up best.

I have gained (from using Herb's pulse generator) an appreciation for the highly directional character of most of the crossover and alignment phenomenon. As many respected gurus have always said, the best speaker is the simplest one, located all at one point in space.

What more can we say? The following is from Herbert Chaudiere:

Here is the diagram of the pulse generator which we have used for setting signal delays, particularly when used for device alignment.

The pulse rate (interval between pulses) can be varied from about 80 msec to 5-1/2 seconds. The trigger delay is adjustable from 1.2 msec to 125 msec (a little over a foot, out to well over 100 feet).

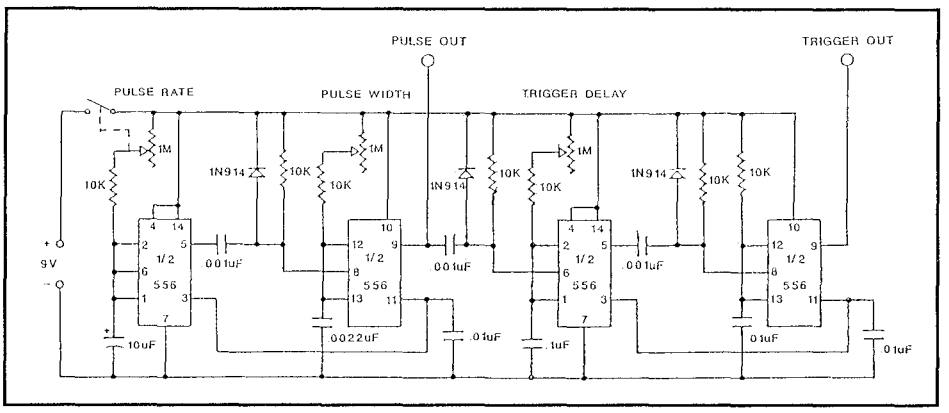
Obviously this device is used with a calibrated time base scope having an external trigger input. A sound level meter is used as the survey mic and preamp to drive the scope vertical input. Running the pulse directly into an RTA will give you an idea of the pulse spectrum for various pulse width settings.

In use you start with a fairly wide time window on the scope so you can see the primary and secondary pulses. Then as you adjust the signal delay or alignment to bring the pulses together, you reduce the scope time base to get better resolution. It works great, and since it works in real time, it's fast. It can also be used to check polarity in a system.

The parts are available at Radio Shack and cost less than $20.00, battery included.

Radio Shack Parts Numbers

1-270-222	box	2.19
2-276-1999	14 pin sockets	.89
3-276-1122	IN914	.30
2-276-1728	556	2.98
2-274-346	RCA jacks	.90
3-274-403	Knobs	1.19
3-271-211	IM pots	3.27
1-271-1740	Switch	.69
7-271-1335	10K 1/4w	.55
3-272-126	.001 disc	.74
2-272-131	.01 disc	.49
1-272-1436	10 uf tant	.69
1-272-135	.1 disc	.25
2-272-126	.001 disc (or one .0022)	.49
1-270-325	battery snap	.20
1-23-553	9v battery	1.99



A Lot is Happening at University Sound

Doug Wilkens is, in his capacity as Marketing Manager, Commercial Products for Electro-Voice, creating a new standard of excellence for such products. Under the name new University Sound, Doug is producing data sheets on his products that amount to basic classroom introductions to all products of that type. The University Sound "Commercial Sound and Public Address Installation Guide" is an excellent primer for those who want something more basic than Sound System Engineering on selected subjects.

University Sound has a publication called "Contact" and we have found its initial issues to be well written and containing useful fundamental instruction in basic audio matters such as "Why use balanced circuits?"

Perhaps the most interesting insight I can provide on the integrity of this flood of new detailed data is to relate an experience we had recently at a special class for RC Communications. We were demonstrating the use of the TEF analyzer in evaluating loudspeakers and having spotted a cobraflex reentrant horn in their inventory, I said, "Let's look at a device that has problems." Lo and behold we were hard pressed to find any significant problems to discuss. Frankly, we were surprised to see the quality of the polar response over as wide a range as this unit is specified for. The 500 to 5000 Hz Q figure makes it a most useful voice range device. I had always lumped all reentrant devices together in my mind. This was the exception to the general case.

Doug's new specification sheets showing this consistency became totally acceptable after having just experienced it in the field. It is truly a remarkable accomplishment to find data sheets for products of this type that are accurate and can be used for predictive design. This kind of experience makes the audio business fun.

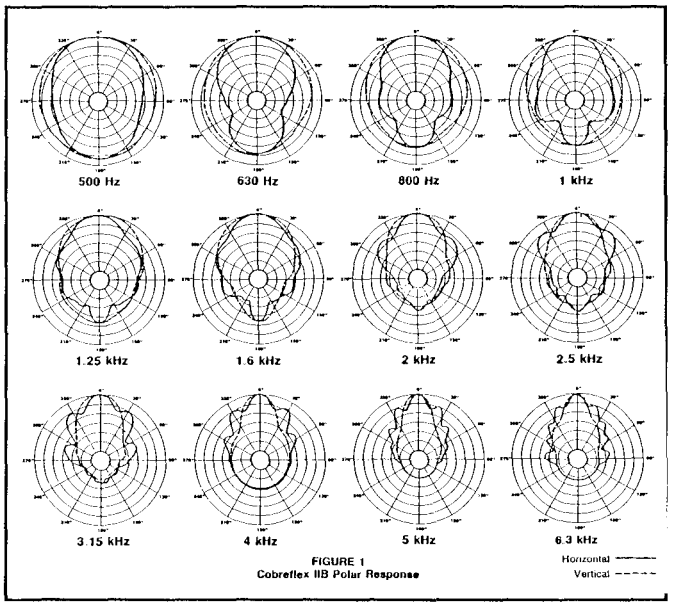


FIGURE 1
Cobreflex IIB Polar Response

With the intelligence, integrity and drive that Doug is bringing to the University line, it has a very promising future for the alert contractor.■

Is There a Stereo Console in Your Sound System?

A recent experience we had out on a checkout of a large church system might be something more commonly encountered with today's consoles than is realized.

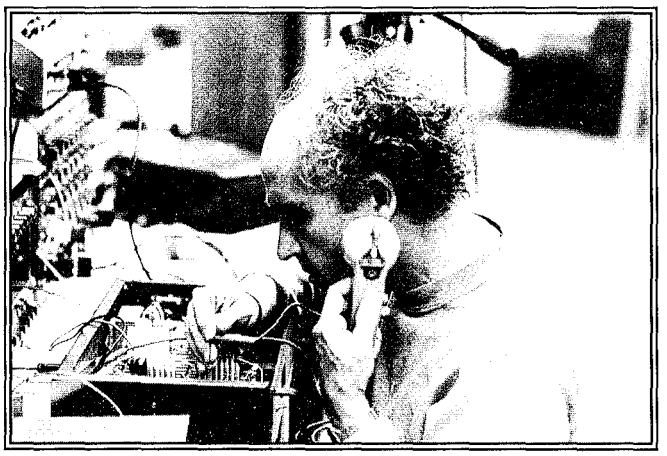
It is our habit to measure the open circuit voltage and the source impedance at the output of a mixer or console in order to insure that the levels indicated are the levels achieved. In this case the console was a large Japanese model and we measured a source impedance of 75 ohms.

Whenever we do work of this type, we always ask for a representative from the installing contractor to be on hand and in this case he was a Syn-Aud-Con grad and a superb engineer. He immediately pointed out to me that the console being measured should read 150 ohms. Upon further inspection—you guessed it!—It was a stereo console with the two channels paralleled by simply tying them together.

Naturally the correction of this problem was immediately audible as much lower distortion and better level. We then proceeded to check out the remainder of the system.

Be alert to stereo input equipment being used to drive mono reinforcement channels.■

One Smart Fellow Using the J W Davis TS-1 Test Set and His Brains



Don Heavener of Miami was a member of our staff for the Orlando, Florida class. Good thing too! Our Sunn prototype 10 usec/step signal delay broke down. Here you see Don successfully signal tracing an unknown digital device sans wiring diagram with only a signal source and J W Davis handset. He successfully isolated the faulty component. He then proceeded to jump around it so we could go on with our demo.

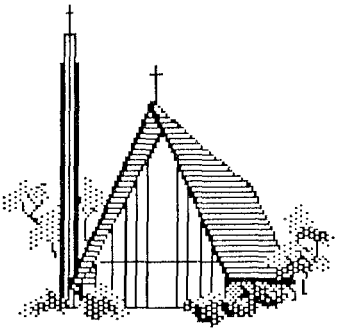
The problem was the antialiasing filter and it was interesting to note that going around it caused approximately a 40 usec change in calibration, which obviously had been accounted for in the controls. So much for instantaneous anything in audio. When you hear the word instantaneous, you know you're dealing with a TEFless person.

Test set TS-1 contains a single transducer that allows a listener to hear signals as low as a phono cartridge to as high as 500 volt filter capacitor and everything in between. It can also be used as a microphone. Don Heavener used his as a most effective signal tracer on our precision digital delay.

Don also brought into the class several new approaches to boundaries used with small microphones.

Don Heavener was the first to build and demonstrate small table top pressure zone loudspeakers. All current applications of such technology are direct adaptations of his design. Don regards such "borrowings" with "its better to be stolen from than to have to steal." We always feel privileged to be adopted by such talented individuals.■

Resources



Someone sent us a copy of *Resources* magazine. We had heard of the magazine but hadn't actually seen a complete issue before (Doug Jones had sent us three articles that he wrote which we quoted in an earlier Newsletter.)

The magazine is referred to as "The twice yearly church products and services guide for pastors." This issue was divided into five sections, one being Sound and Lighting Systems. We recognized several friends among the authors: Ralph Lockhart, President of BIAMP wrote, "Selecting a Sound System for Your Church"; David Marsh from PMI wrote, "Building Good Acoustics into Your Church"; Jim McCandliss of Sound Investments wrote two articles: "Improving Productions with Wireless Mikes", and "Operator Training: The Missing Link to Great Sound". They are all good articles. If the church pastor reads these articles, the church will have better sound systems.

If you would like to have a copy of the magazine, write Resources, SMS Publications, 701 Main St., Evanston, IL 60202. PH 312-328-3386.■

All Equalizers Are Not Created Equal

by
Don Washburn
of
The Audio Bug
in Miami

Editor's Note

Don Washburn has flooded us with a wave of first class workmanship. The one that fascinated us the most was the carefully detailed analysis of three filter sets being used in the marketplace at the present time.

We're going to let the measurements speak for themselves with the single comment that we finally see why some people get so upset about being asked if they have combining filter sections. Remember Heyser's comment that ripples in one domain result in smearing in the other domain.

Equalizers

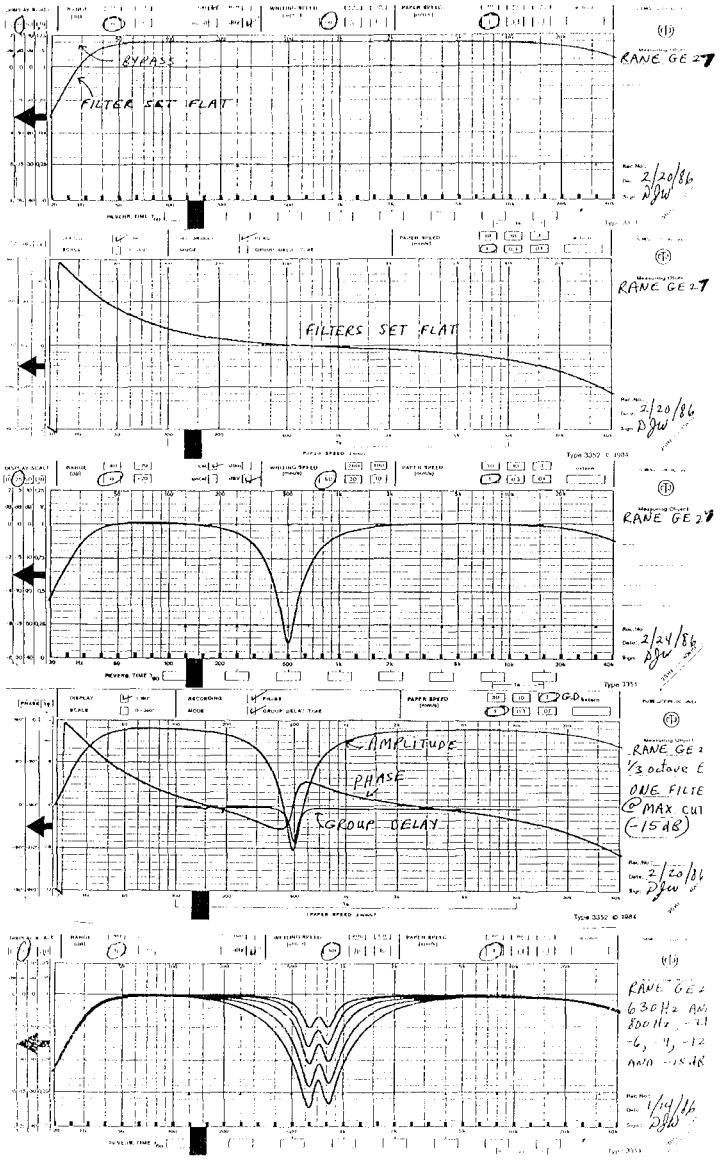
No other single electronic device has received so much attention. New product developments and claims of various manufacturers abound. Some devices are worthy professional products and others fall far short of usable performance.

We've conducted tests on a number of 1/3-octave equalizers and have included the results of some of these tests.

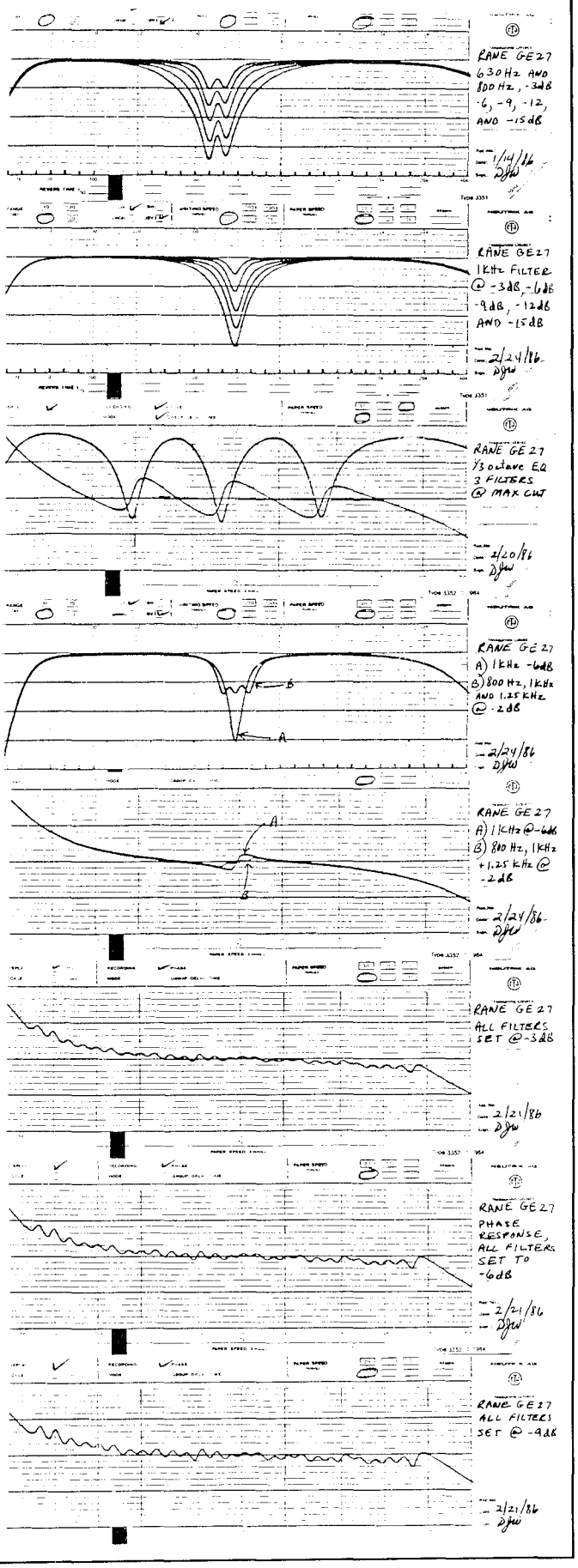
All units were tested under similar conditions. The White 4001 was terminated with 600 ohms but otherwise the tests were identical. The Rane GE-27 was examined with somewhat greater detail than the other two units in an effort to determine its characteristics. As can be surmised, it would not be our best choice as a room equalizer. The Grommes G4EA exhibits many of those characteristics noted as desirable in **Sound System Engineering.** We have used a number of the units and have been well pleased with their performance.

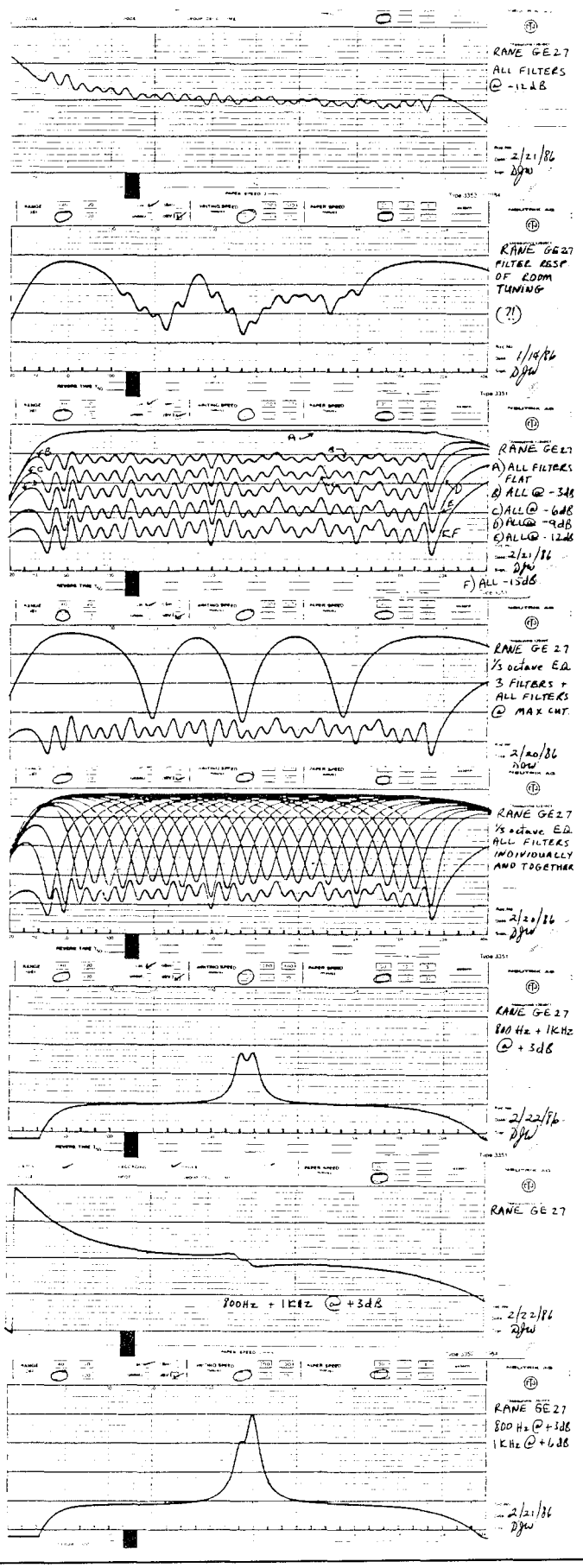
We hope that this insight will help demonstrate the different approaches to equalizer designs and performance.■

Rane GE 27 Equalizer

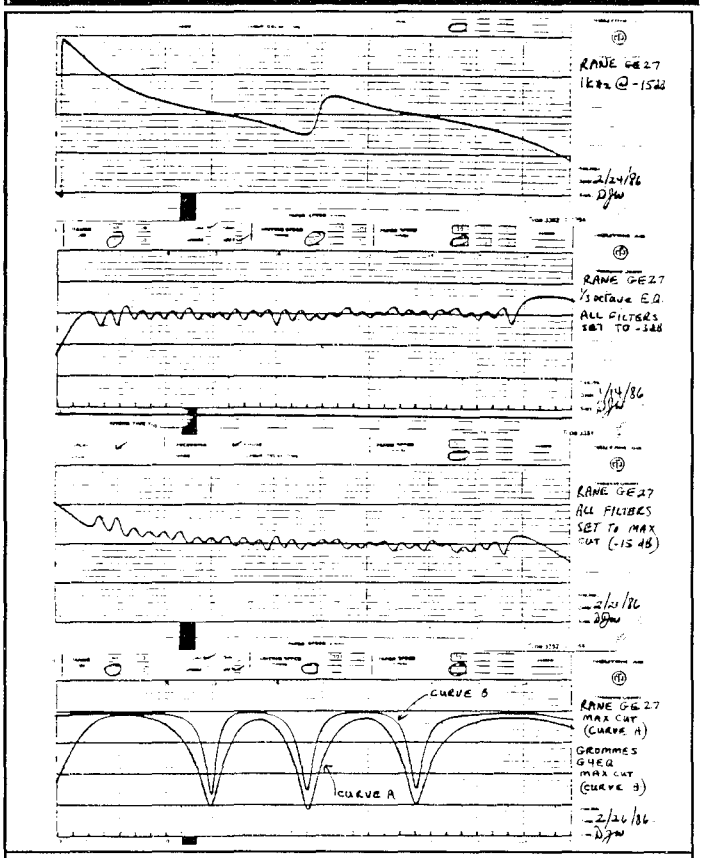


All Equalizers Are Not Created Equal

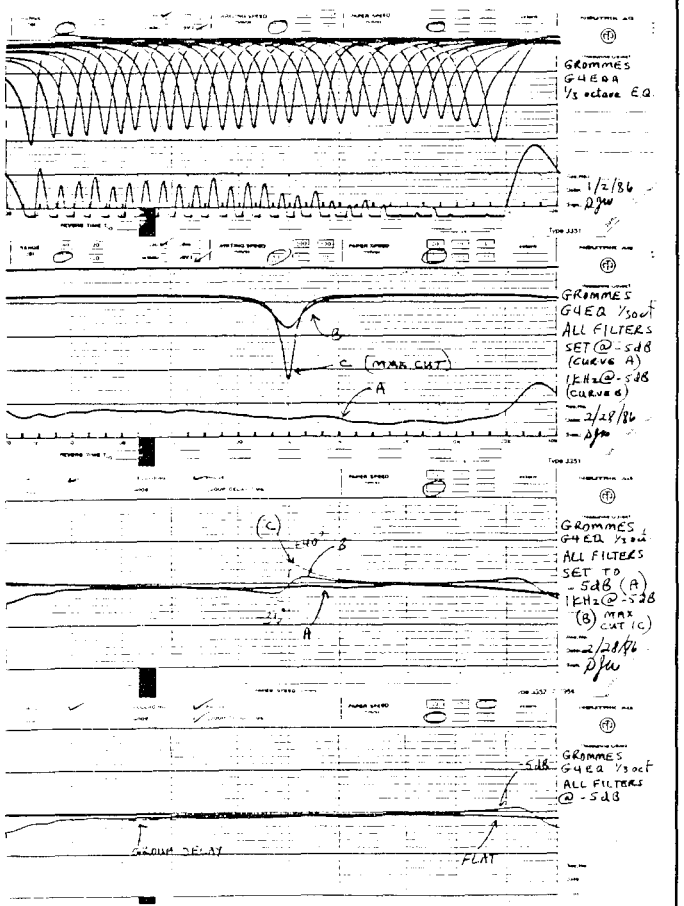


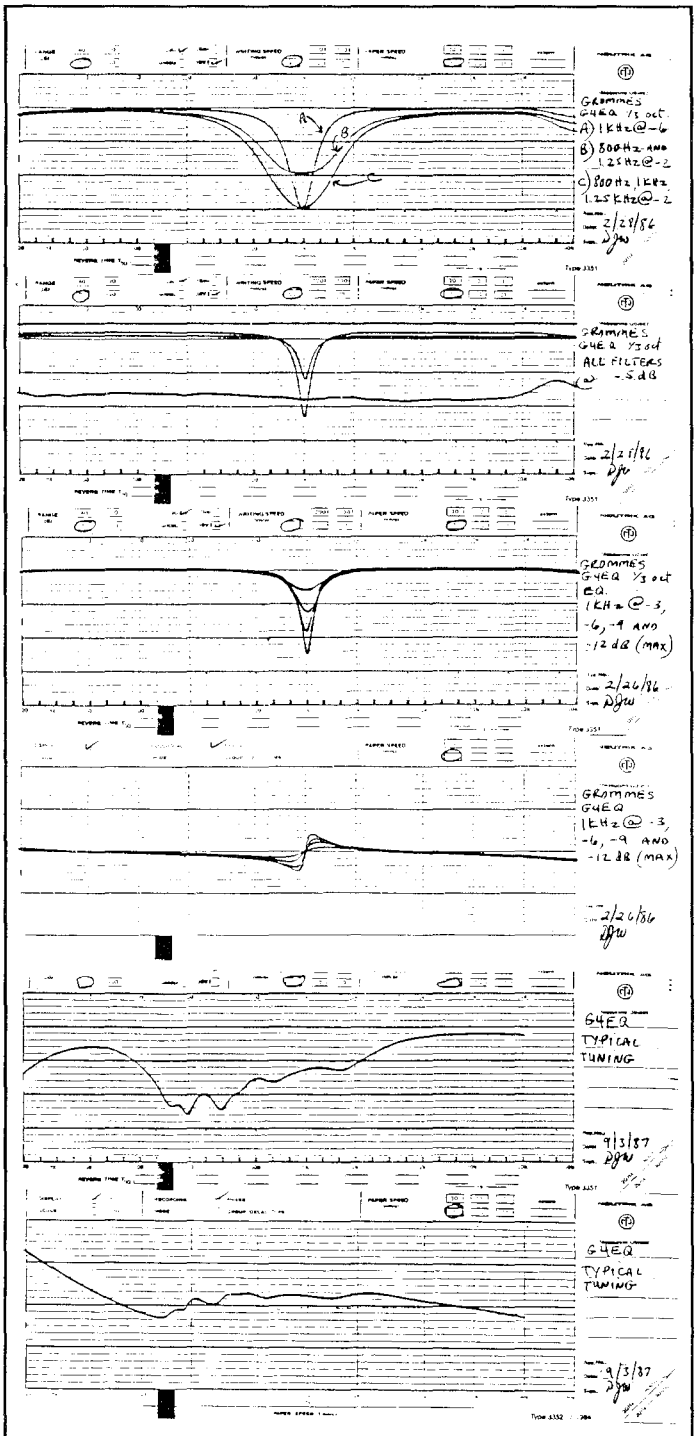


All Equalizers Are Not Created Equal

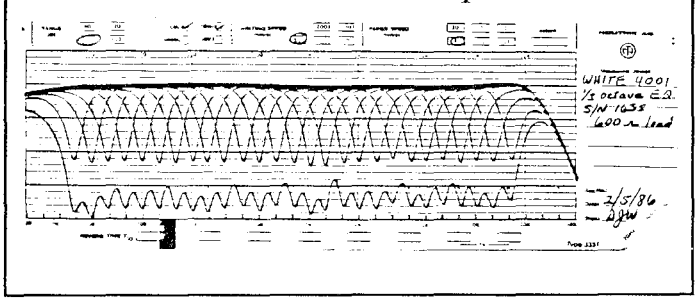


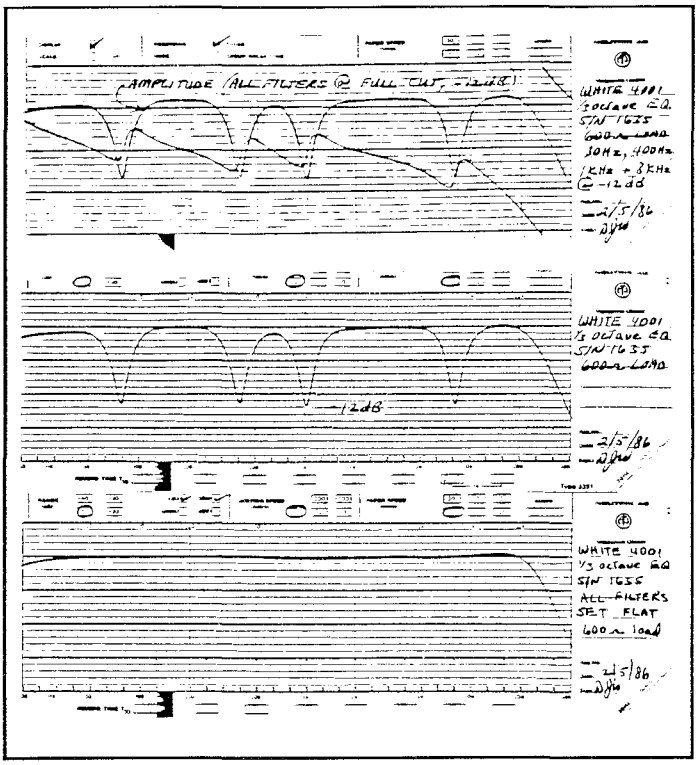
Grommes G4 EQ 1/3-Octaive Equalizer

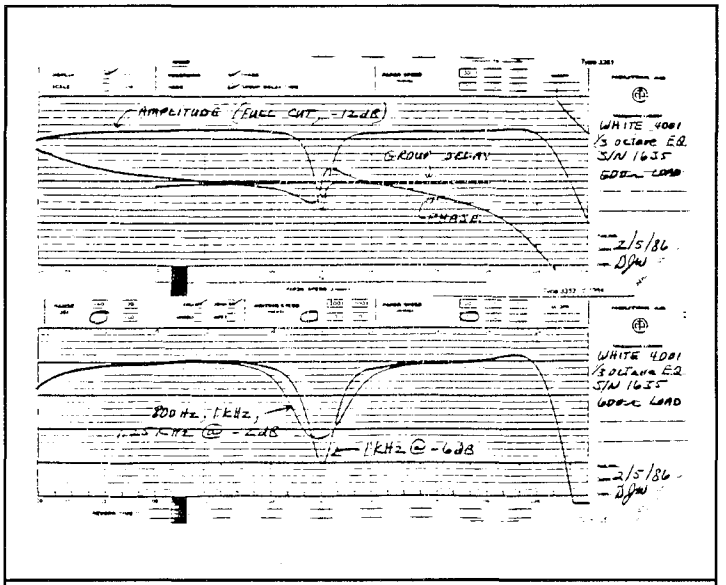




White 4001 1/3-Octave Equalizer







This is a valuable study of 1/3-octave equalizers. Don Washburn has performed a valuable service to everyone interested in equalization

"The Ancients are Stealing Our Inventions"

Polar ETCs were used in World War II

In the February IEEE Spectrum under their "Forum" page we came across a letter from Sidney Bertram of San Luis Obispo, California and formerly a member of the UCDWR (Univ. of California, Division of War Research).

Mr. Bertram had been a member of the team that developed QLA sonar which allowed nine submarines to penetrate the Sea of Japan by underrunning the mine fields through the use of this sonar. They could see and hear mines as blobs of light on an oscilloscope and a "bell like" tone on a loudspeaker.

The technique used was basically a polar ETC display (though resolution was limited to 20 filter bands). To quote Mr. Bertram:

The equipment designated 'QLA Sonar' output a signal whose frequency varied linearly with time, so the difference frequency between the transmitted and received signals was proportional to the distance to reflecting objects. The CRT sweep followed the pointing angle of the receiving hydrophone so the blobs produced a map like display.

Mr. Bertram states that he designed the filters and the electronic switch used for the scanning and the plan position indicator circuitry for the display.

They could see and hear mines as blobs of light on an oscilloscope and a "bell like" tone on a loudspeaker

It would seem, from this evidence, that we are 45 years behind the sonar, and probably the radar uses, of such technology. Dick Heyser and Farrel Becker's contributions to polar ETC's is not diminished by this knowledge, but it merely reemphasized the importance and usefulness of the polar ETC.

One final note. Mr. Bertram states that QLA sonar was called "Hell's Bell's" by its operators. The nine submarines that made it into the Sea of Japan were called "Hellcats."■

A Current Statement on Intelligibility Predictions and Measurements

In spite of all you read from various misinformed sources there is no IEC RASTI standard. There is a proposed standard that is poorly conceived and that we hope does not become a standard.

The best prediction technique is either of the Peutz methods for %ALcons. These techniques are remarkably accurate if accurate input data is provided. Therein lies the rub with any prediction—too few people know how to gather or calculate accurate data.

The most accurate "measurement" technique is the TEF %ALcons. It has the further benefit of not only accuracy but reveals the causes of the problem as well.

RASTI is now an obsolete concept inasmuch as the TEF analyzer does the entire STI in 1-1/2 minutes using the more accurate ETC measurement and the Schroeder MTF equation compared to impulse measurements and the B&K technique. The TEF STI also has the Dr. Humes' corrected frequency weighting.

Both ourselves and Don Keele will be presenting papers on this subject later in the year. It is, at long last, able to be logically documented and mathematically supported.■

New Benchmark Microphone Preamp

With Benchmark's preamplifiers and the new transformerless microphones, ranges in excess of 120 dB are now possible.

Benchmark Media Systems, Inc. has a microphone preamplifier system model MIA—4x4 that offers a noise figure of 1dB. (The noise figure is the difference in dB between theoretical perfection and actual measurement.)

Benchmark's data sheet states, "A microphone and its associated preamplifier set the dynamic range limit for most systems. With Benchmark's preamplifiers and the new transformerless microphones, ranges in excess of 120 dB are now possible."

The input impedance depends upon the use of the nominal 20 dB pad, being 4.0K ohm in parallel with 25pF with the pad in circuit. If phantom powering is not required, the removal of these components increases the input impedance to 20K ohm.

Anyone doing state-of-the art broadcasting or recording absolutely requires one of these units.■

A Publication Of Worth

J.W. Davis & Company have just issued a new catalog and reference manual No. 388 which celebrates 55 years of service.

J.W. Davis & Company is the source for many of the items you see in Syn-Aud-Con classes such as:

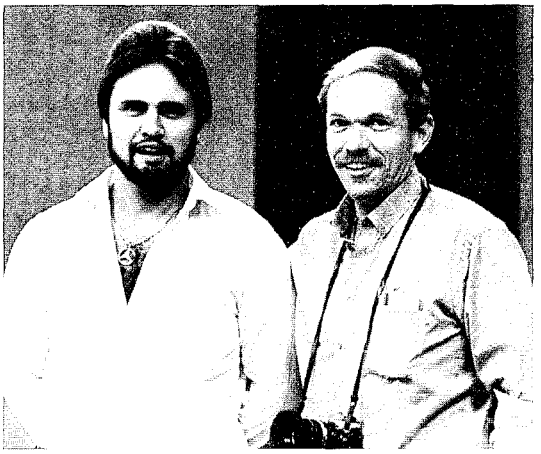
1. SBA systems
2. Pataxial loudspeaker systems
3. Bessel array loudspeakers
4. TS-1 test sets
5. SG-1 signal generator (to be used in conjunction with the TS-1 test set)

This catalog contains ten helpful Technical Notes of practical use to the installer of sound equipment, as well as the most useful equations frequently wanted.■

"Great Peace Have They That Love the Lord"

On our West Coast trip this winter we stopped by the new 45,000 square feet HME factory in the San Diego area. There simply are no superlatives to describe the setting high on a mesa; the building is super modern and efficient; the morale in a company growing this fast just can't be higher. There is no thrill like being part of a winning team. We know the hard work that made it possible. It is a joy to see the rewards.■

The Audio Bug is also a Mercedes Bug



Guess who is the Mercedes owner. That's Joe Dervali on the left and our good friend who has contributed so much to this Newsletter, Don Washburn, from The Audio Bug in Miami on the right during a break in the Orlando class.

We had the privilege of meeting Don's father who had been a Western Electric sound man back in the theatre days and later a USIA sound man in Asia and elsewhere. A thoroughly fascinating man with a zest for living adventurously.■

R C COMMUNICATIONS CLASS

70V LINE MATCHING TRANSFORMERS by Don Washburn of the Audio Bug in Miami

70V Line Matching Transformers

As has been pointed out in **Sound System Engineering** and many Syn-Aud-Con Tech Topics, 70V line transformers can present particularly difficult loads to power amplifiers. Just how severe this problem can be varies from transformer to transformer.

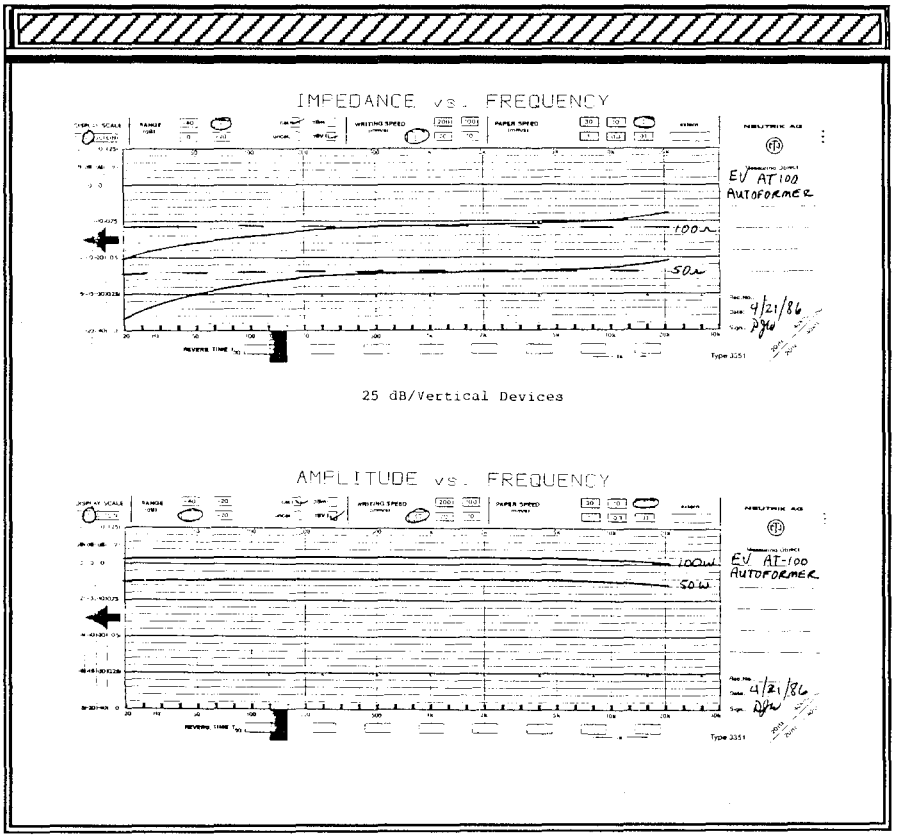
We have tested a representative sample of transformers and herein include both amplitude vs frequency and impedance vs frequency curves of these samples. In all cases, the transformer's secondary tap was terminated with a non-inductive 8 ohm load. The resulting curves indicate variations in primary tap impedance and frequency response.

Of greatest interest to the designer and installer of 70V systems is the impedance curve of the transformers. One can readily calculate the variations from specified primary impedance and measured impedance:

$$Z = Z_{REF.} \times 10^{\frac{+/-\Delta dB}{20}}$$

It's not uncommon to find that the typical low-cost transformer will draw two to four times the rated power of the primary winding. Unfortunately, this can occur at frequencies at which the speaker's output is deficient. The natural tendency on the part of the operator is to boost the amplifier's response at those frequencies; further exacerbating the situation. Many an amplifier has fallen victim to being overloaded by a "properly matched" load. We've all seen the literature from manufacturers and other sources advising "ten 10 watt speakers matched to a 100 watt amplifier." Our poor amplifier has no other choice than to self-destruct!

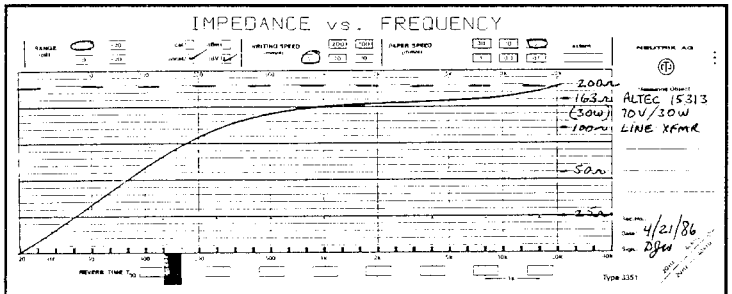
The solution is to carefully measure the total speaker line impedance and ascertain that it doesn't exceed the amplifier's minimum rated load impedance. The results can be astounding.

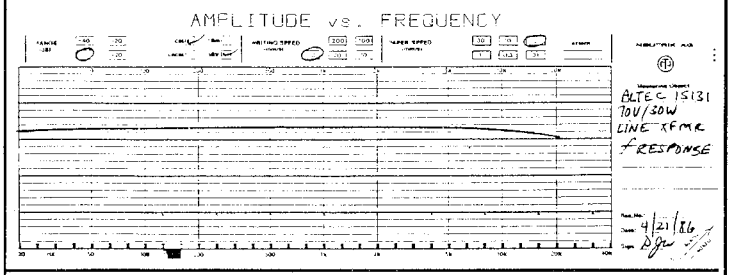


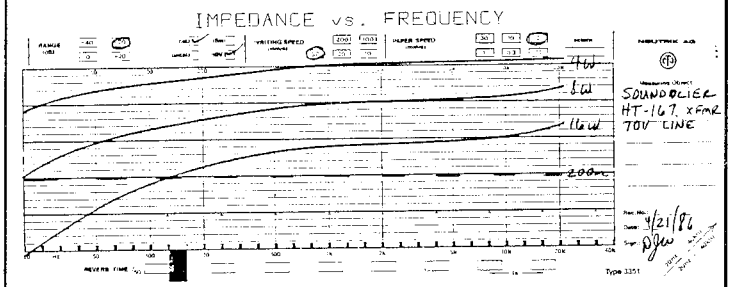
Editors Note

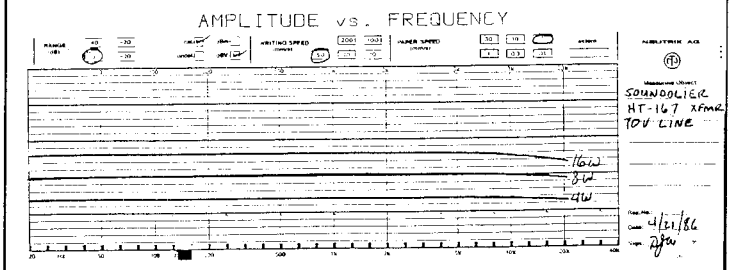
Don Washburn's measurement of 70V line matching transformers is very important. He documents a series of devices widely used by many of you. Failure to check what's really happening on your amplifier's output can lead to problems that range from instant burnout to 25 year life expectancy reduced to 25 days.

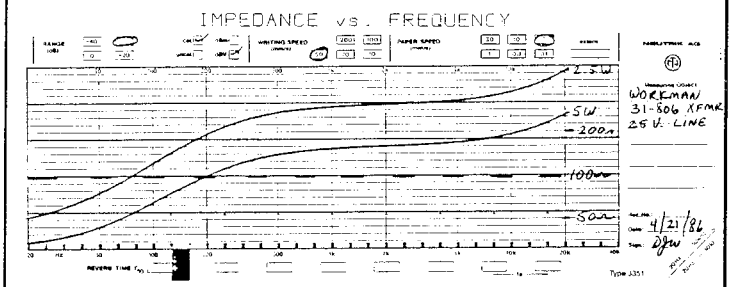
70V Line Matching Transformers

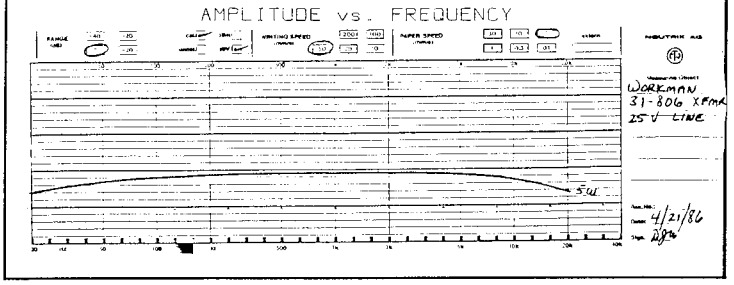


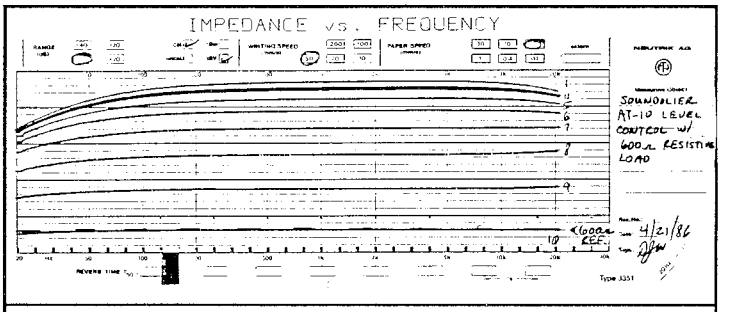


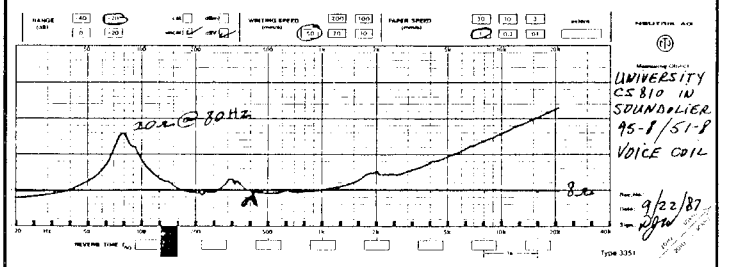


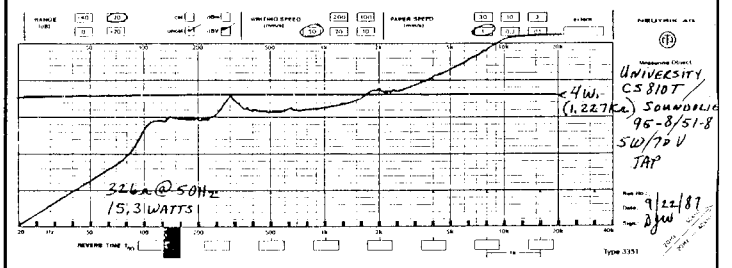


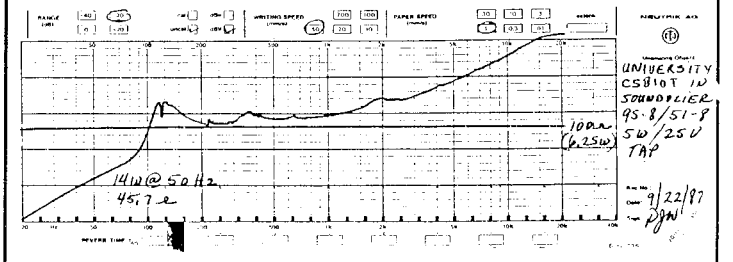


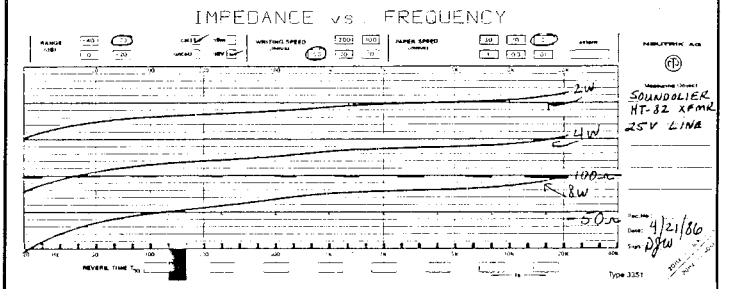


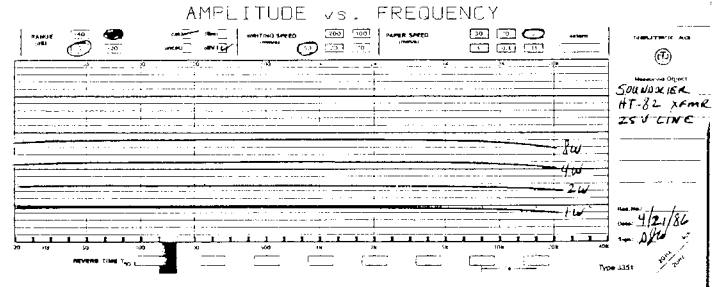




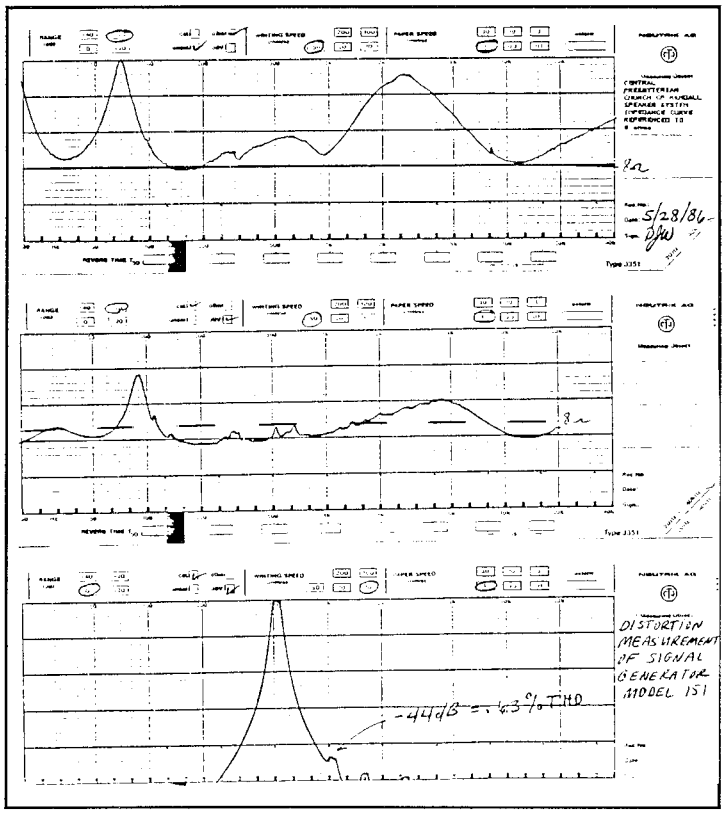


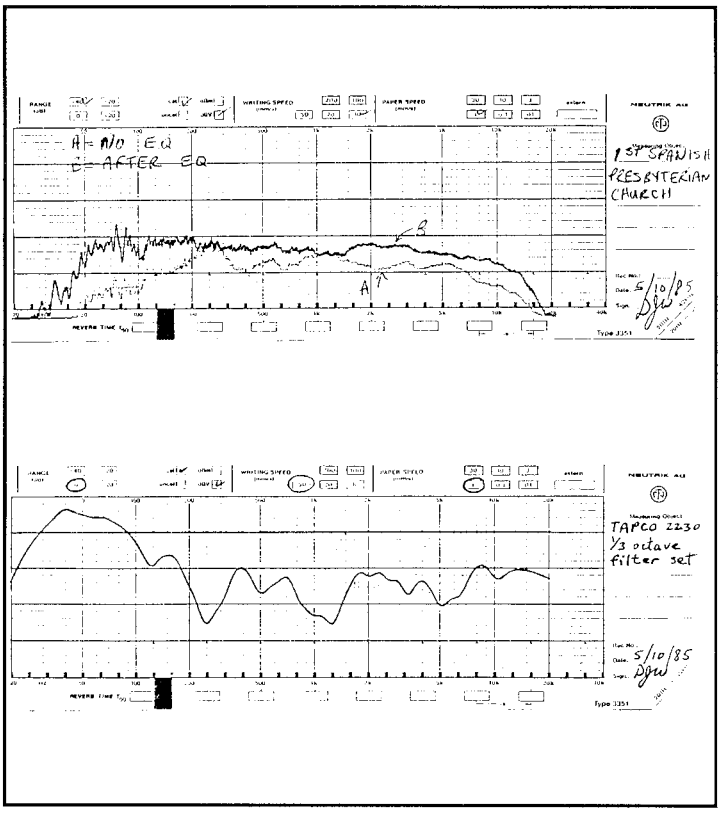






70V Line Matching Transformers



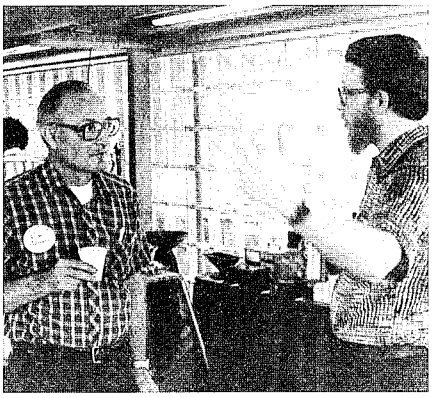


SEATTLE CLASS

On Housing Speaker Component

John Alexander of Anchorage has attended several Syn-Aud-Con seminars and workshops during the past 10 years. He was with us in Seattle in February. When we were showing a measurement of a severe feedback problem in the 125 Hz region because the bass cabinets, mounted above the minister's microphone, were leaking 125 Hz into the microphone. I heard John, who was in the front row, say, "That is incredible."

At coffee break I had a chance to



talk to John and he explained that when he was in our 1982 Loudspeaker Array Workshop at Rancho Carrillo he had talked with Workshop chairman, Dr. Patronis, and told him that he was housing all the speaker components in an array and was getting dramatic improvement over a "naked" array. He told me in Seattle that what was "incredible" to him was seeing a visual proof in the measurement of what his ears had been telling him.

We got out a copy of the Tech Topic about the 1982 Workshop and sure enough, there was John talking to Dr. Patronis. I'm sure he was telling him about the importance of housing speaker array components.■

Farrel Becker Has Moved

Farrel Becker has spent the past 3 months supervising the building of a new house for his wife, Gina, and their baby, Elizabeth, now a year old. So his TEF analyzer has been packed up. This accounts for our lack of new material for this issue of the Newsletter from Farrel Becker. He called recently to say that he was unpacked in their new house and ready to go back to TEFing. The new address is 7915 Warfield Rd., Gaithersburg, MD 20879. Phone 301-977-5633■

ELECTRET THROAT MICROPHONE

David Clark Company, Inc. has a headset model H3140 that can be had with an Electret Throat Microphone. They recently sent us a data sheet listing a couple of typical applications. They also offer some very useful literature on their Series 3100 and 3400 communication systems.

It is our belief that David Clark makes the best hearing protectors available today and their communication system headsets benefit from this technology. Literature can be obtained by writing:

David Clark Company Inc.
360 Franklin Street
Box 155
Worcester, MA 01613-0155
617-756-6216

Shure Literature

An explosion of Shure literature hit our desk this spring. Their Broadcast Applications Brochure AL693C is a must for sound contractors wanting professional performance in small reliable packages.

For any of you in Cellular telephone selling, their 800 HF clearvoice system is a true "Why didn't I think of that?"

Shure's new "Land Mobile" catalog AL901 has to be the "end all" of hand held microphones.

Finally, Shure has issued Vol. 1 (AL936) of the Shure AMS update which is a compilation of the first ten issues of their AMS update newsletters.

We are impressed with the evidence of a massive engineering effort on the part of Shure, that spans all their product lines, to insure their continued leadership in their carefully chosen market areas. Make no mistake. Where Shure chooses to compete, they are tough competition.■

David Klepper Receives AES Silver Medal

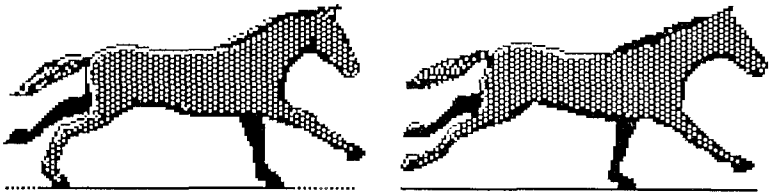
Syn-Aud-Con has a very high regard for Dave Klepper and we joined the rejoicing over his being awarded the AES silver medal. Dave is gold medal material to us. When I think of organizations such as the AES in their formative days 20 plus years ago, it's men like Dave Klepper, Art Davis, Paul Klipsch, John Hilliard, Dick Heyser, Mahlon Burkhard and Dr. Hunt who gave us early encouragement as well as unconsciously serving as role models we followed as far as we were able.

David Klepper at one of our Syn-Aud-Con workshops. Even at coffee breaks and meals, he is sharing freely

Dave is a true acoustical pioneer in every real sense of the word and a leader in present day research as well. Few persons in audio are blessed with as long a creative span at the very top of a profession. In his 30 years as an acoustical consultant he has worked on over 3,500 projects. After graduating from MIT, where he studied with Dr. Beranek and Dr. Bolt, he joined the firm of BBN, working in their Cambridge, Chicago and New York offices. He started KMK associates in 1971.

Anyone who has ever attended a Syn-Aud-Con workshop with David knows Dave shares freely from his vast experiences. He holds back nothing.

Our heartfelt congratulations to a friend and mentor. (I think of David as a mentor, though we are about the same age. David was a well known acoustician at 30 when I joined Altec and was starting to learn about the world of quality sound systems.) ■



Our First Year in Indiana

We have now completed our first year of using our Indiana farm as our headquarters. Our main reaction is that we should have done this ten years sooner. The ability to circle back to headquarters on a regular basis between classes has allowed us to manage Syn-Aud-Con in a much more efficient manner. By concentrating our energy in a single operating location we have been able to build better laboratory facilities and do research in them on a more frequent basis.

We have moved our Bedford facility to the farm as well so that our main office, laboratory, and home will all be on the same acreage. 1988 will witness several new experimental ideas for making classes on the road even better: our first video tape offerings (perhaps in conjunction with selected sponsors) and, we hope, an increased number of tutorial articles in various popular audio magazines on how to select loudspeakers for use in engineered listening rooms dedicated to music listening. We are making genuine progress toward a much fuller understanding of how we listen to music and how to both record it more accurately, process it more intelligently, and design a playback environment more appropriate to our true listening benefit.

Tremble, you Hi Fi pretenders, the lions of truth are stalking the psychoacoustic fields seeking those glib of tongue but devoid of substance. By 1990 we will be measuring many parameters accurately that today are only accessible to the gifted musical ear and musically trained mind.

1988 will see a full exposition of all of our work in intelligibility measurements, predictions, and how to benefit from the lessons learned in real life system design. We would not be at all surprised to see in excess of 400 TEF analyzers in the field by the end of the year.

We are planning now for the twenty year get-together of Syn-Aud-Con grads in the year 1992 and welcome suggestions as to where to hold it, how long should it be (one, two or more days) and what kind of a program should we plan that will mean the most to the largest number of grads.■

"Winning is Compulsory"

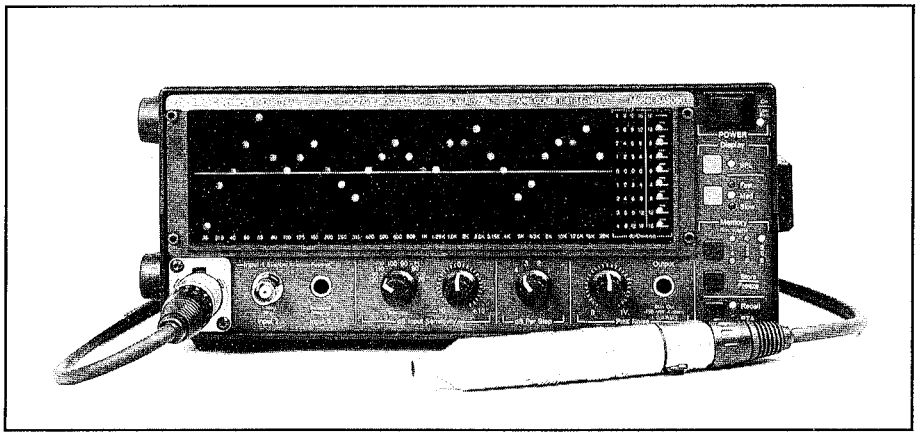
Lew Barrett (L) of Northshore Marketing in Seattle with one of his good sound contractors, David Carpenter (R) of the Music Machine.

Whenever I'm around Lew Barrett, I am reminded of the story about the English gentleman whose den was full of trophies for all kinds of sports who when asked how he had earned so many said, "Oh, games were compulsory." Whatever Lew does is undertaken in the same spirit—winning is compulsory. Lew can beat my pants off at trap and skeet, he's a serious amateur astronomer (Questar scope), and a superb manufacturer representative. His partner, Ferd Boyce, is a crack pistol shot, goes 25 straight in trap and makes a perfect "straight" man for the Lew and Ferd show.

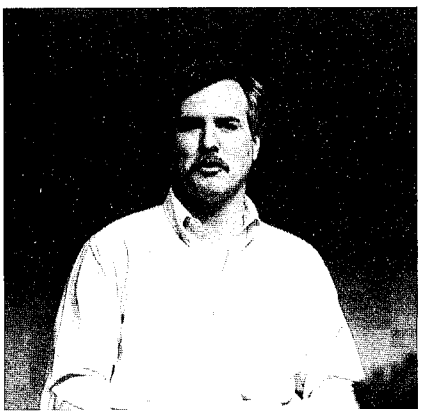
What makes guys like these? For one thing their maker gave them an extra dose of super-charged energy. Their instincts are those of true gentlemen in the classic meaning of the word, and they must have been seated in the front row when brains were passed out.

Lew and Ferd are our highly prized Syn-Aud-Con representatives in the great Northwest.■

A Good Low Cost Real Time Analyzer



The SA-3050A spectrum analyzer is an affordable, real time, 1/3-octave analyzer with memories and SPL display. Their address is: P O Box 3199, Lynnwood, WA 98036. (206) 775-8461



Tom Walker of Audio Control Industrial attended the Seattle class in February. Tom is the manufacturer of the SA-3050A 1/3 octave spectrum analyzer that sells for well under a thousand dollars. We tried one of these units during the class and found that, on the simple tests we conducted, it was an accurate, usable instrument. We found Tom a knowledgeable engineer devoted to producing a high quality product and we believe Audio Control Industrial will supply the answer to a definite need.

NEW SYN-AUD-CON ADDRESS AND PHONE

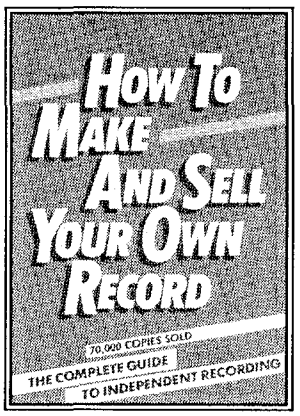
R.R. 1, BOX 267
NORMAN, IN
47264

812-995-8212

Watch Out For Those Early Reflections

Quoting from *MIX*, Volume 10 Number 8, "Lunching with Bonzai" - and interview with Tom Hidley.

Hidley: You should be able to walk on a studio floor and feel like you're almost in heaven. You must be able to transfer the magnificance of the studio to the control room. We've worked very hard in developing proper monitoring, and especially the control of the room's first reflections. While in retirement, I dreamed of a control room that had no equalization at all. I think I've found the answers, but it was only after a few years away from the business. The most important element to consider is the control of first reflections. You have to deal with the ceiling, the walls, and the floor. If you don't have control of the first reflection, you will never have naturalness. You may use brute force equalizers for a power balance at a certain point in the room that would be called a flat response—but as you begin to move around, things begin to change. And after a few hours, your ears begin to hurt. Ear fatigue sets in early when there is a high acoustic phase distortion caused by poor first reflections. You get tired, your mind begins to turn off. The power levels have to be kept more restrictive when you have first reflection problems.■



Walter Rapaport of Rapa Sound in Jerome, AZ was in our Anaheim class in February. He told us about a book that his wife, Diane Sward Rapaport, had written, *How to Make and Sell Your Own Record.* We asked Walt if he could send us a copy as we were interested in the title and we felt others would be also.

The book, published in 1984, has sold 70,000 copies; no small feat in our small audio industry. You don't have to get far into the book to decide that you like Diane Rapaport. Ms. Rapaport dedicates the book "*To my friend and former publisher, the late Andrew Fluegelman of the Headlands Press, a man of great vitality and integrity. He inspired me to write this book and helped me persevere through many drafts to ensure a book that would endure.*"

Anyone who has done much writing knows that it is not easy to be grateful to someone that has encouraged you to write draft after draft to polish a manuscript that you would rather send off to the publisher and never see again. *How to Make and Sell Your Own Record* is a book that will endure.

Diane Rapaport was formerly an artists' manager for Bill Graham's Fillmore Management and has been a pioneer in helping musicians become educated about the business of music. "*When I first started teaching in the San Francisco Bay Area some 15 years ago, I could count the number of schools offering music business and recording classes on one hand. Now there are hundreds!*"

Ms. Rapaport wrote us a letter after the Anaheim class saying, "Walter had a wonderful experience with your class. He came back full of enthusiasm and desire to learn more; and many of the things he did learn he could immediately apply to audio installation jobs in this area." Nothing makes us happier than to have someone say that a Syn-Aud-Con class filled them with enthusiasm and a desire to learn more.■