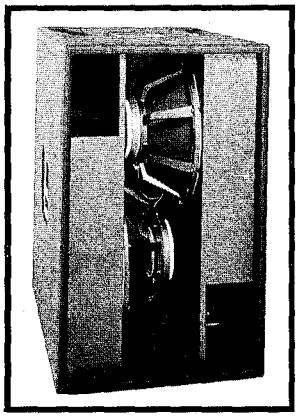
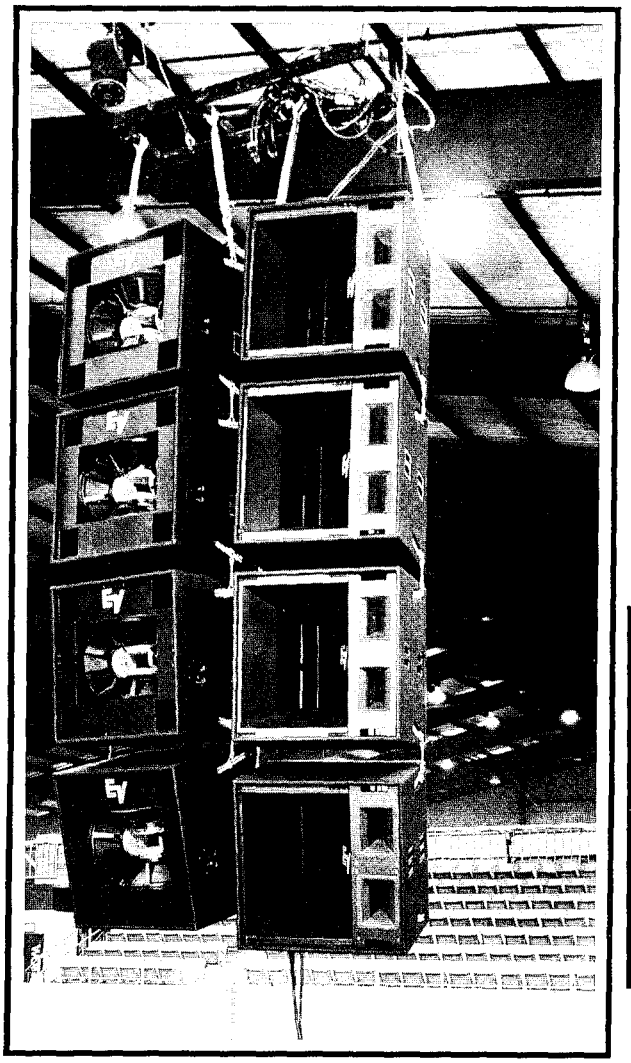
SYNERGETIC
SYN AUD CON
AUDIO CONCEPTS

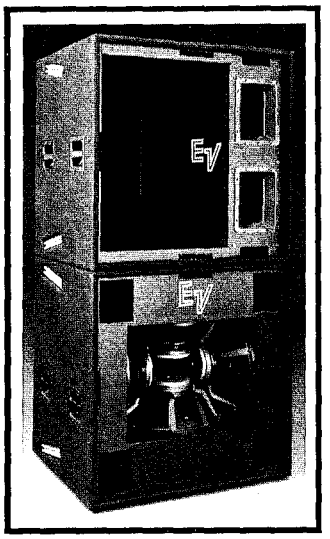
# newsletter

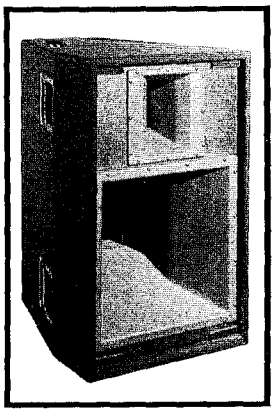
Volume 19, Number 4
Summer 1992

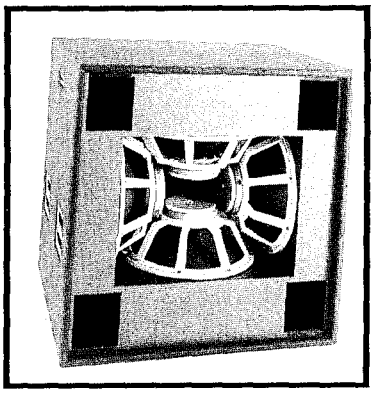

## *EV Manifold Systems*











*Diligentia*
*Accuracy of response*

*Vis*
*Power to do the job*

*Celeritas*
*Quickness of assembly*

SYNERGETIC
SYN AUD CON
AUDIO CONCEPTS

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: 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.

Editors: Don Davis
Carolyn Davis

Design & Layout: Dashia Meadows



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.

Syn-Aud-Con Newsletter (ISSN—07397518) is published quarterly for $35 per year (U.S. and Canada) and $40 per year outside the U.S. by Synergetic Audio Concepts, 12370 W. Co. Rd. 100 N, Norman, Indiana 47264. Second-class postage paid at Norman, Indiana 47264.

If you attend a Syn-Aud-Con Seminar during the year, your subscription will be extended one year. (Your registration fee includes a $35 subscription for one year to our Newsletter and Tech Topics).

For additional information contact:
**Synergetic Audio Concepts**
**12370 W. Co. Rd. 100 N**
**Norman, IN 47264**
**Ph:(812) 995-8212**
**FAX: (812) 995-2110**

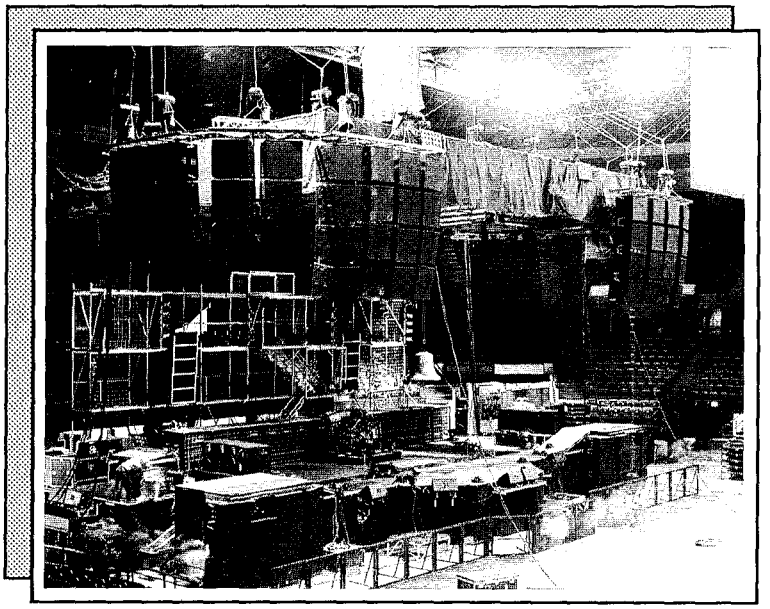
# TABLE OF CONTENTS



## When Do I Renew?

You can check to see when your subscription will expire by checking the mailing label on the envelope in which your newsletter was mailed. In the upper righthand corner, beside the name, a date will appear (i.e. 4-92). This means that you will receive this issue and it will be the last issue sent unless you renew. Renewal notices will be sent at this time. You must renew before the next quarter's newsletter is mailed or your subscription will become inactive.

**POSTMASTER:** Send address changes to Synergetic Audio Concepts, 12370 W. Co. Rd. 100 N, Norman, IN 47264.



Probably the most surprising evolution in the audio business during the past twenty years of Syn-Aud-Con is the development of massive, powerful entertainer systems. Unlike speech reinforcement or sound reproduction systems, entertainer systems and concert sound are a combination of synthesizer, sound reinforcement, and sound production systems. They have generated new rigging technologies, and monitoring systems have become separate massive systems in their own right.

The electrical systems providing the power to the electronics has, in many cases, been capable of being a sub station to a small village. Nor has the acoustic power output been neglected over these past two decades. EV's manifold systems are an example of the ingenuity that has been brought to bear on radiating wide bandwidth acoustic watts over a wide audience area.

Our first contacts with Electro-Voice were in 1953 when Carolyn and I started a high fidelity business called "The Golden Ear" (for the first six months the only calls were for feed corn and hearing aid batteries). In 1959, while working for Paul Klipsch as his President in charge of Vice, we flew up to Buchanan, MI to meet with the legendary Al Kahn, Lou Burroughs and a young, but very talented, engineer named Robert Avedon.

Lou Burroughs was a remarkable teacher of audio facts and balloon buster of audio fictions. Lou was a teacher with his dealers, with his competition, and with his associates.

The managers and engineers at EV are worthy descendents of their illustrious predecessors, witness the Masten-Patronis collaboration on theater system development.

Whether you think EV stands for Electro-Voice, Exceptional Value, or Energy and Vision, they are a Syn-Aud-Con sponsor worth getting to know better.

# *AEQ, RTA, NLA, NC, STI, RASTI, TDS, ETC, 3D*

The TEF-20 is rapidly becoming the only sensible choice in instrumentation for audio and acoustic work. The combination of the TEF-20 and the Ariel SYSid is already the overwhelming choice of anyone seeking the front edge of measurement in situ.

Let's go into the alphabet soup in the title above:

AEQ-Altec Acousa-EQ. A new precision split screen equalization technique that simultaneously displays the equalized curve, the unequalized curve and the inverse of the equalizer's electrical response curve. (See Figure 1)

RTA-Real Time Analyzer. In this case 1/1, 1/2, 1/3, 1/6, and 1/12 octave displays. (See Figure 2.) Promised sometime in the future is a dual channel version allowing true RTA transfer functions.

NLA-Noise Level Analysis. (See Figure 3.) Perhaps the ideal choice for monitoring the levels of a live group. $L_{EQ}$ (the equivalent level) is a fair way to control wayward groups.

TDS-Time Delay Spectrometry. A whole new view of an old friend when on a TEF-20. It's dynamic range now allows looks at distortions previously hidden from normal mortals' view.

ETC-Energy Time Curve. Now with twice the dynamic range and unbelievable adjuncts for $RT_{60}$, %ALcons, and spiral display.

3D-The TEF-20 now does 3D measurements—this time with 36 curves. (See Figure 4)

NC-Noise Criteria curves done automatically.

STI-The full speech transmission index.

RASTI-Rapid Speech Transmission Index.

All of this not to mention both the time domain and frequency domain, spiral displays of the real and imaginary signals.

Some real sophisticated room acoustic approaches are in the works based on some ideas from Manfred Schroeder, Yoichi Ando, and Jacques Hadamard.

We now feel, totally without equivocation, that anyone waiting for the TEF-20 to mature can consider it accomplished. On recent consulting jobs we have used the TEF-20, Ariel combination for all measurements with complete satisfaction.

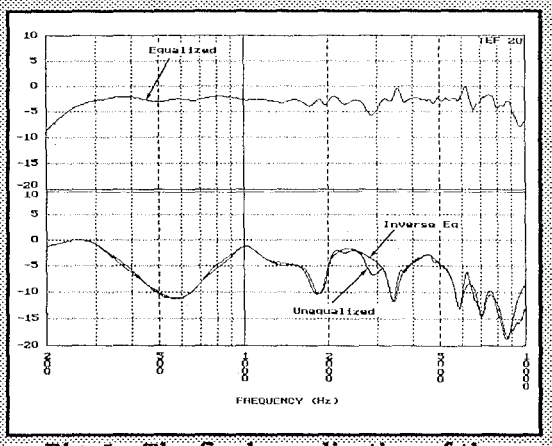



**Fig. 1—The final equalization of the test system, about as good in a few minutes as it will ever get.**

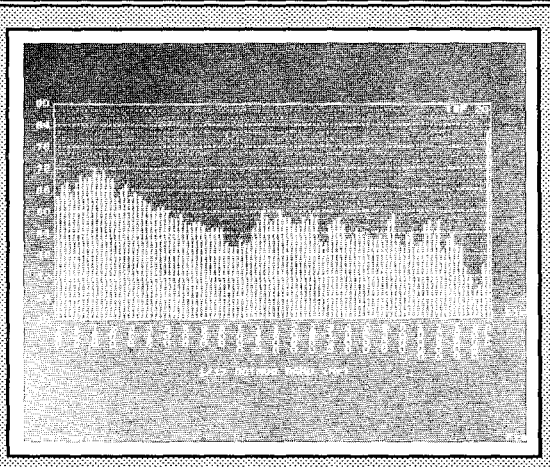


**Fig. 2—1/12 octave RTA**

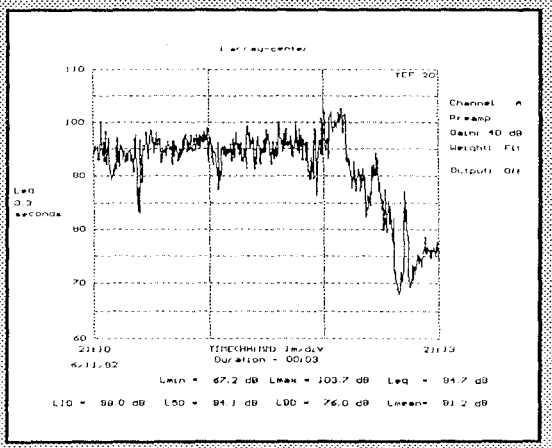



**Fig. 5—Environmental Noise Level Analysis**

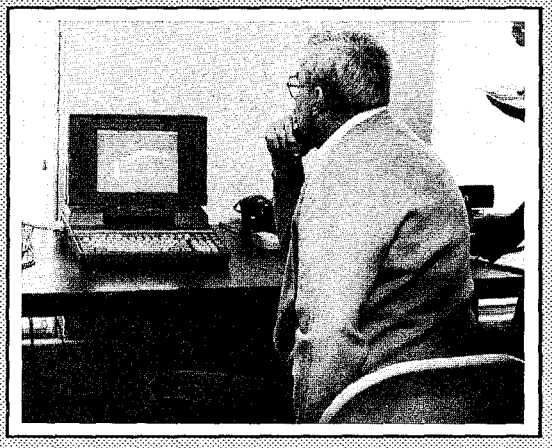


**Fig. 4—Waterfall in progress**

# Altec Meeting Prior to NSCA

*Dave Merrey and Bob Rodgers of Altec looking very pleased at the conclusion of a successful meeting.*

Don, Carolyn, Dr. Patronis, Don Eger, Ron Bennett, Farrel Becker and Peter D'Antonio, all attended the Altec sales meeting prior to the NSCA in Anaheim, CA.

The reason for all of our participation in the Altec meeting has to do with their leadership in seeking new ways to explore improvements in sound system design, installation, and adjustment techniques.

Jerry Spriggs, sales manager for Altec, led the way to the Medora Gym becoming a Workshop Center, thanks to Altec's donation of a sound system to the school. This brought about an early interest in the new approach to equalization that was being jointly explored by Don, Dr. Patronis, and Techron. Ron Bennett from Techron made the programming breakthrough we needed (split screen, triple display, inverted EQ curves). Dave Merrey recognized that it was a needed improvement in the art, and Gene Patronis laid down the equalizer requirements.

The Altec meeting was large, we saw many old friends, and Akira Mochimaru's binaural auralization plus Acousta-EQ were indications that Altec is on a roll.

Mr. Takane, EV's man from Japan, was present and he got to meet and know Dr. Patronis and Peter D'Antonio.

# Lenz's Law

H. F. Lenz was a Russian physicist of the early 19th century (a contemporary of Joseph Henry in the U. S. and Michael Faraday in Great Britian.)

Lenz found, among other things, that changing the number of magnetic lines that thread through a circuit induces a current in it if the circuit is closed, but the change *always* induces an electromotive force.

The electromotive force induced in a coil having N turns is given by

$$\text{EMF (Volts)} = \frac{\text{N (change of magnetic lines per sec)}}{100{,}000{,}000}$$

It is this induced voltage in the voice coil of a loudspeaker that impedes the flow of current from the power amplifier. It is greatest at the loudspeaker's resonance frequency. When we "block" the diaphragm of a loudspeaker and thus do not allow the change in magnetic lines per sec we see the large peak in the impedance plot drop to near the dc resistance of the coil dc. The difference between the dc resistance and this impedance peak at resonance is called the motional "impedance."

# A Useful Test CD

| TRACK | DESCRIPTION | LENGTH | START |
|---|---|---|---|
| 1 | A sinus of 1 kHz, 0 dB | 10'03 | 00'00 |
| 2 | A sinus of 20 Hz, -10 dB | 0,33 | 10'05 |
| 3 | A sinus of 30 Hz, -10 dB | 0,33 | 10'39 |
| 4 | A sinus of 40 Hz, -10 dB | 0,33 | 11'13 |
| 5 | A sinus of 50 Hz, -10 dB | 0,33 | 11'48 |
| 6 | A sinus of 60 Hz, -10 dB | 0,33 | 12'22 |
| 7 | A sinus of 100 Hz, -10 dB | 0,33 | 12'56 |
| 8 | A sinus of 125 Hz, -10 dB | 0,33 | 13'31 |
| 9 | A sinus of 250 Hz, -10 dB | 0,33 | 14'06 |
| 10 | A sinus of 400 Hz, -10 dB | 0,33 | 14'40 |
| 11 | A sinus of 800 Hz, -10 dB | 0,33 | 15'15 |
| 12 | A sinus of 1000 Hz, -10 dB | 0,33 | 15'50 |
| 13 | A sinus of 1250 Hz, -10 dB | 0,33 | 16'24 |
| 14 | A sinus of 2500 Hz, -10 dB | 0,33 | 16'59 |
| 15 | A sinus of 3150 Hz, -10 dB | 0,33 | 17'34 |
| 16 | A sinus of 4000 Hz, -10 dB | 0,33 | 18'09 |
| 17 | A sinus of 5000 Hz, -10 dB | 0,33 | 18'44 |
| 18 | A sinus of 6000 Hz, -10 dB | 0,33 | 19'19 |
| 19 | A sinus of 7000 Hz, -10 dB | 0,33 | 19'54 |
| 20 | A sinus of 8000 Hz, -10 dB | 0,33 | 20'29 |
| 21 | A sinus of 9000 Hz, -10 dB | 0,33 | 21'04 |
| 22 | A sinus of 10 kHz, -10 dB | 0,33 | 21'39 |
| 23 | A sinus of 11 kHz, -10 dB | 0,33 | 22'14 |
| 24 | A sinus of 12 kHz, -10 dB | 0,33 | 22'49 |
| 25 | A sinus of 13 kHz, -10 dB | 0,33 | 23'24 |
| 26 | A sinus of 14 kHz, -10 dB | 0,33 | 23'59 |
| 27 | A sinus of 15 kHz, -10 dB | 0,33 | 24'34 |
| 28 | A sinus of 16 kHz, -10 dB | 0,33 | 25'10 |
| 29 | A sinus of 17 kHz, -10 dB | 0,33 | 25'45 |
| 30 | A sinus of 18 kHz, -10 dB | 0,33 | 26'20 |
| 31 | A sinus of 19 kHz, -10 dB | 0,33 | 26'57 |
| 32 | A sinus of 20 kHz, -10 dB | 0,33 | 27'32 |
| 33 | Channel indication with sweep, 20 Hz to 20 kHz, -10 dB | 0,11 | 28'07 |
| 34 | Pink noise, -10 dB | 3'03 | 28'20 |
| 35 | Pink noise, 180 out of phase, -10 dB | 1'03 | 31'24 |
| 36 | A sinus of 200 Hz, -10 dB | 1'05 | 32'29 |
| 37 | A sinus of 200 Hz, 180° out of phase, -10 dB | 1'05 | 33'36 |
| 38 | Left and right A sweep of 20 Hz to 20 kHz, -10 dB | 0,45 | 34'43 |
| 39 | Left a sinus of 10 kHz, -10 dB | 1'04 | 35'29 |
| 40 | Right a sinus of 10 kHz, -10 dB | 1'04 | 36'35 |
| 41 | Drum solo, mono | 1'29 | 37'41 |
| 42 | Drum solo, stereo | 1'29 | 39'11 |
| 43 | A sinus of 440 Hz, -10 dB | 1'04 | 40'42 |
| 44 | Announcement track **45** | 0,04 | 41'47 |
| 45 | SMPTE code, left 25 frames, right 24 frames, -10 dB | 10'00 | 41'51 |
| 46 | Announcement track **47** | 0,04 | 51'53 |
| 47 | SMPTE code, left 30 frames, right 29 frames, -10 dB | 10'00 | 51'57 |
| 48 | Silence | 1'03 | 62'01 |
| 49 | Index test, counting from 1 to 99 | 2'19 | 63'05 |
| 50 t/m 99 | counting from 50 to 99 | 3'54 | 65'26 |
| | Total time: | | 69'20 |

Distributed by
The Moss
Music Group
Div. Essex
Entertainment
Inc 75 Essex
Street,
Hackensack
NJ 07601

"The Ultimate Test CD" made in Germany and distributed in the U.S. is a very useful disc.

The explanations and definitions accompanying the disc are amusing. Hertz is spelled Herz and frequency is defined as "the pitch in Herz". Phase is their term for polarity. Pink noise is "the kind of noise in which all frequencies are equally represented."

The tracks that are of special interest to us are Tracks 49 and 50, counting to 100. The talker is superbly recorded and we haven't found its match for voice testing a sound reinforcement system.

This is the test disc I would like you to have on hand when I visit your latest system.

**A Pet Peeve**

So often when we are asked to listen to someone's sound system either to show us how good it is or we are being asked to diagnose a problem, a CD of music is played.

A very accurate way to evaluate the sound system is to have someone whose voice excites the greatest range, especially the low frequencies as this is the range that often gives the most problems in a space, speak with and without a sound system while a critical listener walks the entire space.

Tracks 49 and 50 of "The Ultimate Test CD" is almost as effective as the live talker. The live talker method has the advantage of one being able to compare the fidelity of the live vs reproduced sound - yet it is very clear from the Test CD when there is coloration to the voice, something that is completely masked when a CD of music is played.

We listen to speech every day. How often do we listen to live music?

We felt it was such a useful disc that we have ordered a quantity to have available for our classes. You can order from us for $12.00 plus $2.50 shipping and handling.

# "O King Live Forever"

On Page 12 of the Spring 1992 Newsletter we asked, "I have reached the age of 16 dB. How old am I?"

Ron Wexler of IED responded to the question with infinite "O King, live forever"

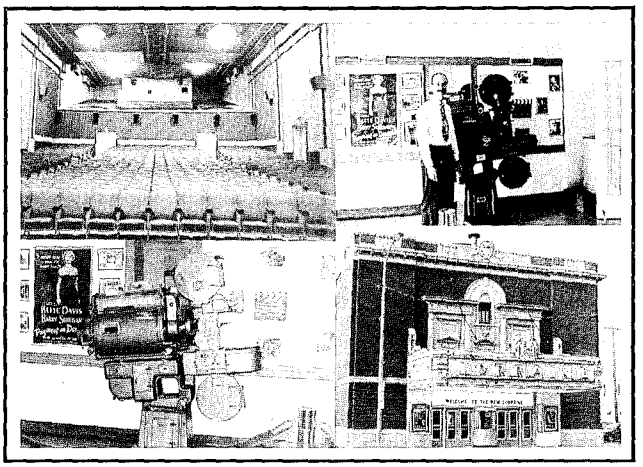
$$10 \log \frac{64}{0} = \infty$$

If we assume my life began at conception, then my age is tabulated from birth and

$$10 \log \frac{64}{9/12} = 19 \text{ dB}$$

Naturally I prefer to be infinite, but suspect it will be difficult to manifest. Any further comments will be distributed to those who have already commented as that makes them experts on the subject.

# "If You Build They Will Come"



**Gregory Boardman in the lobby of the Lorraine Theater. The original projectors from the 1930s is on display.**

We enjoyed the Kevin Cosner film about baseball greats, "Field of Dreams". We are always attracted to the dreamers of this world. The world of audio is blessed with many dedicated dreamers. When real talent is part of the package as well, then miracles do happen.

Gregory W. Boardman is just such a dreamer. He works for NBC in California and has planned ahead for his retirement near Hoopeston, IL, where he was born - a small community of about 5,000 in the midst of vast blackland farms. Mr. Boardman purchased the classic 1937 Lorraine Theater in Hoopeston and is refurbishing it into a Middle West Mecca for movie fans who want the best. It is a classic large house with HPS-4000™ sound system consisting of Klipsch Theatre Loudspeakers and surround speakers which are custom built by Gary Gillum of Gillum Loudspeakers, and the most modern projection equipment.

John F. Allen of Newton, MA, engineered the exceptional sound installation.

About 10 years ago we heard one of John Allen's sound systems for motion picture theaters. The TEF analyzer was new and we were making measurements at Boston Symphony Hall. John Allen was present and invited us to hear the HPS-4000 sound sytem using Klipsch Theatre Loudspeakers in Community Playhouse in Wellesley. The sound was truly memorable.

Since that time, which was his first sound system for theaters, he has designed and installed his theatre sound sytems all over the world.

When Greg Boardman made the decision to buy the Lorraine Theater in Hoopeston he went to many theaters in the Los Angeles area to evaluate the sound and projection. When he heard John Allen's HPS-4000 system he got in touch with John.

A year ago we attended a special presentation by Dolby at the Academy Theater in Beverly Hills, CA, where they showed choice sections of "Dances With Wolves." In a few words, the Lorraine Theater in Hoopeston exceeded the Academy Theater in every way, especially with regard to the surround system.

John has worked out surround coverage that is extraordinary. He matches the radiating patterns of the surround speakers to the individual size and shape of the auditorium. You can't localize to any surround speaker, even sitting underneath one. There is one scene in a movie where a bullet whistles past your head as it travels to the back of the auditorium.

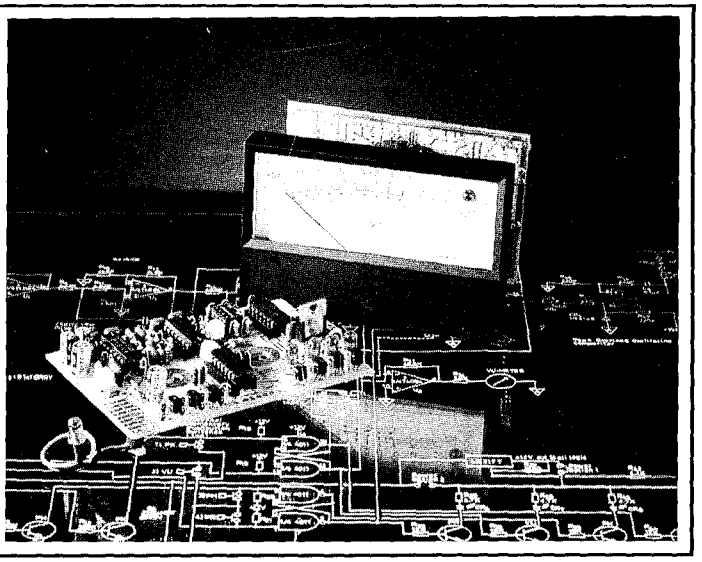
Another aspect of the sound that particularly pleases us is the intelligibility of the spoken word, whether spoken from a microphone or dialog from the movie.

**"If You Build, They Will Come"**

Yes! it is true--"if you build, they will come"--and we did (it's a 150 mile drive from the farm and worth every mile.)

If more people lived their dreams rather than spending a lifetime engaged in fantasies, this would be a far better world. Hurray for the dreamers who dream the waking dream.

# The Benchmark RPM-1 Remote Program Meter Card



The Benchmark RPM-1 remote program meter card is still, in our view, one of the best buys anyone using professional VI instruments (often misnamed VU meters) can make. One of these will teach you more about mixing than anything else I know of.

# NSCA
# Our Audio Convention of Choice

NSCA is our show of choice. We no longer attend AES or SMPTE and only occasionally the ASA. Many of our grads attend the NSCA and our sponsors are prominent participants

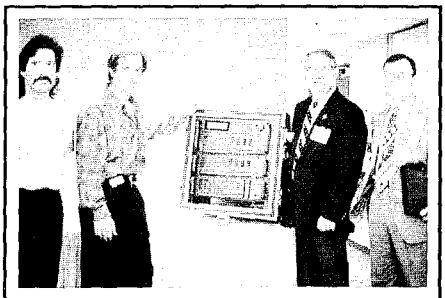
Those who know me well know that I very rarely pay attention to product names or numbers. I am very interested in what products can do. I'm even more interested in what the people behind good products are like. The NSCA Conventions are a place where I get to see the best people, their products, and hear their new ideas.

You need to realize that this short description of NSCA is a very tiny sample of the people we get to see there. And, best of all, without the distraction of controversial technical papers and academic posturing. No wonder the NSCA has become our show of choice.

Janine Masten with Gene Patronis. She's the young lady that had the vision to put Gene Patronis and AMC together with the resultant superior theater system by EV.

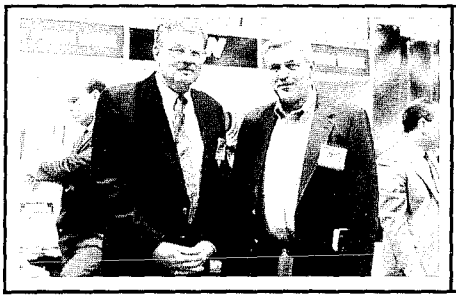
John Bareham, formerly with Bruel & Kjaer, is now a consultant on his own. John is a very competent instrumentation man and a totally honest human being. We have always had the highest respect for his knowledge and his willingness to share it with others.

James Kogen of Shure Brothers is easily one of the most experienced executives in all of audio. He's a first rank engineer, manager, and planner. Very large companies require exceptional management and James Kogen meets every qualification. How many company presidents do you know that make a commitment to work the show in the booth instead of the Hospitality Suite? Alan Shirley (L) is with Mr. Kogen sporting a new promotion for his talents.



John Murray and Chuck McGregor of TOA, John Royer of the Indianapolis Motor Speedway and the Indiana State Fair along with Kurt Gish, AV Marketing in Indianapolis. The equipment is the TOA SAORI which John will use in the coliseum at the State Fairgrounds.

That's Amy Heyser and Jo Earp, two ladies we truly enjoy being around. Make no mistake, they're not just decorative, they're both skilled business women who can help keep us up to date on our industry.



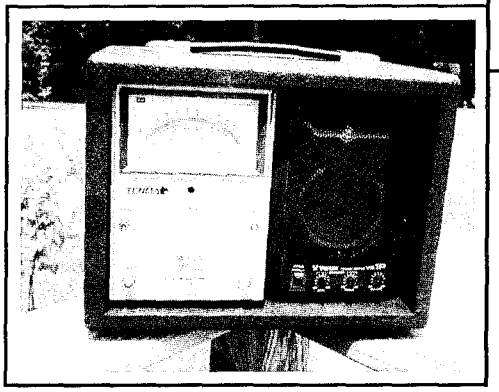
Don Hastings of West Penn Wire has been a loyal friend of Syn-Aud-Con and has been a stalwart of the NSCA from the beginning. I would wager that there isn't anyone who attends NSCA, except the competition, that doesn't remember West Penn Wire with affection. The lush banquet provided for all who attend NSCA is surely a love feast.

Finally, Andrew Ferreghy and Bob Reim of Acromedia with Dave Merrey, President of Altec. Bob and I worked together on a Boner equalization in 1968 - the first either of us had ever done.

# *Pat Brown—Sound Contractor of the Future*

Pat Brown of Pro Sound Audio in Clarksville, IN, personifies the kind of young men we like to see in the sound contracting business. He knows his basics--he stood out in the Syn-Aud-Con class he attended, knows all the tools of the trade and uses them skillfully, is computer literate, and up-to-date on measurements (TEF owner) and their proper application.

Pat recently designed us a test box for quick system checkouts that lets us see link circuit voltages and hear the circuits as well. Pat currently is working on the re-do of the very large sound system at the Indiana State Fair Coliseum.



In the picture he was helping make In-the-Ear measurements at the Medora Gym last summer. Truly an up to date, all around competent sound man.


World traveller, astute business man, patriot, loyal friend, and technical gad fly that's Dave Andrews. David is from a good New England family, a graduate of Gettysburg College and of Vietnam. We increasingly realize that our mental image of David is more of a "suit with vest" businessman that enjoys wearing disguises.

# MorningStar Productions —Special Class—

MorningStar Productions does the sound for Dan Seals and are experienced practitioners of Nashville country music setups all over the world.

They arranged with Syn-Aud-Con for a special class to be held in early June to coincide with Farrel Becker's annual vacation visit to the Farm.

MorningStar has a TEF 20HI and they were ready to go.

On the 2nd day they brought in their 18 wheeler and unloaded their entire system and set it up so that Farrel and I could make measurements with it. It became evident during these measurements that we badly need an interface box between the TEF 20 and a lot of equipment being used in the music reinforcement business.

MorningStar does an excellent job with their equipment. They have paid due respect to the acquisition and control of ac power and are well versed in grounding and shielding techniques.

Subjects discussed in a special class like this range from "barn door" acoustic reflectors, detailed equalization, and optimum array arrangements.

These young men are a team that knows how to work together and obviously are the product of a selection system that screens out everyone but the intelligent, receptive workaholics.

During one of the breaks, we introduced them to the game of Skittles, the backwoods forerunner of pinball, and one was able to observe their good natured but very competitive spirit.

We're not sure who learns the most when we interface with such a talented team but we surely enjoy it.

# Source Dependent Measurements, SDM Demo

We now demonstrate SDM (source dependent measurements) in our current classes. By using the Ariel-SYSid dual channel FFT to obtain the acoustic transfer function of the system, we are able to do the following:

❃ Obtain a wide time window impulse response and its FFT to the frequency domain. See Fig. #1.

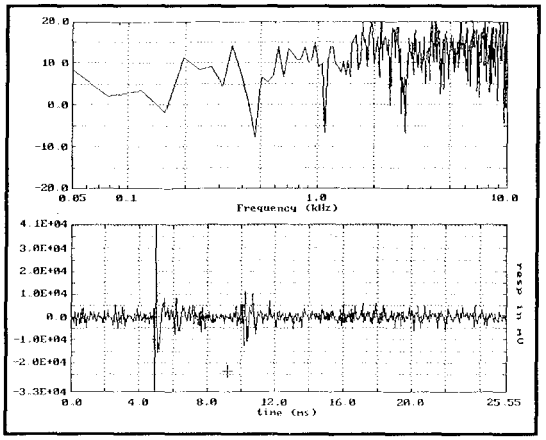



*Figure 1*

❃ Edit out, in the time domain, the direct sound and a first reflection. The FFT of this edited impulse response appears in the frequency display. See Fig. #2.

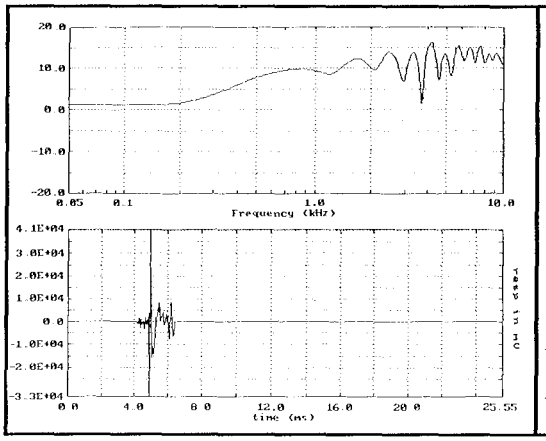



*Figure 2*

❃ Re-edit the impulse response this time including a later reflection.

❃ The FFT of this time response shows the comb filters caused by the above edited time response. See Fig. #3.

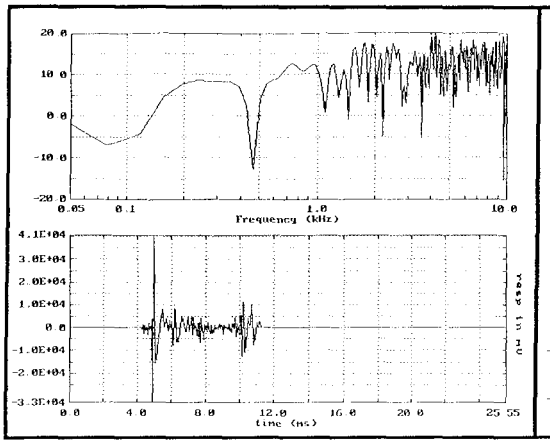



*Figure 3*

For comparative purposes, we'll do the same three measurements only this time instead of using music as the test source we are dependent upon, we'll depend on the internal chirp test signal (200 averages fast as with the music).

Fig. #4 shows the direct sound with the very early reflection.

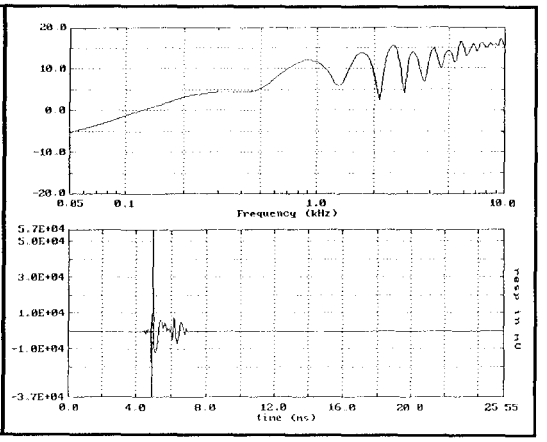



*Figure 4*

Fig. #5 shows the comb filtering caused by including the later reflection.

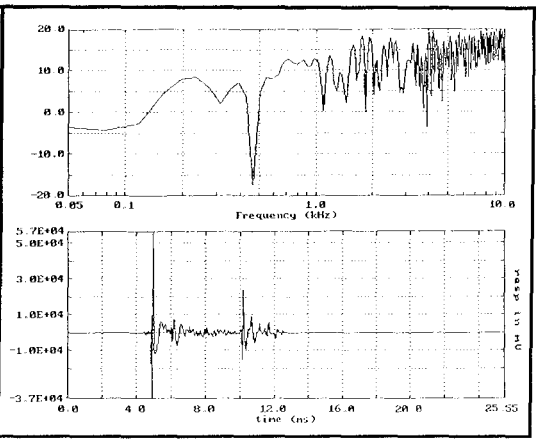



*Figure 5*

As can be seen, the correlation between transfer functions made with music as the source is a test chirp as a source is dependent upon the distribution of acoustic power generated by the source. At higher frequencies, noise plays a larger role.

As we have repeatedly pointed out, Yes! you can perform SDM measurement. The question is why? Just as the gullible during the Crusades brought home all kinds of holy relics that were sold to them by Muslin merchants, so there are those who still wish to "tune out" echoes, reverberation, reflections and audience affect. Just remember such performances are a religion--not a science.

# SAM SAN

Sam Berkow, the Digital Dazzler from Dallas, recently invaded Japan, assisted by Tad Inui and John Murray. We're not sure about the girls he went out with in Japan but at least they put on a good front.

Shogun Sam stopped by the farm a couple of weeks ago and assured us that the Japanese are now properly auralized and HyperSignaled.

# Roe and Wade

We were on our way to church on a bright early May Sunday when we saw a young puppy in the center of the road and two ladies trying to coax it to the side of the road. We stopped to help and found out that these were two puppies that probably had been thrown from a car and that one, the male one, was under the ladies' car with a broken right rear leg. The female pup was in the center of the road totally terrorized and exhausted. The two ladies had stopped to try and get them out of the road. Ernie Pence got the male pup out from under the ladies' car while Don got the other pup out of the center of the road. Carolyn & Viv meanwhile made the decision that the Davis family had just expanded. On the drive to church with the two pups now ensconced in the rear of the Escort wagon, we decided to name them Roe and Wade. Since Wade seemed a more masculine name than Roe, the male became Wade and the female Roe. Someone at church thought we might have gotten the names backward but our feeling that the whole subject is somehow backward allowed us to keep them named as indicated.

In any case, Roe and Wade now enrich our lives as only young, vibrant, full of life creatures can and they were soon close companions with an earlier orphan arrival, the cat, Rascal (so named by Gene Patronis after watching Rascal play lion tamer with Pete, Tilly and Francine by chasing each of them up on a chair and then strutting around them like Clyde Beatty.)

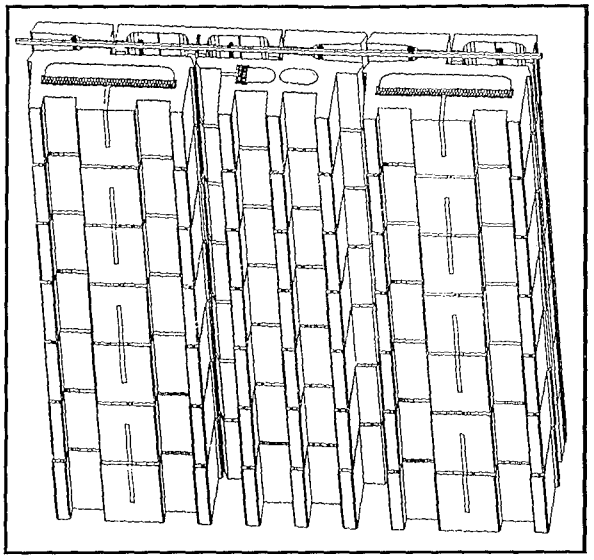
Wade's broken leg quickly mended, Roe's ears now sit up like a proper German Shepherd. (Thank goodness, since Roe and Wade are identical twins except for their ears.) The Vet thinks they are a combination of German Shepherd and Labrador.

We now have four dogs; Patch, Pedro, Roe and Wade plus four cats; Pete, Tilly, Francine and Rascal.

Patch and Pedro are a little confused about how they became the parents of two but they have accepted the responsibility with nobility and patience.

Roe and Wade bounce around the yard like a pair of matched harness horses and watching the way Roe took care of Wade while he recovered from his broken leg is a lesson in animal compassion and love.

The Vet tells us they'll both be large dogs so sign up for a Syn-Aud-Con class now because we need the money for dog food.



# DiffusorBlox™ Answered Prayer

How often have we seen or been asked to work in cinder block buildings used by churches and schools with the accompaning frustration of parallel walls, no absorption, and no chance of ever doing the job right. Peter D'Antonio's DiffusorBlox™ are an answered prayer because they economically incorporate acoustics into the structure of the building.

The new DiffusorBlox™ provide the highest absorption of any load-bearing structural block, NRC of 0.85 with an absorption coeffiecient of 0.98 at 125 Hz. In addition, DiffusorBlox™ provide an added bonus of broad-bandwidth QRD® sound diffusion, not offered by any other concrete masonry unit. DiffusorBlox™ also offer a phenomenal STC of 55, which makes their use in noise control applications such as movie theaters, highway barriers, etc. very promising.

RPG Diffusor Systems licenses it's automatic block machine steel molds to local block producers in the vicinity of the job site to minimize shipping costs. All of these structural acoustical features are available at prices comparable with conventional block.

Contact Troy Jensen or Peter D'Antonio at RPG Diffusors and ask for their literature on the DiffusorBlox™: 651C Commerce Drive, Upper Marlboro, MD 20772 (301) 249-0044 Fax 301-249-3912

Get this data in front of every building committee you can find.

# Working Man's Answer to the Fluke 97 Scope Meter

**Here is the "working man's" answer to a previously expensive problem. Our thanks to Posey Bowers of New Orleans for sharing his ideas:**

Well, same old story, seems my idea is not new! The folks at Fluke say that the use of a 80i600 coupled to a scope (terminate the probe with a 10Ω 5 watt resistor) is nothing new and is an acceptable way to investigate power line current waveforms for a lot less than the price of typical wideband current probe. (A Fluke 80i600 is good to about 10 KHz and will set you back about $120 at Kelvin Electronics or W.W. Grainger.)

Here at the office we have 120/208Y service. Our loads consist almost exclusively of 4 fixture fluorescent lamps with magnetic ballasts and 3-phase motor loads for air conditioning. An examination of the current trace in each phase shows a fairly clean sine wave but a very lumpy sine wave is displayed in the neutral. I must point out that for a single service we have two watt-hour meters supplied by current transformers and two separate sets of disconnects. Only two 200 amp fused disconnects on one meter are readily accessible. In examining the neutrals in each of the accessible 200 amp disconnects I find something interesting. Not only are the currents in the neutral dirtier than in even the dirtiest phase but the current in one of the neutrals seems to be pulsed at about the same rate as the pulsing of a telephone busy signal. This is easily seen on my old NLS mini scope and is quite audible over the loudspeaker of my Radio Shack Mini Amp.

Fortunately, none of this is my problem. Knowing what I now know, however, I would definitely check the power before I ever bid on a sound job. Never mind whose problem it was; it would be my problem if any of that clearly audible pulsing or above 60 Hz hum found its way into my system. For the kind of money we are talking about, it may well be good practice for more of us to take a look at these current waveforms before committing on a job.

# PZM Plexiglas Panels Used For Recording

EQ magazine had an interesting article in the June issue, called "Less is More - an audiophile recordist takes an unothodox approach to reproducing the excitement of live music."

Quoting from the article written by Pierre M. Sprey, owner of Mapleshade Studio and Mapleshade CD label,

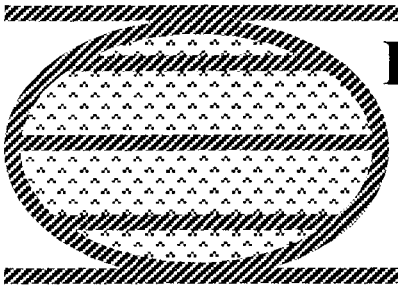
*"I use a pressure zone microphone (PZM) wedge for essentially all my recordings. My basic design is a V-shaped stereo array of two plexiglass panels, two-feet square and carefully damped to eliminate resonances....There is one volume control per channel. I avoid mixing consoles like the plague -- their long, tortuous signal path can't help but degrade the sound.*

*"The PZMs reproduce piano and drums better than any mics I know. The percussive impact of the hammers hitting the piano strings really comes through.*

*"Drummers are knocked out by the accuracy of the PZM sound. The mics are so fast you get the real impact of the sticks on drum heads or the airiness of brushes on cymbals without any audible time smear.*

*"Some musicians are placed closer to the mic wedge, some farther away because I get the mix by adjusting physical distance, not by knob twiddling."*

Mr. Sprey ends his article, *"And sticking to a single stereo pair of mics gives a terrific sense of real depth - real three-dimensionality."*



# Don Heavener Receives Patent for Variable Pattern, Collapsible, Directional Transducer

James D. (Don) Heavener has received United States Patent number 5,103,927 dated April 14, 1992 for a "Variable Pattern, Collapsible, Directional Transducer".

The abstract reads:

"This is a highly directional floor microphone. A pair of hinged panels rest upon the floor. A compliance may be used to acoustically seal the panels to the floor. At the apex of the floor and hinge is a transducer. The hinged panels are trapezoidal in shape and the hinge is acoustically opaque. The floor increases the directivity 6dB. The panels increase the directivity by 12 dB. Tapering the panels in a trapezoidal shape increases the directivity by 2 dB. The total increase in directivity is 20 dB, allowing a working distance of ten times that of an omni-directional microphone. The folding nature allows easy storage and carriage."

This is a practical way to make a Ken Wahrenbrock boundary PZM that can be easily carried. We're pleased to see such a patent issued to a Syn-Aud-Con graduate and assistant teacher in addition to being a good friend of Ken Wahrenbrock. Don Heavener is the man who built the first pressure zone loudspeaker PZL.

***Don Heavener at our Intelligibility Workshop #2, 1990.***

## *FSR'S Elite Control System Custom Service*

FSR now offers an Elite Control System Custom Service. Anyone without a metal press, silk screen facilities and a worldclass electronic technician will find this service a Godsend!

FSR, 224 Bergen Blvd, West Paterson, NJ 07424, 201-785-4347.

# *Dr. Paul W. Klipsch, FASA, FAES*

In a world of societies that exist primarily for political mediocrities, an occasional award goes to some truly deserving individual. We were particularly pleased to learn recently that Paul W. Klipsch is now Dr. Paul W. Klipsch, as well as a newly elected Fellow of the Acoustical Society of America. The Honorary Doctorate is from his Alma Mater, the New Mexico State University. Both awards were unsought by the recipient, but richly deserved and they do honor to the givers. I now address all my mail to Paul as: Dr. Paul W. Klipsch, FASA, FAES.

## Domains

We are reminded again that the constraints of our physically measurable parameters suggest that there must be parameters to be discovered if we are ever to match technology with our mental perception of musical events.

We are, at the present time, limited to amplitude (voltage), frequency, and time in our measuring instruments.

Fourier made us aware of the frequency domain and the time domain viewpoints. In the illustrations shown here, Hewlett Packard has reinvented Dick Heyser's Modulation Domain.

**Frequency Domain**

Frequency which is the reciprocal of time, 1/T = f, consists of two parameters, amplitude and frequency.

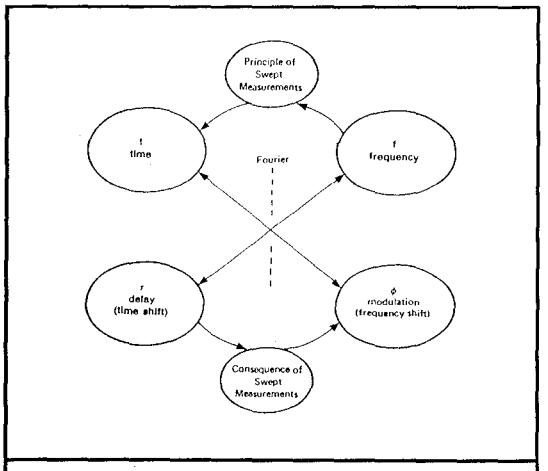
**Time Domain**

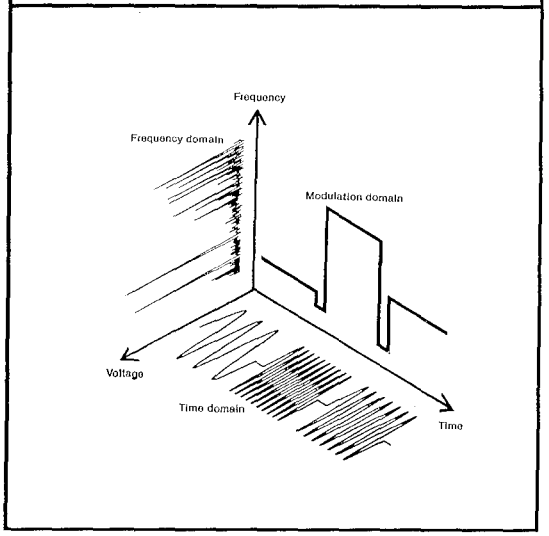
The time domain where time is the reciprocal of frequency, 1/f = T, consists of amplitude and time.

**Modulation Domain**

Modulation consists of frequency and time. We know from experience that modulation plays a key role in the enjoyment of music, both of amplitude and of frequency. Delays also significantly affect the mood music can stimulate.

Just as an ETC envelope better describes the decaying sound of a bell as compared to the traditional impulse response, so too should we be seeking the best possible descriptions of what is common place to the musicians' ears.




## Progress

Circa 1972-a computer-calculator with printed tape output cost $6,000.

Circa 1992—a 486-33 with 200 meg hard drive, color graphics, and 8 megs of RAM costs $4,000.

Perhaps that's what's called staying competitive in a rough world. In real life it's not what you have done but what can you do now on demand.

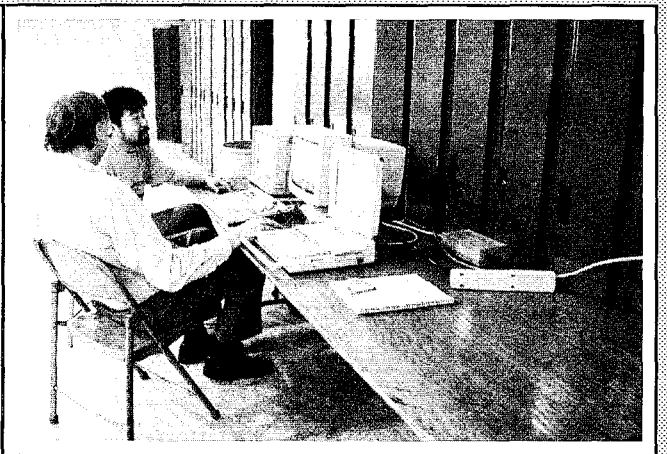
The United States at its most competitive (1945-1965) had as its driving force the veterans of WWII. We need some of the same today and it won't come from Harvard MBAs.

# *Binaural* Auralization and *Precision* Equalization Workshop

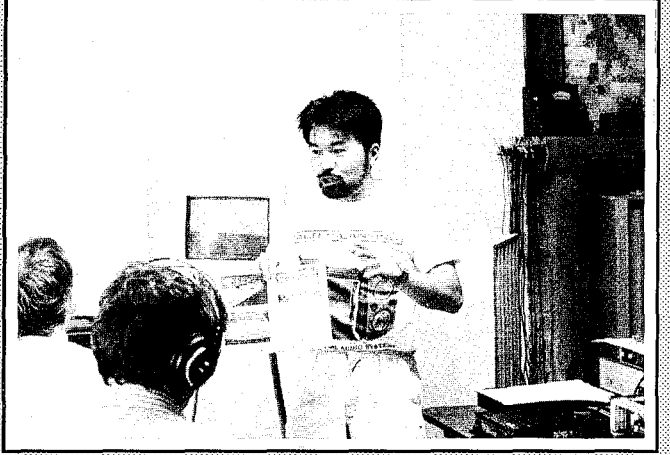
The Medora Gym seems to attract the most talented grads. This time it was to work with two new tools that will quickly take over in their respective areas: Binaural auralization and Altec Acousta-EQ (precision equalization.)

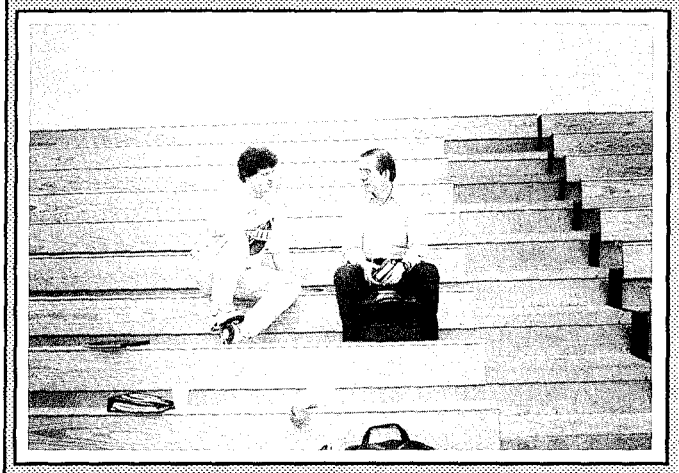
Once heard, binaural auralization's advantages are so apparent as to defy competition.

The Group watching a precision equalization at the Medora gym. It sometimes seems to us that the most productive workshops are those that are attended by many who have experienced previous workshops. They have learned how to get the most out of unstructured opportunities and they encourage people who are attending a workshop for the first time.

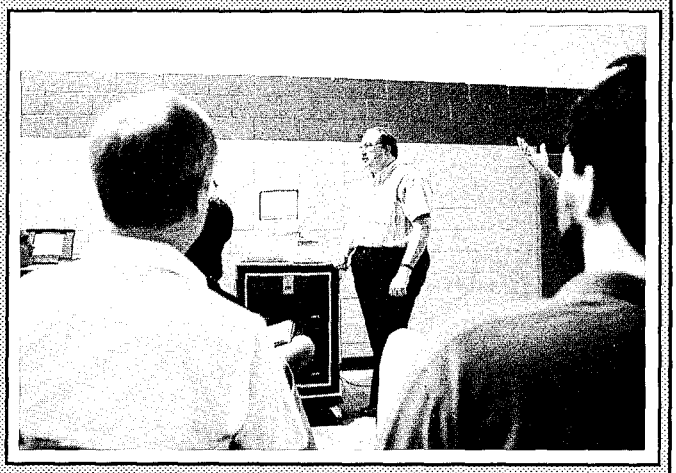


That both Altec via Akira Mochimaru and Renkus-Heinz via Wolfgang Ahnert came together in the same place and demonstrated to each other, as well as the rest of us, made for some very special insights. For those still laboring under ideas such as "the inscrutable oriental", watching Akira sell his ideas (see photo) can quickly heal you. The very meaning of "peer group" was exemplified by Ahnert and Akira who truly are a peer group unto themselves. But, then we've always preached that the test of real talent is the ability to recognize it.





Like all workshops, those who attend are leaders in their own right and the one on one interaction is precious time.

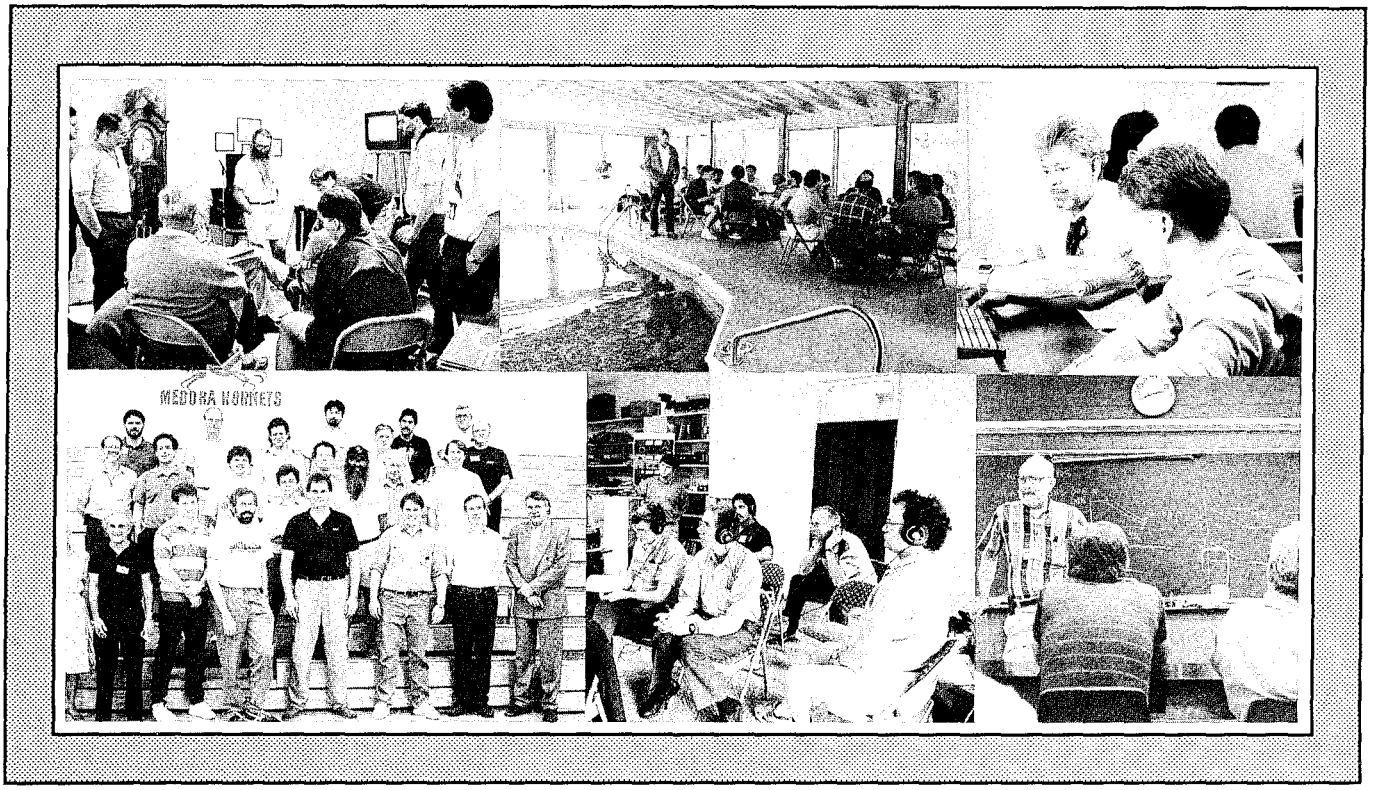


A surprise demo, Johnny Johnson from IED who truly showed us that we all want the IED UDAP system as an equalizer. To appreciate UDAP, think of your house curve on a UDAP screen being fitted to a fully digital equalizer and then inserted into the system without an audible clue except for the improved sound.

The prize for coming the farthest went to John Burgoyne who came from the Philippines. Peter Mapp (Great Britain), Dr. Ahnert (Germany), Akira (Japan) and Dave Andrews (NYC) all contributed to the international flavor of this workshop.

The staff, as always, made major contributions with Don Eger, Ron Bennett and Jim Bumgardner from Techron, Akira Mochimaru from Altec, and Frank Ostrander from Renkus-Heinz assisting Dr. Ahnert and Dr. Patronis.

The Binaural Auralization and Precision Equalization Workshop provided a penetrating look into the mid 90's.



# Syn-Aud-Con 1992 Seminar Schedule

3-Day Sound Engineering Seminar—$550

The Farm—Norman, IN

***July 16-18***
(Asst. Instructor: Fred Fredricks)

***August 20-22***
(Asst. Instructor: Dr. Eugene Patronis)

***September 17-19***
(Asst. Instructor: Kurt Graffey)

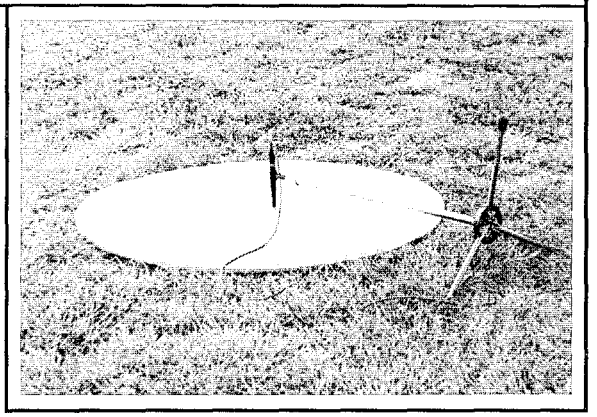
***October 15-17***
(Asst. Instructor : Randy Vaughan)

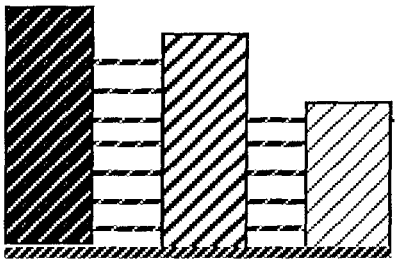
**We are in correspondence with Victor Peutz of the Netherlands. At this time he is planning to be with us in September. When we have a definite schedule, we will let you know; but we are assuming it will be in the time frame of the September class.**

# Making High Resolution Acoustic Measurements

When equalizing and synchronizing loudspeakers "in situ", we want the best frequency resolution possible while retaining essentially anechoic response. If, for example, we want a frequency resolution of 50 Hz (good to 25 Hz) then we need a time window for that measurement of 1/50 = 0.02 secs. (20 msecs). In gymnasiums a PZM™ measuring microphone allows this when it is placed on the floor away from any wall surfaces. In auditoriums an excellent approximation can be obtained by placing either one or, better yet, two 4' x 8' sheets of 3/4" plywood across the tops of the seats and placing your B&K 4007 measuring microphone on it in a PZM™ configuration. The inexpensive, three-legged stand shown in the illustrations happens to work well with the B&K 4007 microphone which is a pressure calibrated capsule well suited to PZM™ type applications.

This technique virtually eliminates the floor surface from consideration in your measurements allowing accurate, dependable, low frequency measurements to be obtained.





# The Canonicals

Sound systems in trouble need the following checklist. Sound systems being designed and installed, if they don't want trouble, need the following checklist. Persons who don't understand this checklist shouldn't be designing or installing sound systems.

Any sound system, existing, new, in trouble, or seemingly working satisfactorily, need the following checks:

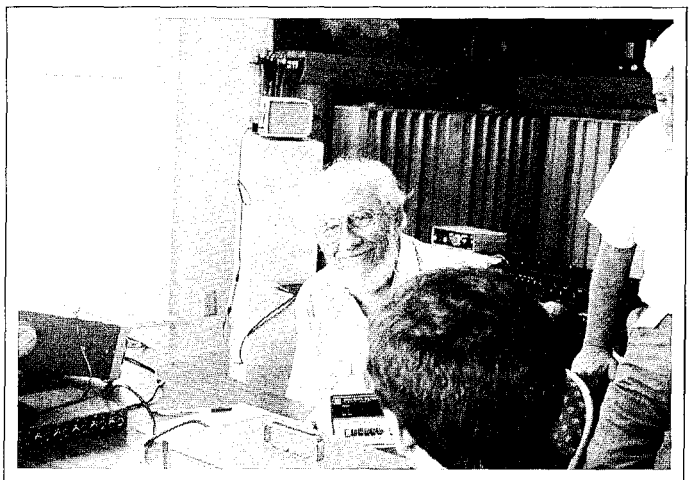
1. All link circuits examined for:
   - A. Circuit configuration (i.e., balanced, unbalanced, differential, transformer, etc.)
   - B. Circuit polarity
   - C. Circuit impedance (both source and input)
   - D. Circuit voltages (with both voltage and impedance level can be computed)
   - E. Shielding & grounding
   - F. Current carrying capacity
   - G. Mechanical properties (especially for microphone wiring)
2. Signal synchronization of all acoustic transducers with particular attention to devices sharing the same frequency range and same portion of the audience area.
3. Audience coverage (this can't be done prior to all of the above)
4. Equalization

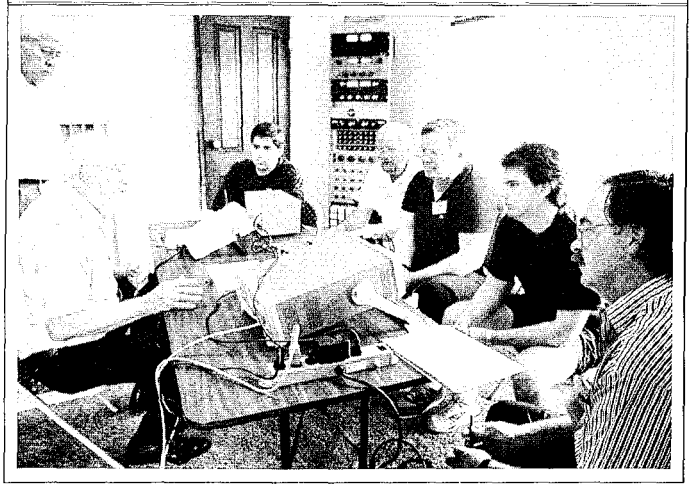
Taking any of these steps for granted can lead to well hidden system problems that often elicit well intentioned, but never-the-less, witchcraft remedies by some entertainers' "sound expert." In a rebellious age disproportunate awards go to the disciplined and patient worker.

# *Vic Hall – A Master of the Craft*

Vic Hall of San Diego, CA, came to visit the farm just prior to the Indianapolis 500 and participated in teaching the May class while he was here. This is a man we greatly admire and treasure as a long time friend. Vic has hiked the length of the West Coast mountains from Mexico to Canada. As a successful business man he was found ringing a Salvation Army bell in the pouring down rain for one of their Christmas drives. Vic has been one of the key prime movers in the growth of the NSCA.

I'm interested to see all these qualities reflected in his face as he talks to the class. Vic and his wife, Mary, have raised a successful family and are a happily married couple. It's awe inspiring to contemplate the experience behind that warm friendly smile. Vic and his brother, Max, started and owned, with partner Pete Jordan, Communications Co., in San Diego until he retired. Many of our readers know him for the $RT_{60}$ meter, the RTA for under $1000, the new SP Speech Processor and a host of other practical and useful products.





# Site Survey

Existing construction as opposed to new construction offers many advantages in terms of system design. The designers can measure rather than calculate the key parameters that will directly affect his system. These parameters are:

1. The reverberation time, $RT_{60}$
2. The ambient noise level $L_{AMB}$
3. The room geometry

**REVERBERATION TIME, $RT_{60}$**

I often measure the critical distance, Dc as a substitute for $RT_{60}$. When one measures $RT_{60}$ for sound system design purposes, it is usually to obtain a realistic estimate of the total absorption Sa that is in the space.

Measuring the Dc with a loudspeaker whose Qs are known for the various octave bands yields the same accuracy data on Sa

$$Sa = \frac{(D_c)^2}{(0.141)^2 Q}$$

The total absorption is used in the Hopkins Stryker equation along with source Q, $L_W$, and the 'N" factor to determine the level of the reverberant sound field $L_R$.

**AMBIENT NOISE LEVEL, $L_{AMB}$**

Since not only the sound system is exciting the $L_R$ but also the $L_{AMB}$ which, on occasion, can be significant, it is necessary to have accurate knowledge of its level. The $L_D$ from a sound system at any point in the audience area is simply a matter of using inverse square law from its sensitivity reference distance at an input power suitable to the use of the system. The measured $L_R$ is merely a matter of making your measurement well beyond Dc.

**THE ROOM GEOMETRY**

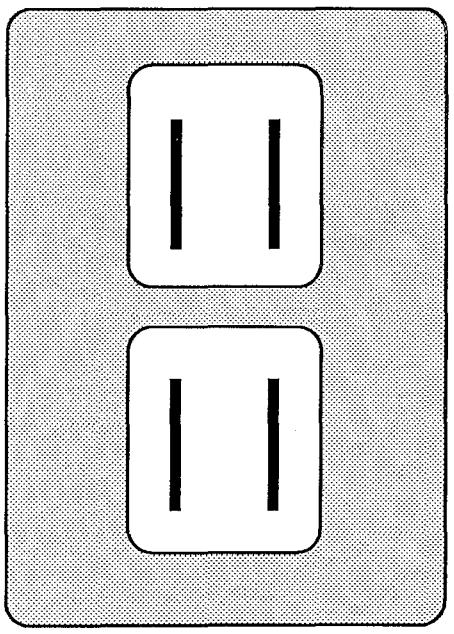
Whenever the audience area is small compared to the total surface area your job will be easier. Whenever the angles from the talker to the audience area does not exceed 120°, your job will be easier. (The human voice in the vital 2 KHz region is approximately 120° horizontal by 90° vertical).

Domes, curved rear walls, curved balcony fronts are hazards to regard with extra care. Lucky is the designer who can control $L_{AMB}$ and Sa to exactly the values required to match the acoustic output of the human voice to reach the last seat unaided.

In this enlightened age, the use of diffusors (specifically quadratic residue diffusors) have allowed creative and easier correction of undesirable room geometry.

**MAN'S FOLLY**

Interestingly, most serious intelligibility problems we have observed are a result of misdesign of the sound system. These mistakes are aided and abetted by manufacturers promising a variety of anti-gravity measures for their products. Design by catalog numbers is a sure sign of incipient incompetence. Design by required function disciplined by performance parameters and criteria signifies a professional design attempt.



# *Want to check a Wall Socket for dc ? Use a TEF 20HI*

At a recent Workshop, we arranged evening sessions for members of the class to work informally at the Stonehenge Motel.

They worked the first night in one room, but the hotel moved them to a different room for the second night. They plugged in a TEF 20HI. It blew! They plugged in a second TEF 20HI. It blew! They THEN discovered that the socket was dc. The dimmer switch circuit connected to a wall socket. The mental bulb that finally lit must have been neon.

The happy news is that the fuses blew in both TEFs, and secondly, I have a perfect illustration for the classes of why one MUST test a strange wall socket before plugging in anything - especially a valuable piece of equipment.

# "While We May Be Getting Closer, We're Nowhere Close To Actually '"Being" There.

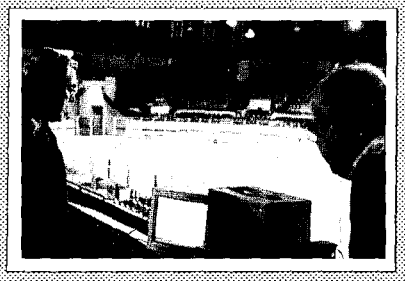
The July issue of Audio Magazine printed an interview with Heitaro Nakajima who is introduced as "one of the founding fathers of digital audio. It is an interesting article, but it is the final Question and Answer that I would like to quote here:

Question: "Do you think audio technology will ever improve in its ability to convey the live music experience?"

Answer: "I believe it will remain quite difficult for us to ever achieve this so-called "musical reality." For although we are improving our ability to simulate key sound-field characteristics with more sophisticated digital signal-processing techniques, it must always be remembered that these are only simulations, with far fewer aural cues than the actual live musical experience. *While we may be getting closer, we're nowhere close to actually 'being' there."* (Italics mine.)

## What History Looks Like

These pictures are a snap shot of history. They show Don, Gene Patronis, Fred Fredericks and Kevin Mecks in the process of testing what was to become Altec Acousta-EQ (pronounced Acousta-Q). What we needed for the test was a large system in a large room. John Royer supplied the coliseum at the Indiana State Fairgrounds for a test site. Dr Patronis proceeded to show us all how it's done. In the picture where Gene is wearing his hat he's saying to Don, "Elementary, Watson , Elementary!"



## We Agree

The Syn-Aud-Con bumper sticker approval committee has awarded the following bumper sticker our award of the month:

"As long as there are tests in schools, there'll be prayer in schools".

# Cause & Effect According to Dirac

P. A. M. Dirac has been attributed with the following quote:

"I completed my course in engineering and I would like to try to explain the effect of this engineering training on me. Previously, I was interested only in exact equations. It seemed to me that if one worked with approximations, there was an intolerable ugliness in one's work and I very much wanted to preserve mathematical beauty. Well, the engineering training which I received did teach me to tolerate approximations and I was able to see that even theories based upon approximations could have a considerable amount of beauty in them...

"I think that if I had not had this engineering training, I should not have had any success with the kind of work I did later on because it was really necessary to get away from the point of view that one should only deal with exact equations and that one should deal only with results which could be deduced logically from known exact laws which one accepted, in which one had implicit faith. Engineers were concerned only in getting equations which were useful for describing nature. They did not very much mind how the equations were obtained....

"And that led me, of course, to the view that this outlook was really the best outlook to have. We wanted a description of nature. We wanted the equations which would describe nature and the best we could hope for was usually approximate equations and we would have to reconcile ourselves to an absence of strict logic."

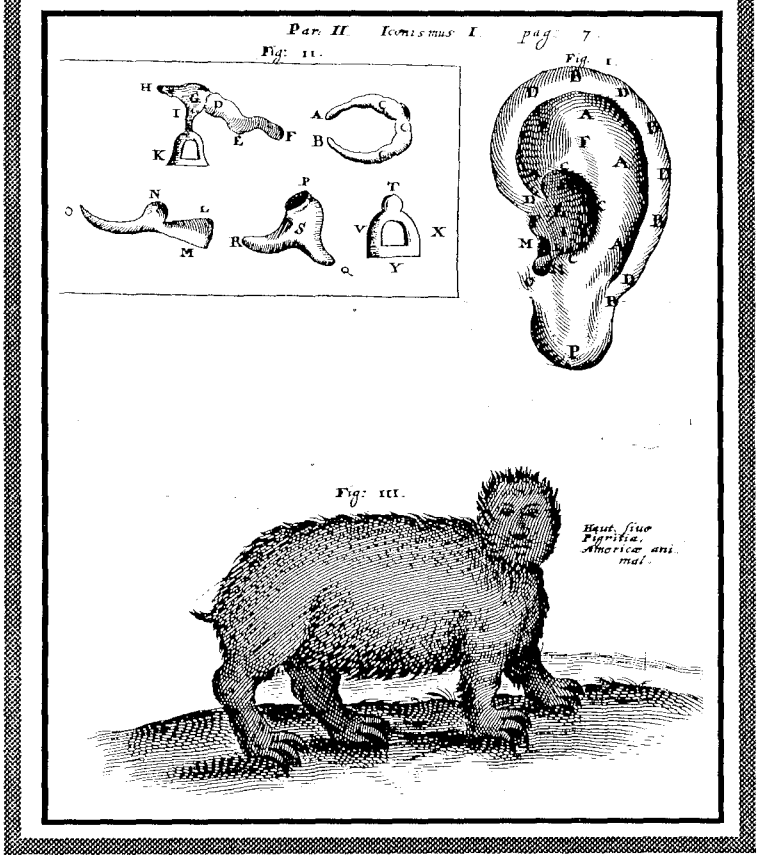
We believe that those attacking Heyser's work need to reflect upon the fact that detailed mathematical definitions (that incidentally are not accepted in Physics) are not and will not be accepted by us as viable arguments against Heyser's work.

We suggest that innocent bystanders reflect on the fact that Dick Heyser said, "When your theory conflicts with nature it's best to stick with nature." We are measuring nature in new and far more accurate ways than has previously been done, and we all benefit daily from Dick's work whereas Dick's critics, even in "critical mass", have produced nothing.

# Magia Universalis 1657

We have a neat book written in Latin, *Magia Universalis*, written by Gaspare P. Schotto, published in Herbipoli in 1657.

We would like to start sharing a few illustrations from the book. Here we have, for the period, a remarkable dissection of the hammer, anvil and stirrup from the ear; a detailed description of the pinna; and an interesting beast labeled "Americae animal," no doubt intended to slow down immigration.



# "Where Would You Like the Back Door?"

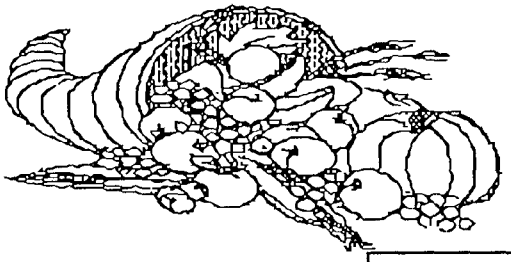
Many or our readers have indicated that they like to hear how the farm is doing. This year just happens to be the most beautiful one we have experienced since moving back to Indiana. The rains came late but beautifully spaced with just the right amounts. The streams are flowing, the corn growing, and the deer herd enjoying all the "set a-side" pasture.

We cut a bunch of new motorcycle trails in the large pasture enclosed by woods as well as made a spot for the motorhome to use for camping out at the back of the farm.

Northern Indiana has experienced a drought year so far, as well as a totally unexpected mid June frost. Southern Indiana is being blessed with abundant rainfall, cool nights and warm days.

Just a few mornings ago Carolyn and I were driving to one of the back fields to pick up some straw and spotted what looked like a medium sized dog. It turned out to be a young fawn, which after watching us for awhile, showed us its "flag" and bounced away.

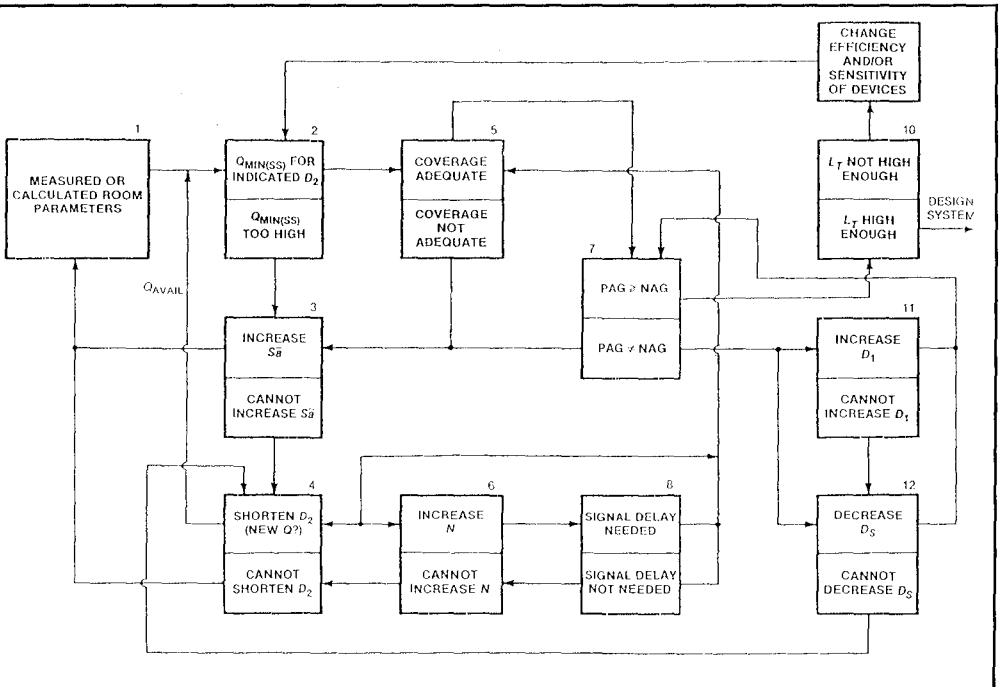
Talking about country stories, we like one Jim Carey tells about the sound man visiting a remote southern church to set up a sound system. When the Pastor brought out a box of snakes and placed them between him and the front door, this sound man asked him where the rear door was. The Pastor replied there wasn't one. To which the sound man replied, "Where would you like one?"



# By Your Fruits Ye Shall Know Them

We receive many requests to comment on currently available sound system design programs. We largely refrain because while a majority of them are incomplete, they all have portions that are useful. Any program that is missing any of the blocks on this diagram can be judged as incomplete. The three most common omissions we encounter are:

1. Cannot calculate acoustic gain
2. Cannot account for the effect of 'N'
3. Does not compute the electrical gains and losses from the microphone to the loudspeaker.




Flowchart for sound system design.

We still await the complete program and in the meantime continue to use Farrel Becker's program for most of the work we do. ($30 plus $2.50 handling charge.) Farrel's program was written for Quattro Pro but will run on Lotus 123 or Excel. You can contact Farrel at 7915 Warfield Rd., Gaithersburg, MD 20879. Phone 301-977-5633.

# Enablers or Disablers?

Most people are far more talented than they realize. Given encouragement and guidance, if needed, most of us can achieve more than we would if left entirely to our own resources.

When one human being meets another human being they have a choice of liking or disliking the other person. Experience teaches us that if we allow time to explore the background and the capabilities of the individual before forming an initial judgment, the odds for liking them is greatly enhanced.

Once we have established communication, one of the great thrills in life is the opportunity to "enable" them to utilize some talent they possess.

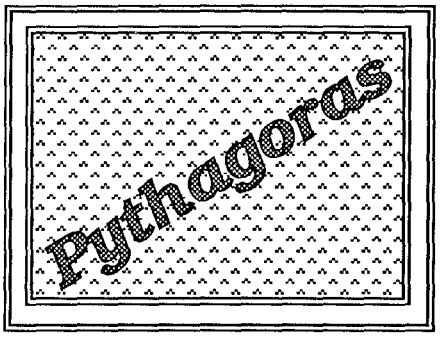
There are some individuals, fortunately quite rare really, that instead seek to disable talent or suppress another's free expression. These we avoid as best we can.

How do you go about "enabling"? Well, first of all, honestly. You look for talent with your whole heart because its discovery is exciting. When identified, you appreciate it, encourage it, and support it.

Quite often the operating principle is that one of your talents joined with the other individual talent becomes something bigger for both of you. When it's realized that each of us are programmed by our own unique background and that every other human being has his or her own unique background, then each contact with another person contains the potential for increasing both backgrounds.

It's true that most of us are more comfortable with persons having similar backgrounds - but oftentimes real breakthroughs can occur from interfacing with radically differing backgrounds. In those cases where our backgrounds are truly likely to be beneficial we are the enablers - if the other party wishes it. If the other person's background is superior we'll feel it and if we are willing we can learn from it.

---




Probably the most used mathematical tool in solving "real life" problems in audio and acoustics is Pythagoras Theorem. This half-mythical figure (569? - 500? B.C.) was the first to import proof into mathematics. It is said that he died in the flames of his own school fired by political and religious bigots who stirred up the masses to protest against the enlightment which Pythagoras sought to bring them.

Most of us first met the Pythagoran equation in early high school:

$$c = \sqrt{a^2 + b^2}$$

The demonstration I always liked the best was that of building a square on each side of the triangle whose dimensions were that of the side it was on. In the illustration shown here Side A = 6 units which results in a square having 36 units in it. Side B = 8 units resulting in a square containing 64 units.

If we add the square units associated with each of these two sides we get:

$$36 + 64 = 100 \text{ units}$$

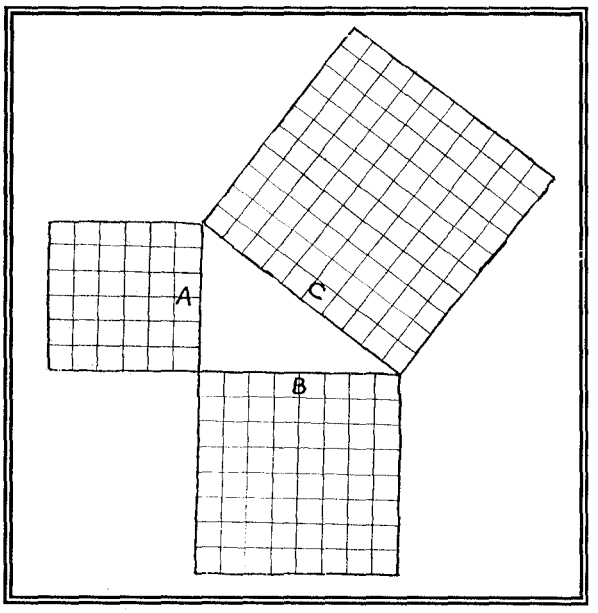
If we then make Side C into a square, lo and be-

$$6^2 + 8^2 = 10^2$$

so $\sqrt{6^2 + 8^2} = 10$

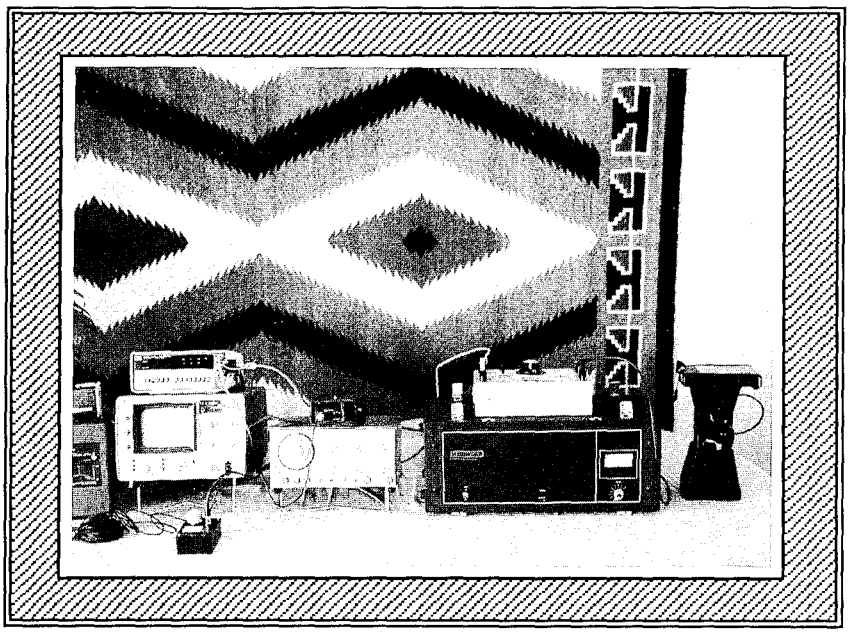
hold, it contains 100 squares and, of course, the square root of 100 is 10 so Side C is 10 units long

Since we use this marvelous relationship for impedance measurements, phase measurements, and audio power calculations we should enshrine it in read only memory.




The great despair in Pythoraras life was the discovery of $\sqrt{2}$ the in the process of using this technique - a unit without a number - an unending series. Since Pythagoras thought God was a number this was akin to Auda abu Tayi saying about Lawrence to Sherif Nasir in Lawrence of Arabia, "He's not perfect - there was no gold in Akaba."

# Early TDS



Digging through some old files, I came across our original TDS (Time Delay Spectrometry) lashup. It consisted of an H.P. Spectrum Analyzer (swept sine wave type) modified to allow a vernier controlled, substitute I.F. oscillator, to be injected. Varying the I.F. frequency caused the relative time offset between Send and Receive.

The setup shown here was at our old home in Rancho Carrillo, CA, in the late 1970s. James Moir from England was visiting us at the time and we set it up for him to see what we were doing.

All we can say now is that we have come a long way.

# More on Sound Fields

To make skillful use of measuring microphones you need to know both which sound field you may want to put them in or which sound field circumstances are forcing you to put them in.

In a given acoustic environment there can be many different sound fields. Looking at the illustration the talker can be driving a direct sound field to the microphone and a reverberant sound field at the listener with his live voice.

The sound field back from the reinforcement system to the talker can be:

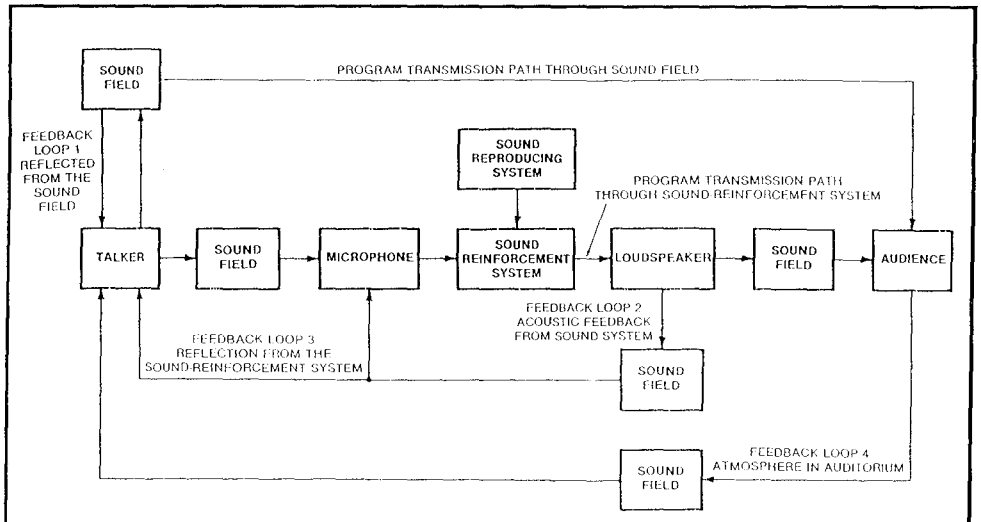
1. Direct $D_1 < D_C$
2. Early reflected $D_1 = D_C$
3. Reverberant $D_1 > D_C$

The sound field from the loudspeaker system to the listener is usually either semi or fully reverberant but outdoors could be a direct sound field.

The audience provides a reverberant sound field back to the talker (applause, laughter, etc). There can be monitors that give the talker direct sound and nearby listeners further away get reverberant sound from that monitor.

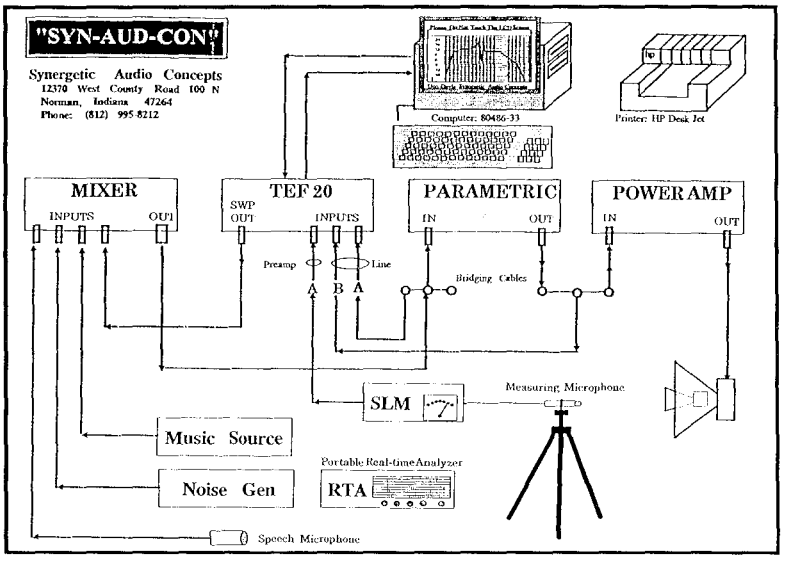
To measure reverberation the source and the microphone *must* be separated by at least 2 $D_C$. To properly equalize a sound system you *must* be able to watch the direct sound response and it is useful to also observe the interaction between the changes you make in the direct sound field on the total sound field, (direct, early reflected and reverberant combined).

What's reverberant to an omni measuring microphone may be direct sound field to the in-the-ear microphones. There are few instruments more valuable than a TEF analyzer with its ETC measurement to actually see what kind, quality, and quantity of sound field your microphone system is in.




Example of the multiplicity of sound fields that can affect how you choose to equalize.

# Hooking It All Up




Testing a modern sound system has gradually grown more involved than in the past. The use of two channel analysis as well as simultaneous monitoring of equalizers and transducers during performances, by means of the transfer function, requires multiple interconnections to the systems under test.

Each point where a connection is made needs to be a non-interacting bridging connection. This often requires transformer isolation, built outs, and in some extreme cases, active circuit isolation techniques.

The basic idea is to read only the difference between an input point and an output point at chosen points within a complex system.

One setup is shown in the illustration. In this case, we are measuring the electrical response of the equalizers, the raw response, and the equalized response.

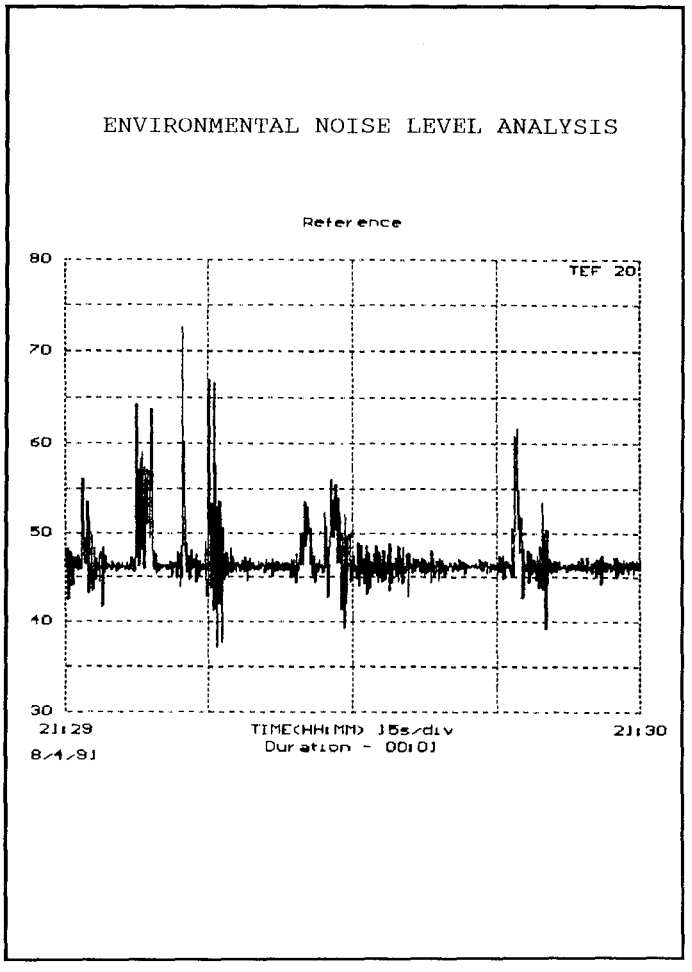
It would behoove manufacturers to give serious consideration to providing these isolated points (with BNC Connectors) right at the input and output of their devices. This is especially important for all signal processing devices.

Illustration by Fred Fredericks.

# Noise Level Analysis

Want to study various forms of musical technique, style and interpretation? Try NLA on the material. Dynamic range falls out automatically as does the Leq for the listener.

Setting the $L_{(10)}$, $L_{(20)}$... can be a fascinating way to compare orchestras, pianists, and singers. NLA had different purposes in mind, but what does that have to with anything?



# More on Noise Criteria Curves

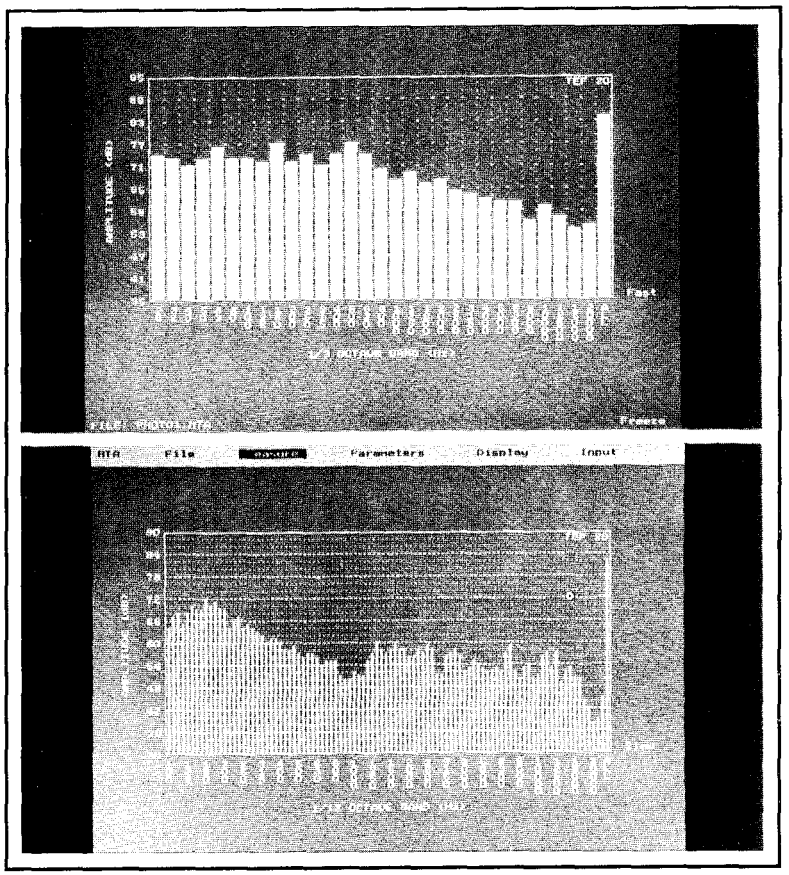
Considering how many churches, auditoriums, and music halls exceed NC 50 (at least the ones we are called in to look at) it is perhaps time to review again what NC levels are desired for good results. (This is a more detailed version of the NC Chart in Tech Topic 18 N5).

One of the few places where NC 50 is acceptable is in public toilets. We sincerely hope that placing this table in front of your local architect, building committee, or other decision maker will encourage fewer acoustic toilets.

TABLE 17-1 Ranges of Indoor Design Goals for Air-Conditioning System Sound Control

| Type of Area | Range of A-Sound Levels, dB | Range of NC Curves |
|---|---|---|
| Residences | | |
| Private homes (rural and suburban) | 25-35 | 20-30 |
| Private homes (urban) | 30-40 | 25-35 |
| Apartment houses, 2- and 3-family units | 35-45 | 30-40 |
| Hotels | | |
| Individual rooms or suites | 35-45 | 30-40 |
| Ball rooms, banquet rooms | 35-45 | 30-40 |
| Halls and corridors, lobbies | 40-50 | 35-45 |
| Garages | 45-55 | 40-50 |
| Kitchens and laundries | 45-55 | 40-50 |
| Hospitals and Clinics | | |
| Private rooms | 30-40 | 25-35 |
| Operating rooms, wards | 35-45 | 30-40 |
| Laboratories, halls and corridors, lobbies and waiting rooms | 40-50 | 35-45 |
| Washrooms and toilets | 45-55 | 40-50 |
| Offices | | |
| Board room | 25-35 | 20-30 |
| Conference rooms | 30-40 | 25-35 |
| Executive office | 35-45 | 30-40 |
| Supervisor office, reception room | 35-40 | 30-45 |
| General open offices, drafting rooms | 40-55 | 35-50 |
| Halls and corridors | 40-55 | 35-55 |
| Tabulation and computation | 45-65 | 40-60 |
| Auditoriums and Music Halls | | |
| Concert and opera halls, studios for sound reproduction | 25-35 | 20-25 |
| Legitimate theaters, multi-purpose halls | 30-40 | 25-30 |
| Movie theaters, TV audience studios, semi-outdoor amphitheaters, lecture halls, planetarium | 35-45 | 30-35 |
| Lobbies | 40-50 | 35-45 |
| Churches and Schools | | |
| Sanctuaries | 25-35 | 20-30 |
| Libraries | 35-45 | 30-40 |
| Schools and classrooms | 35-45 | 30-40 |
| Laboratories | 40-50 | 35-45 |
| Recreation halls | 40-55 | 35-50 |
| Corridors and halls | 40-55 | 35-50 |
| Kitchens | 45-55 | 40-50 |
| Public Buildings | | |
| Public libraries, museums, court rooms | 35-45 | 30-40 |
| Post offices, general banking areas, lobbies | 40-50 | 35-45 |
| Washrooms and toilets | 45-55 | 40-50 |
| Restaurants, cafeterias, lounges | | |
| Restaurants | 40-50 | 35-45 |
| Cocktail lounges | 40-55 | 35-40 |
| Night clubs | 40-50 | 35-45 |
| Cafeterias | 45-55 | 40-50 |
| Stores retail | | |
| Clothing stores, department stores (upper floors) | 40-50 | 35-45 |
| Department stores (main floor), small retail stores | 45-55 | 40-50 |
| Supermarkets | 45-55 | 40-50 |
| Sports activities—Indoor | | |
| Coliseums | 35-45 | 30-40 |
| Bowling alleys, gymnasiums | 40-50 | 35-45 |
| Swimming pools | 45-60 | 40-55 |
| Transportation (rail, bus, plane) | | |
| Ticket sales offices | 35-45 | 30-40 |
| Lounges and waiting rooms | 40-55 | 35-50 |

# TEF 20 RTA

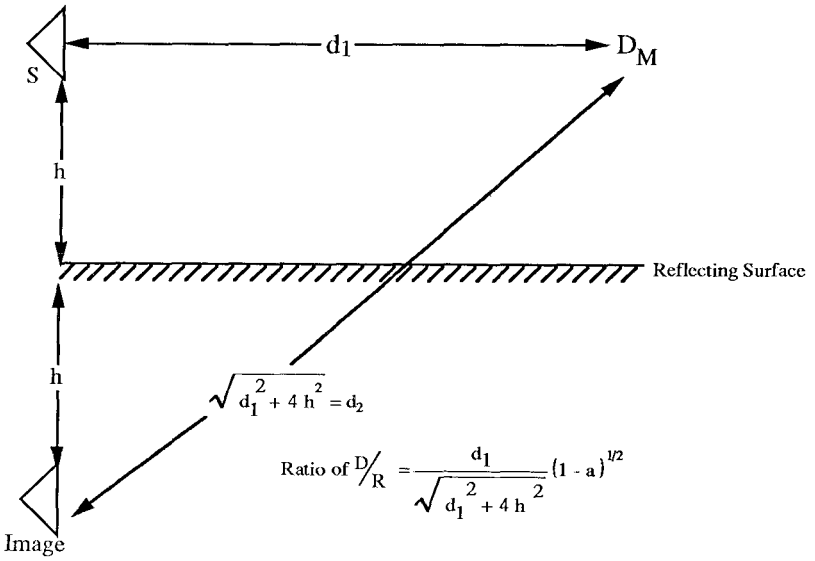



With Sound Lab RTA, measurements can be made at 1, 1/2, 1/3, 1/6, and even 1/12 octave bands, while collected data can be viewed in 3, 6, or 12 dB per division increments. For storage purposes, six sets of non-volatile memory are provided. 1/3 and 1/12 octave measurement modes are shown above.

The real time analyzer program for the TEF 20 Sound Lab RTA has instantly become our favorite real time. We now await, impatiently, the dual channel version for use with our SDM technique.

# Reflections

Once in a rare while it is useful to be able to find the expected effects from a discrete reflection. The equations allow the rapid, easy calculation of the frequencies of the first peak and the first null caused by the reflections' influence on the direct sound, as well as the ratio of direct-to-reflected sound.




$$\text{Ratio of } D/R = \frac{d_1}{\sqrt{d_1^2 + 4h^2}}(1-a)^{1/2}$$

when: $\sqrt{d_1^2 + 4h^2} - d_1 = \frac{2N-1}{2}\lambda$ (One half wavelength)

Signals cancel

when: $\sqrt{d_1^2 + 4h^2} - d_1 = N\lambda$ (One wavelength)

Signals add in phase

$$\text{Therefore: First notch} = \frac{0.5c}{d_2 - d_1}$$

$$\text{First peak} = \frac{c}{d_2 - d_1}$$

Where: c is the velocity of the media


**AVAILABLE:** 21 years of experience in the sound reinforcement industry. Roger Carroll, formerly marketing manager with IRP, has enormous experience. He started work at IRP when sales were $250,000 per year, now in the millions. **CONTACT:** Roger Carroll, 508 Braeside Drive, Arlington Heights, IL 60004, 708-259-8822.


## My Spell Checker

I have a spelling checker
It came with my PC;
It plainly marks four my revue
Mistakes I cannot sea

I've run this poem threw it
I'm sure your please too no
I'ts letter perfect in it's weigh
My checker tolled me sew

From Joe Mitchell

# Manufacturer's

# Training Seminars

Manufacturers recognize that sound systems are becoming very complex, requiring training for both the sound contractor and the end user.

Altec started annual meetings with sound contractors, consultants and their clients in 1959. Those meetings, which still take place each year, are a combination of technical training and product information.

Many companies now hold such meetings either annually or biannually, but there are only a few that hold intense two or three day training classes in which you are given tests to help you measure your comprehension and it helps the manufacturer reinforce what they want you to retain from their investment. Manufacturers of very hi-tech products are literally forced to such training sessions. Rauland Borg have held such classes for years for their school and hospital systems.

**IED - The Originator of Computer Controlled Sound Systems**

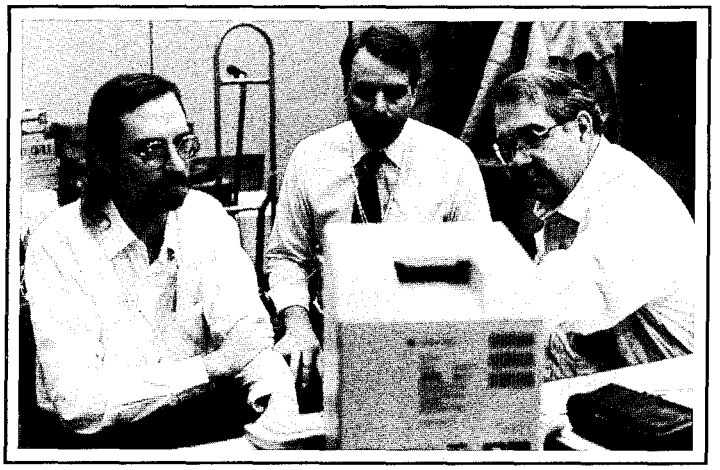
The first such training class that we attended was IED in 1990. They have a dedicated training room for 20 audio professionals in their facility in Louisville. The IED family embraces you with old fashion hospitality, whether they are feeding your brain or your body at the likes of Col. Sander's original restaurant after a drive through the beautiful horse country between Lexington and Louisville.

They don't tell you in advance that there will be a review "test" just before lunch the first day (and at the end of the day and before lunch the next day) but believe me following the first "review" they have your attention! You know that they expect to have a return on their investment in you. It is an open book test as they are not testing your memory capability but your ability to find the answer when you need it in their overflowing manual. Your test is on the table upside down when you return from lunch. Then, each question is discussed. You know what you have missed and what the correct answer is.

When you receive your invitation from IED to be one of the 20 audio professionals attending the next class, don't hesitate.

**Techron and the TEF Analyzer**

Techron introduced the TEF 10 in 1982. We conducted several "on location" TEF workshops but about 1987 Techron recognized that they needed specific classes for the basics of "how do I turn the machine on, make the first measurement, and what does that measurement mean?" Farrel Becker was hired on contract to prepare the manual and teach introductory TEF classes. He has been very successful. And he should be. He owned one of the first TEF anaylzers shipped, writes programs for the TEF, wrote the instruction manuals and is a wonderful communicator.



**Crown International & the IQ 2000**

Crown is the new entry into training classes for their innovative IQ2000 series.

We attended a class in early March in South Bend. Twenty people must be the ideal number because that was the number Crown had - a good mix of sound contractors, consultants and end users - all people with whom one is delighted to spend a couple of days. One real strength of the Crown class was their use of the people attending. People who had made major use of the IQ2000 system shared their in-the-field experiences. It all gave you the feeling of the power behind the IQ2000 series.

Crown had competent, enthusiastic instructors in a convention center meeting room - never as nice as your own training facility but none-the-less a good environment.

**Videos From Manufacturers**

Manufacturers that are small but want their message to reach their customers and their clients are turning to in-house videos. We have seen two videos: one distributed by J. W. Davis from Music Supply Company in Dallas - an informative video on the use of their products. The most recent one is from BIAMP. Ralph Lockhart, president of BIAMP, starts the tape and the straightforward honesty and openness you see is the real Ralph. He's proud of his company's products, people and positioning in the market place and we might add, rightfully so.

It's a brief tape that quickly shows you key people, key jobs, and their key management posture towards the market place. If you haven't met these folks before, you will want to after viewing this tape. Contact Ralph Lockhart at BIAMP, 14270 N W Science Park Drive, Portland, OR 97229 503-641-7287, FAX 503-626-0281.

# *Professional Services*

Acoustical Consultants may list their cards on this page. There is no charge. The only requirements are that you are a full-time consultant, that you have attended a Syn-Aud-Con seminar, and have an active subscription to the Syn-Aud-Con Newsletter. If you would like to be on our Consultants page, send in four (4) business cards for our file.

Orfield Associates Inc. Architectural Technologies

2709
East 25th Street
Minneapolis
Minnesota
55406

Richard G. Pierson
Acoustics
612
721-2455

---

**LARRY ELLIOTT ASSOCIATES LTD**

Consulting in Electroacoustics and Audio Visual System Design

Larry J. Elliott

P O Box 66-050 Beachhaven
Auckland 10
New Zealand

22A Tramway Road, Beachhaven
Telephone: 64 9 482-0772
Facsimile: 64 9 434-551

---

**Towne, Richards & Chaudiere, Inc.**
**Consultants in Sound and Vibration**

**Herbert T. Chaudiere**
Vice President

105 NE 50th Street Seattle WA 98105 206/523-3350

---

AMERICAN ACOUSTICAL ASSOCIATES

*KENNETH B SCOTT, P.E.*

P.O. Box 987
Powell, Ohio 43065
614/889-2899

- ARCHITECTURAL ACOUSTICS
- INDUSTRIAL NOISE CONTROL
- COMMUNITY NOISE EVALUATION
- SEMINARS & EDUCATIONAL PROGRAMS

---

J.E. Mitchell and Associates

*Electronic and Acoustic*
*Design, Analysis and Measurement*

Telephone
(205) 823-9367

2500 Chatwood Road
Birmingham, AL 35226

---

RB SYSTEMS *ELECTRONIC SYSTEMS FOR THE PERFORMING ARTS*

ROLLINS "ROLLY" BROOK
*DESIGN CONSULTANT*

*5715 CALVIN • TARZANA • CA 91356 818•345•5419*
*FAX 818•708•7064*

---

**SIA Acoustics**

*Consultants in Acoustics*

**Sam Berkow**
*Principal Consultant*

514 Valencia Ave.
Dallas, Texas 75223

(214) 340-9601
fax: (214) 327-9539

---

Acoustical Design Group, Inc.

Consultants in Acoustics

**Ian R. Wolfe**
Principal

Executive West
6700 Squibb Rd., Suite 204
Mission, KS 66202

(913) 384-1261
FAX (913) 384-1274

---

LEWITZ AND ASSOCIATES
AUDIO AND ACOUSTICAL CONSULTANTS

JOEL A. LEWITZ PE

1505 BRIDGEWAY
SUITE 206
SAUSALITO
CA 94965
415/332-3434
FAX 415/332-3340

---

MJM

*MJM CONSEILLERS EN ACOUSTIQUE INC*
*MJM ACOUSTICAL CONSULTANTS INC*
*6555 Côte des Neiges*
*Bureau No 440*
*Montréal, Québec*
*H3S 2A6* *(514) 737-9811*

*MICHEL MORIN, M.O.A.Q.*
*DIRECTEUR*

---

Paoletti/Lewitz/Associates Inc.
ACOUSTICAL AND AUDIOVISUAL CONSULTANTS

KURT M. GRAFFY
CONSULTANT

40 Gold Street San Francisco 94133 (415) 391-7610
FAX (415) 391-0171

---

**Joiner Consulting Group**
acoustics • audio • visual • video

1184A West Corporate Drive
Arlington • Texas • 76006
Facsimile 817-633-5920
Telephone 817-640-7300

**Richard C. Zwiebel**
Principal Consultant

---

FRANCIS DANIEL

ACOUSTICAL CONSULTANT

201 WEST 89 ST. • NEW YORK, N.Y. 10024 • 212/874-0590
FAX SERVICE - 212/724-3785

---

**DIXON MEDIA SYSTEMS & DESIGN, INC.**

Specialist in Consulting and Designing of Systems and Facilities for Communication Needs

**Fred L. Dixon**
Chief Designer

**(517) 626-6794**
**FAX (517) 626-6795**
**13701 Hinman Road • Eagle, MI 48822**

---

**KMK**

7 Holland Avenue
White Plains, New York 10603
Telephone (914) 761-8595

**David L. Klepper**
Consultant in Acoustics

KLEPPER MARSHALL KING ASSOCIATES, LTD

---

**FARREL M. BECKER**

ACOUSTICAL CONSULTANT
SOUND SYSTEM DESIGN • TEF™ MEASUREMENTS

AUDIO ARTISTRY
7915 WARFIELD ROAD
GAITHERSBURG, MD 20879

(301) 977-5633

---

*Design*
*Consulting*
*(213) 665-0700*

*2041 N. Commonwealth Ave.*
*Suite 107*
*Hollywood, CA 90027*

***WILLIAM THOMAS STREIBLE***

*AUDIO • ELECTRONICS • CONTROL SYSTEMS • SPECIAL EFFECTS*
*ARENA • FILM • TELEVISION • THEATRE*

---

ACOUSTICS ELECTRONICS

EUGENE T. PATRONIS, JR.
PH.D.
(AAAS AES APS SMPTE)
SCHOOL OF PHYSICS
GEORGIA TECH
ATLANTA, GA 30332

BUS. (404) 894-5237

# Farm Classes 1992

As we write this, the July and August classes are full. That leaves only September and October for newcomers to come to the farm to have the Syn-Aud-Con experience in 1992. We finish our twentieth year in December and start on our twenty first year fuller of new ideas than ever before.

What's happening in our present classes reminds us of the early TEF classes where those who hadn't seen the new ideas were feeling left out of important developments. Our reason for existing remains the same today as at the beginning of Syn-Aud-Con -- solving acoustical & electro-acoustic problems efficiently. What's not the same are the tools we now have available to aid us in teaching and demonstrating these solutions.

Our new approach to Equalization builds on the past quarter century of experience we've been privileged to acquire in everything from filter design to measuring equipment to PZM techniques. We are now able to show you how to do precision equalization down to 25 Hz with 50 Hz resolution and no room interference.

We can introduce you to the measuring mindset and how to employ it in real life auditoriums, arenas, and other difficult acoustic venues. Here at the farm, class size vs instructor ratios allow you to "ask everything you ever wanted to know about audio and acoustics but were afraid to ask."

A word to any of you hoping for our return to the on the road classes: you wait in vain! We love this vast country of ours and always enjoyed our travel. When we ceased to enjoy travel, we stopped. We still enjoy teaching our classes and sharing the best of what is past and what is to come.

## May Farm Class

# SYN-AUD-CON SPONSORS

Syn-Aud-Con receives tangible support from the audio industry. Nineteen 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** | **Innovative Electronic Designs** |
| **BIAMP Systems, Inc.** | **Intersonics, Inc.** |
| **Community Light & Sound, Inc.** | **JBL Professional/UREI Electronics** |
| **Crown International** | **Klipsch & Associates** |
| **J. W. Davis Company** | **RPG Diffusor Systems, Inc.** |
| **Electro-Voice, Inc.** | **Renkus-Heinz Inc.** |
| **FSR, Inc.** | **Shure Brothers Inc.** |
| **HM Electronics, Inc.** | **TOA Corporation-Japan** |
| **IRP—Professional Sound Products** | **TOA Electronics** |
| | **West Penn Wire Corp.** |