

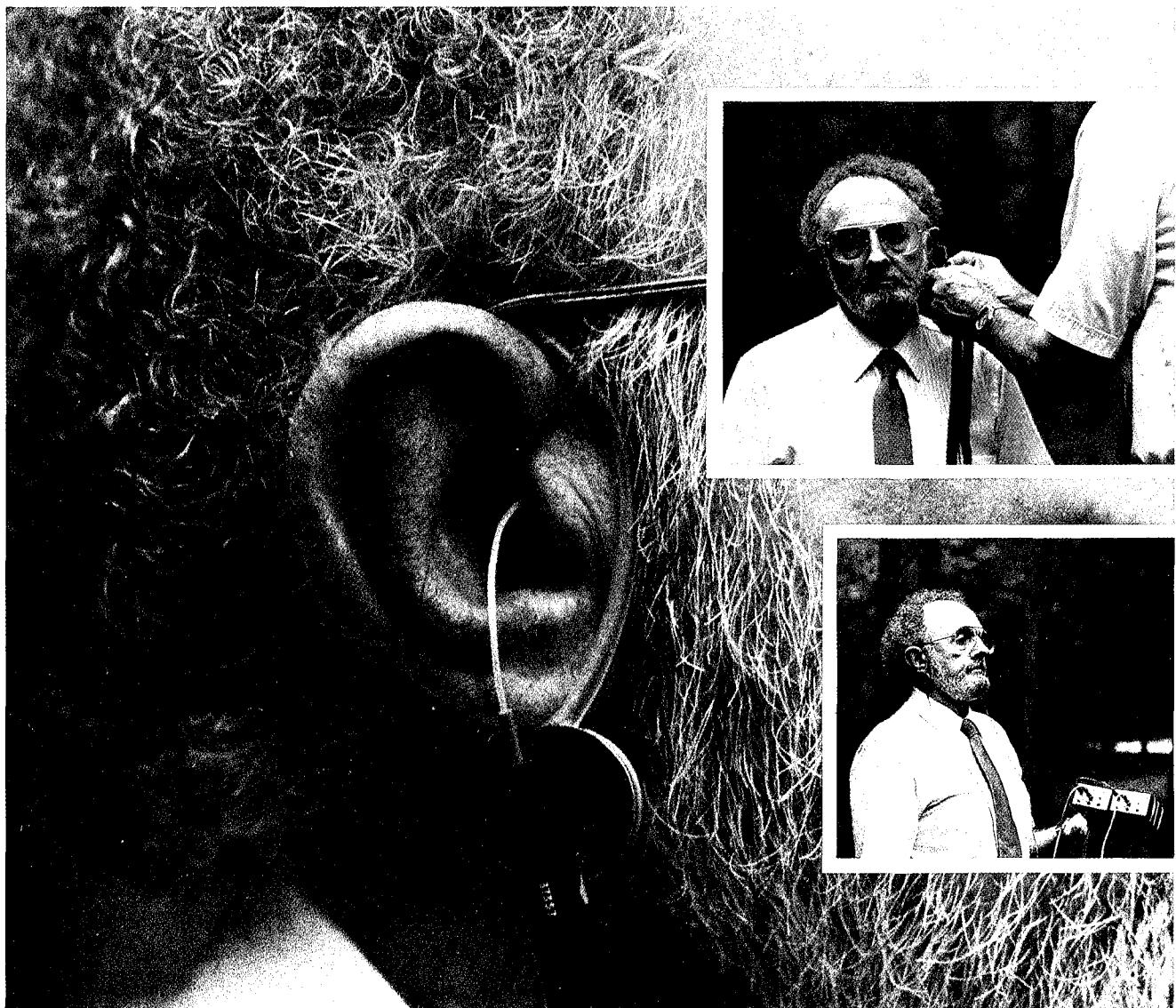
SYNERGETIC
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newsletter

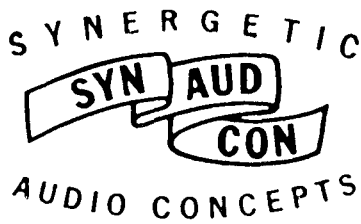
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FALL, 1988

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In The Ear (ITE™) Recording Being Made With a Probe Microphone in the Pressure Zone of the Eardrum



Ted Jones of Indiana University



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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Ted Jones is featured on the cover of our Newsletter. Recordings made with his head and ears resulted in remarkable spatiality in the playback material. Ted is in the School of Music at Indiana University and has given us much encouragement and cooperation in developing this new recording process. He may well become known as another "Indiana Jones."

This is a first view of a new technology. Those who remember how crude the first PZMs were or our early attempts at TEF measurements are now feeling the adrenal flow once again.

In-The-Ear recordings is something we feel may well become the standard way to record classical, country, folk and other music where being part of an audience is part of the thrill. Dummy heads are not new. Neither, for that matter, is recording with "live" heads. But, what may have been overlooked is the remarkable differences between human heads and outer ear structures and their relationship to how we hear musical events when seated in the midst of an audience. All the pieces have been partially investigated by many researchers—pinnae responses, head shapes, shoulder influences, the ear canal as a resonance, and much much more.

Schroeder's amazing work in the 1960's regarding surround sound via two channels was sufficient proof to any but the most ignorantly resistant that two channels were the maximum number needed. Indeed the human hearing system does that as well.

What has not been done is to work out a complete, practical system using two channels over loudspeakers in an ordinary room. (Schroeder's experiments required an anechoic chamber.) Loudspeaker manufacturers trying to imitate Schroeder's work, such as Polk, achieve surround illusion but not fidelity in geometry because it is not being recorded in the music they have to use as source material.

Much like our change in thinking as TEF analysis became available and we found that old ways were not necessarily optimum ways, our finding a way to record and playback true spatial geometry over loudspeakers has led us to a full appreciation of the utter inapplicability of standard microphony to record with realism. Using this new ITE (In-The-Ear) system employing deep ear pinnae acoustic response (PAR™) recording techniques we have for the first time in our lives witnessed listeners unable to tell a live talker from a recorded talker when the recording is played back and the talker on the recording is also present in the listening room. Once ITE recordings are heard, all standard two dimensional recordings truly sound flat.

In-The-Ear
(ITE™)
Recordings

Winter Workshops:



• Concert Sound Reinforcement and • Grounding & Shielding

Our winter workshops are in answer to repeated requests: When are you going to hold a workshop on Concert Sound Reinforcement and on Grounding and Shielding.

We are putting our staff together now as well as lining up the facilities to hold the workshops.

Concert Sound Reinforcement Workshop

The Concert Sound Reinforcement Workshop will be held on the west coast, January 17-19 (just ahead of the NAMM show in Anaheim.)

Our Workshop Chairman is Will Parry of Maryland Sound. I hope everyone realizes the significance of Will Parry as our Workshop Chairman. We have wanted to do this workshop for many years, but we could never get a really genuine leader in the industry to be the Workshop Chairman. Most said, when asked, "why should I give away what has taken me

so many years to learn?" That is what is remarkable about Will Parry. He wants to share!

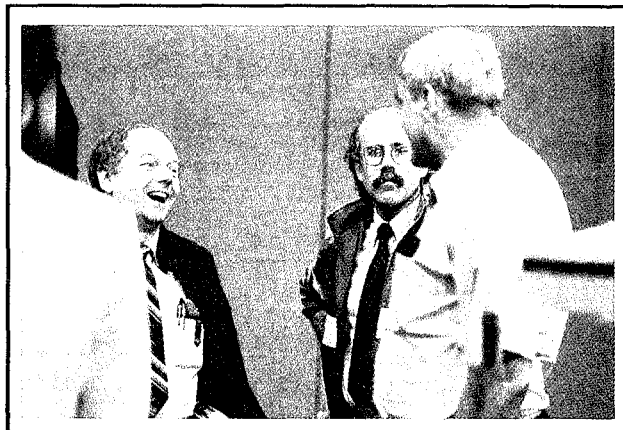
We remember Will Parry in our first class in Syracuse in 1974. He owned All American Sound at the time. It wasn't long after that we heard that he had joined Maryland Sound. In case you haven't been keeping track, Maryland Sound has made their way to the top three touring sound companies in the country.

We recently asked Will if he would be willing to put together this workshop. We were thrilled when he agreed - and I am not using that word lightly. We were thrilled because we know it will be a top notch experience —and a first. Syn-Aud-Con grads will be able to learn from the best in the industry. We will have a brochure in the mail to you soon with the important who, when, and where.

Will's staff for this workshop will be as follows: Albert Leccese, Audio Analysts; M. L. Procise, Showco; and Mick Whelan, Electrotec.

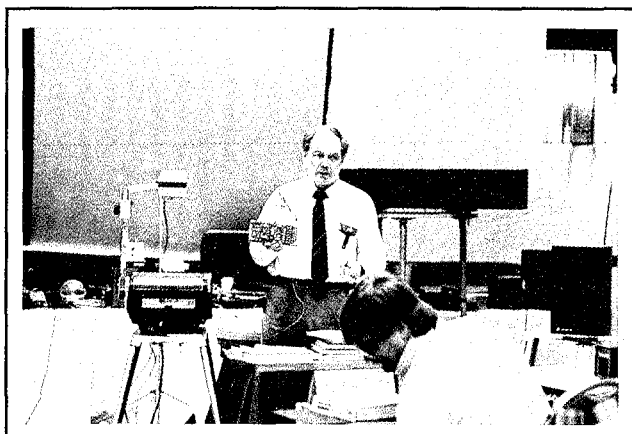
Grounding and Shielding Workshop

Allen Burdick, president of Benchmark Media Systems in Syracuse, will



be our workshop chairman. Allen is an exuberant human with a remarkable talent for audio design. Allen is also an excellent teacher with a keen interest in sharing knowledge with those of us needing his expertise. Having achieved a 1 dB noise figure in his microphone preamplifiers, he has an excellent appreciation of how to control unwanted signals. We are very pleased to have him head up our workshop on this important subject.

Allen wanted the very best talent for his staff. He has John Lanphere of Altec and Edward Lethert of SECO in Minneapolis. Both John Lanphere and Ed Lethert are well known for their knowledge of the subject. Our brochures on the workshops goes into much greater detail. ■



*Two
Pictures
that
Provoke a
Flood of
Memories*

I'm staring in shock at the ETC display unable to comprehend that all that complexity of display has resulted from a single sine wave sweep. I can still clearly hear Dick's replies to my questions,

"You mean that's 400 impulse responses all computed into their envelope?"

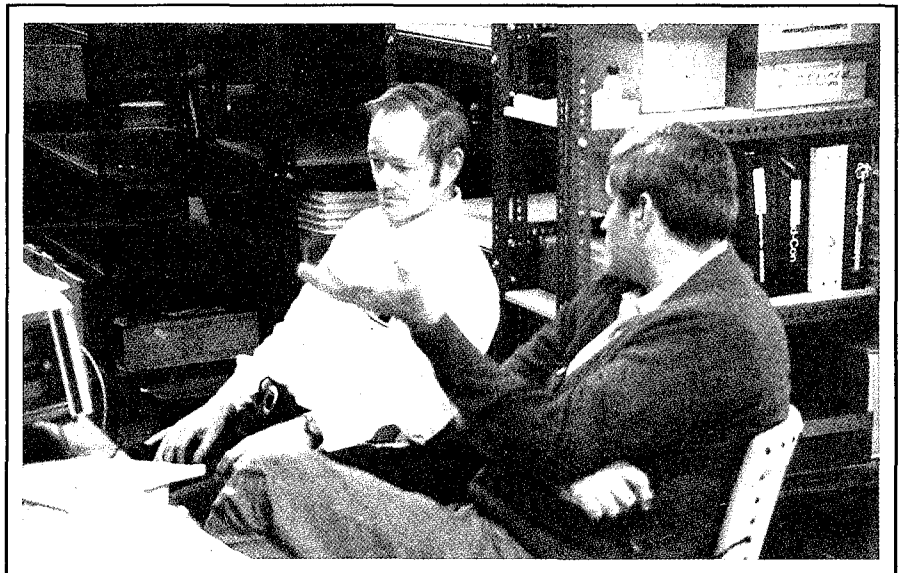
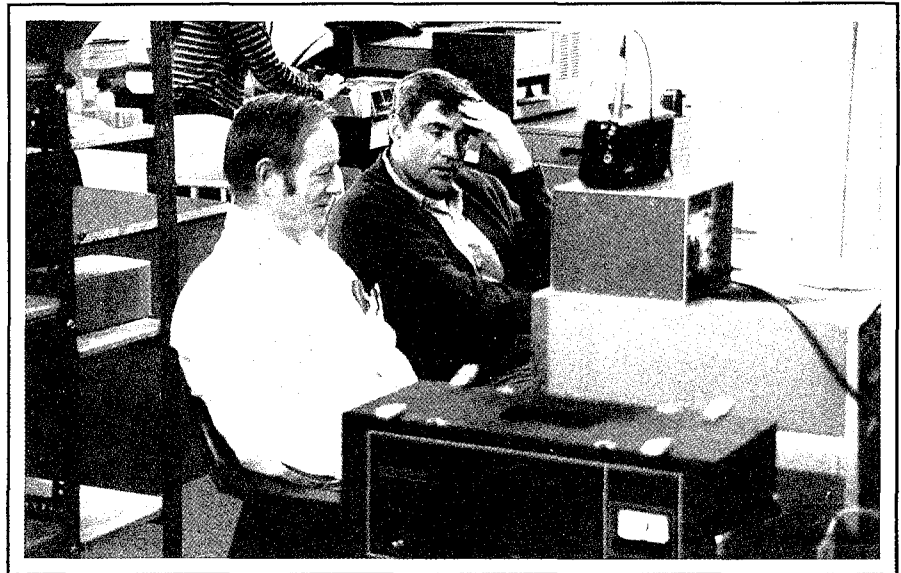
"Yup," he replied.

"You mean you can choose any of them and look at their frequency response?"

"Yup," he again replied.

Dick's "yups" were issued with such authority that when you asked him, "is there a God?" and heard the reassuring "yup", you truly believed him, -- though he called it "there is an Is."

Just ten short years ago - just think: no TEF, no polar ETCs, no "Twenty", no Pasadena meeting, no ten years of discovery yet to come -- and now -- no Dick physically with us, but surely omnipresent in our thoughts. ■



Here are two pictures that provoke a flood of memories.

In late 1978 we had invited Dick Heyser to conduct a special Workshop on what was then called TDS ("The Twenty" was the result.) Dick said that if he was going to conduct a workshop on TDS that he should show us "the next step beyond TDS." Carolyn took these pictures in our office in Tustin, CA in early 1979. Dick had driven down from Pasadena to show us how to convert our HP and GenRad analyzers into an energy time curve, ETC, measurement.

Modulation Fundamentals

In 1927, Harold S. Black, commuting to Bell laboratories (the old West St. Lab) on a Hudson River ferryboat, wrote out a solution to the problem of controlling negative feedback. By his invention Black made it possible to develop a difference signal between the input and output of an amplifier that could be reapplied at the input to correct the response of the amplifier. Thus Harold S. Black became a genuine legend in his own time.

Not everyone knows that Harold S. Black wrote a book called *Modulation Theory*. My copy is published by D. Van Nostrand Company, Inc. 1953. It is part of the Bell Telephone Laboratories series. In browsing through my copy recently I was struck by the following:

Voice Transmission Over an Airpath

"Nature deals with an acoustic radiation problem in speech transmission in a similar fashion (*Editor's Note: similar to the AM radio signals he has just described earlier*). This is doubly fortunate because the modulating wave is too low in frequency to be heard effectively by the human ear. The waves upon which modulation are imposed include buzz-like tones, generated by oscillation of the vocal cords, and hiss-like sounds that result when breath is forced past teeth or lips. The former are called 'Voiced Sounds' and the latter 'unvoiced'.

"These carriers are modulated by changes in tension of the vocal cords and changes in shape of the mouth cavities. Such changes are a result of muscular actions that occur at rates of the order of 10 cycles per second. In final speech the effects of modulation are evident in such things as syllabic structure and *frequency shifts that we recognize as inflections* (italics mine). Thus, information bearing signals, at a low frequency of several cycles per second, are modulated upon much higher audio frequencies and these become the sounds of speech we hear."

I would comment at this point that yes, we hear the effects of modulation as inflections, but that the presence or absence of modulation has nothing to do with intelligibility. Perhaps more investigation should go into "frequency shifts" mentioned above to see if the 2KHz band would contain any significant shifts that could be correlated to %ALcons.

We sincerely hope that the modulation transfer function MTF as proposed in current apparatus not be made into any kind of a speech intelligibility standard. ■

So You're Proud of Your High Impedance Voltmeter?

In the process of rewiring the 105 year old main house at our Indiana farm (this is the building we use as a laboratory and workshop facility) we encountered an interesting technical problem. Ernie Pence had wired me a 30 amp circuit out to where I park the motorhome. When I plugged the motorhome into it, we received no current. Getting out my 10,000 ohms per volt instrument I read the proper 110 volts at the receptacle. When Ernie read across the line he got 80 volts with his 20 ohms per volt instru-

ment. We checked both instruments on a known good line and they both read the same. At about this point having exchanged receptacles and tightened everything at both ends it suddenly dawned on us what the trouble was. The line would read okay without a load (i.e. my high impedance instrument). Ernie's instrument loaded it enough to drop voltage. The motorhome loaded it enough to shut it off. The culprit?—a corroded receptacle in a box that was in parallel halfway back to the main breaker. ■

TEF Analysis of Bass Cabinets by Mick Whelan

Mick Whelan of Electrotec Productions of Canoga Park, CA, has produced an important TEF analysis of low frequency behavior. This is the kind of work we find fascinating because the person measuring is taking nothing for granted and is doing classic investigations on their own.

Lord Rayleigh (1842-1919) was such an experimenter and those who follow truly in his footsteps, as amateur scientists probing the unknown in what is thought to be already known, have the thrill of discovering that what everyone might think "is so" is not.

Mick took a single bass cabinet and did a 3-D polar of it from 50 to 500Hz. He then produced a set of frequency vs angle curves (FAC). In Figure 1, each vertical "tic" is 10 degrees and each contour is 3dB.

Figure 2 has the same parameters but is two bass units side-by-side and closely coupled. The horizontal narrowing is very apparent.

Figure 3 is the most interesting to me, though not the purpose of the study. Here two units are side-by-side, but one of them is shorted (i.e., no acoustic output or appreciable cone motion.) The skewing of the pattern is significant.

The final figure is of the same two bass units separated by a mere six inches at the top. The lobing that results is more severe than I would have guessed if I had been presented the problem as a sample question.

It's obvious from the data shown here that Mick has shared his original "raw" data and the care with which he keeps notes and adjusts his apparatus is commendable. But, the part we admire the most is the care with which his detailed thought about what he wanted to investigate led to such a series of "its all in the pictures" result.

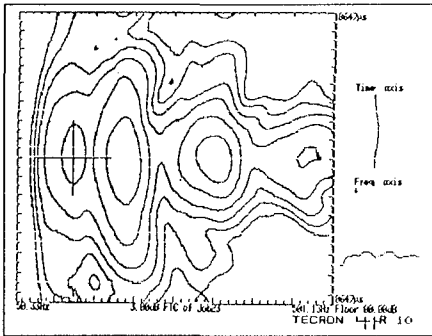


Fig. 1 BASS

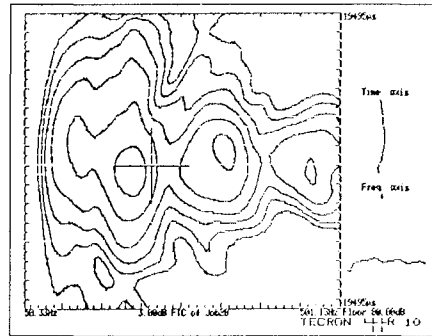


Fig. 2 BASS BASS

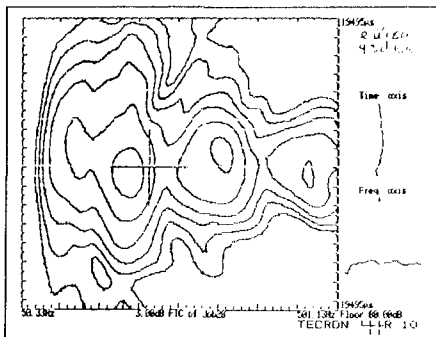
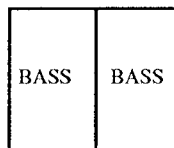


Fig. 3 BASS BASS (shorted)

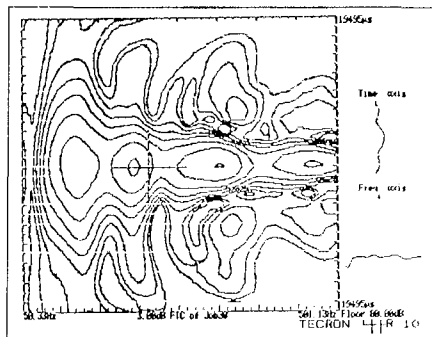
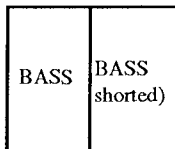
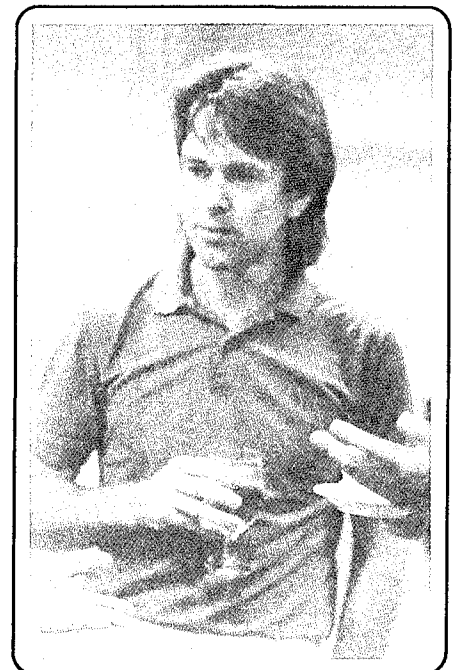
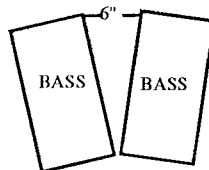


Fig. 4

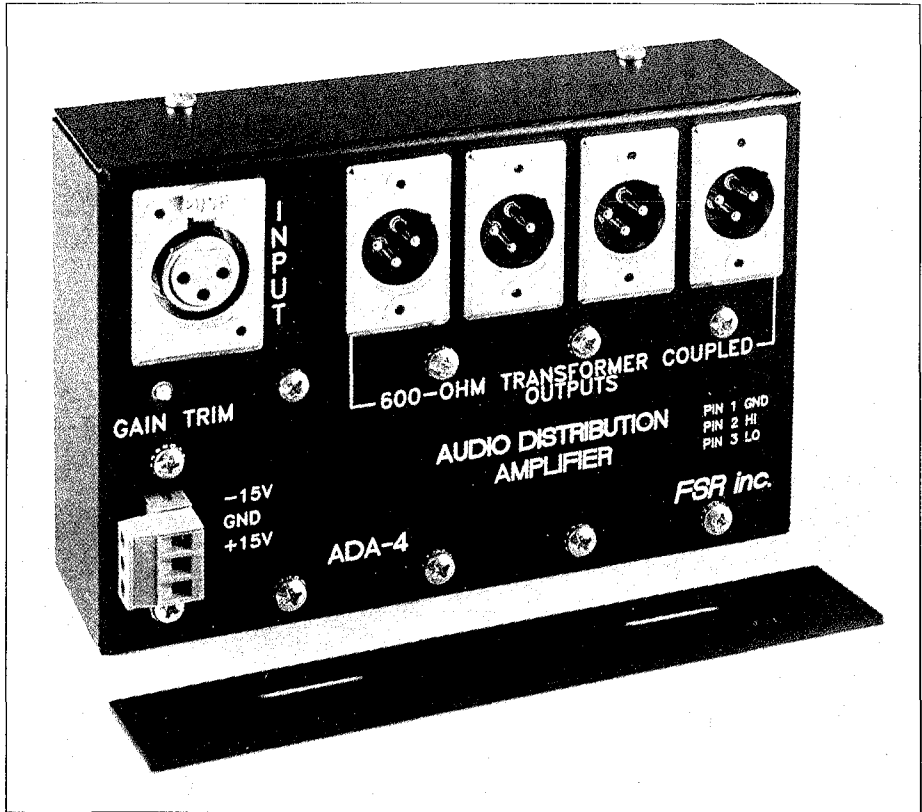


Mick Whelan at the Loudspeaker Designer's Workshop in Atlanta.

Audio Distribution Amplifier

Audio distribution amplifiers (ADAs) at one time were hard to find. Now we have multiple acceptable sources. Shure Brothers has one; the best broadcast quality one in the world is made by Benchmark Media Systems and the latest offering from FSR is a highly useful one made to be easily compatible with their systems.

The FSR ADA-4 features a balanced high impedance input capable of accepting levels up to +22 dBm along with four outputs that are transformer (600 ohms) coupled. Short circuit protection is provided on the output. We are told it is available in either rack mounting or table mounting. The cost is \$185 plus \$49 for a ± 15 power supply. If you would like a data sheet and specifications, write:



FSR, Inc.
220 Little Falls Road
Cedar Grove, NJ 07009
PH: (201) 239-0988

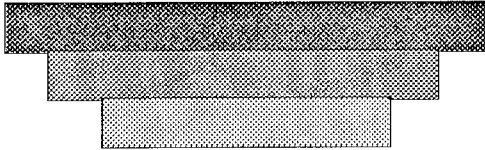


John Macaluso discussing the new FSR AC solid state switcher with the New York class in April.

NEUTRIK OWNERS ALERT

Those Syn-Aud-Con graduates that have purchased the Neutrik Audio-graph 3300 level recorder systems can now add a tracking receive filter type 3314. This unit plus a bucket brigade signal delay could provide a rudimentary form of TDS. Such an arrangement would be useful over a distance of say 5-10 feet for checking loud-speaker amplitude only responses. ■

TEF in the Classroom



Many audio courses offered at the University level turn out to be, upon careful inspection, baby food. Such courses allow students a great deal of "hands on" experience with audio toys and no real meat. The box reproduced here from *Mix Magazine* tells about one teacher doing something about it.

When Timothy Miller, Director of Audio/Recording at Northeast Community College in Nebraska, first came across the TEF System 12 Analyzer three years ago, he thought of it as the perfect tool to allow students to "take what once had been subjective—"Boy, that sounds good," to helping them understand what it really was that sounded good. It was an objective view of what was considered subjective."

The TEF System is a portable computer designed to make quick, accurate measurements of room acoustics and sound systems. All settings are done through the keyboard and can be recalled and duplicated exactly whenever needed. While ten or 12 other schools are using the system across the country, Northeast Community seems to be the only college using it exclusively for teaching.

"Our view of TEF isn't just to teach students how to run TEF, but to use it as a tool to better understand what's going on in the audio or acoustic or electro-acoustic medium that they're in," says Miller, "We're trying to use it as both a tool of instruction and as a tool of illumination with audio."

Instituted just this year, the TEF program takes the better part of one semester. So far, it's been fairly successful. "At first there's a hesitation," says Miller. "The technology is complex and there's a fear. But once the students get over that, they start seeing it in a whole new light. They have an understanding well beyond what any of my other freshmen have had."

"I think more schools in the future are going to be getting TEF and finding out how it can enrich their program. I'm just glad we're doing it now." At the end of the semester, Miller plans to sit down and evaluate the program. "It's been a real enriching year for me—learning TEF and working with it," notes Miller. "I have a long way to go and so do the students."

—Karen Margoff Dunn

Important Study of Heyser's Transform by Mark A. Paoletti

We believe that a young man named Mark A. Paoletti has made an important addition to the qualified talent working on signal processing. Mark guided by a gifted researcher, Dr. George Dodd of the University of

Auckland, New Zealand, has published two brilliantly written and useful papers on the theory underlying TEF measurements:

"Linearly Swept Frequency Measurements, Time Delay Spectrometry, and the Wigner Distribution" appeared in the June issue of the JAES.

"The Application of Linearly Swept Frequency Measurements" appeared in the August JASA. Both articles, when taken together, form a whole.

As with all truly great ideas, Heyser's transform will be the lengthy study of a generation of talented and motivated young people. Each will, hopefully, add to our knowledge of the meaning and application of this wonderful general transform. Again, as with all ideas of this magnitude, there will be those who "borrow" it and present facets of it as their own. To such we can only say:

"It's better to be stolen from than to have to steal."

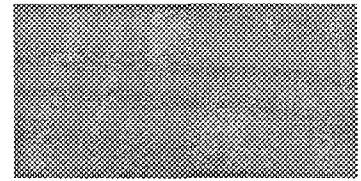
Contributions of the order of Mark Paoletti are the true way to respect Heyser's work. He acknowledges it, has studied it, and has made his own contribution. ■

EVERYTHING
HAS BEEN
THOUGHT OF
BEFORE.

THE PROBLEM
IS TO
THINK OF IT
AGAIN.

VON GOETHE

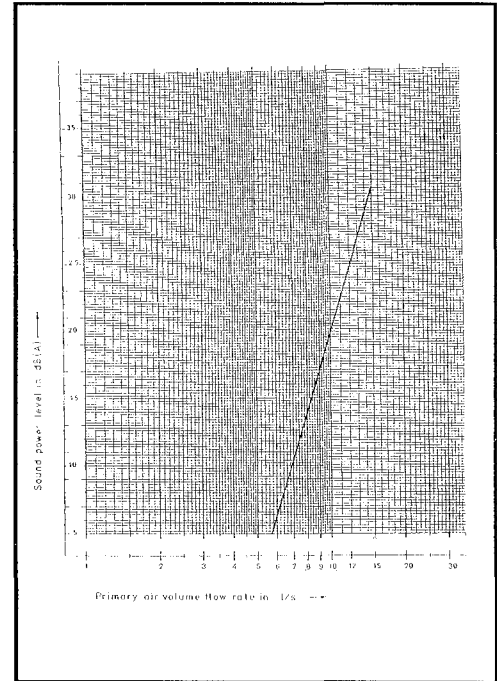
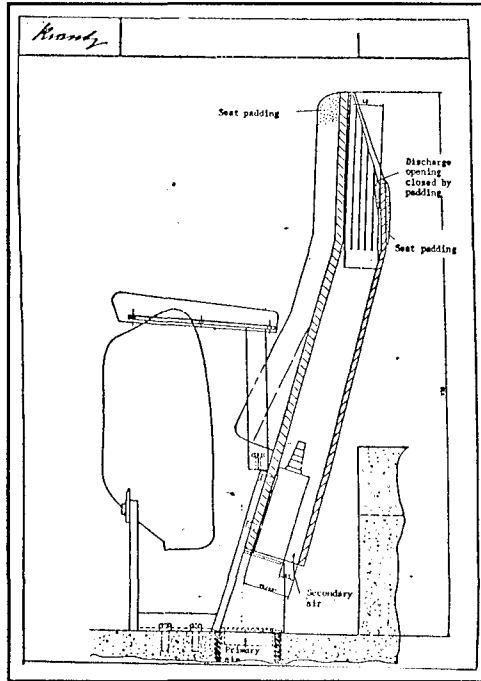
Air Conditioning from Seats in Concert Hall



Michel Morin, architect, attended our Toronto class this Spring. (MJM Acoustical Consultants of Montreal) We enjoyed Mr. Morin, not only because he is an architect truly interested in audio and acoustics, but because his every gesture and inflexion suggested the sharp probing intellect behind each query he made. Mr. Morin's interest in and grasp of signal processing was thorough and well based, and any parts he did not yet grasp were pursued persistently until made his own.

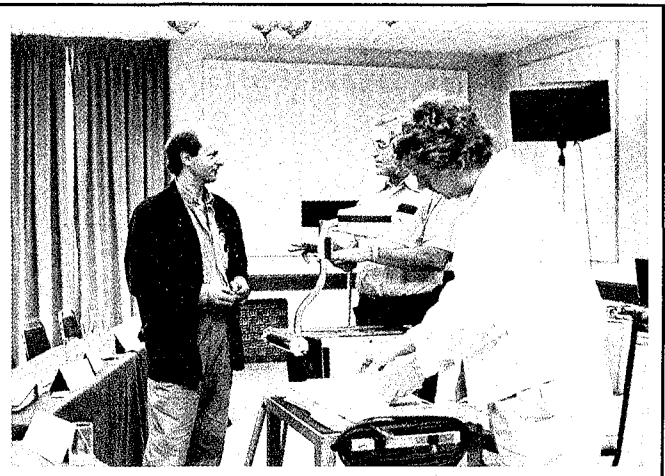
One of the true joys of sharing what we know with others is the reflected sharing back to us. In Mr. Morin's case, we found out about an air conditioning system that uses the auditorium seats to distribute the air - quietly and unobtrusively.

If you think about this from the acoustic standpoint, cool air at the audience level and hotter air above constitutes an ideal thermal environment for keeping sound from angling upward as it passes over an audience. Mr. Morin shared some drawings and tests from the mechanical consultant,

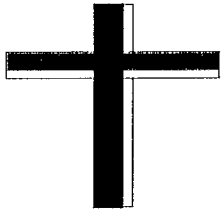


Mr. Andre Dupras of Dupras Ledoux and Assoc.

We were impressed with the test data and appreciated the care and thoroughness of its presentation. We believe this is an idea well worthy of future employment.



Mr. Morin's intensity and charm comes through in both pictures (R in picture #1 and L in picture #2)



A Truly Creative Sound System Design

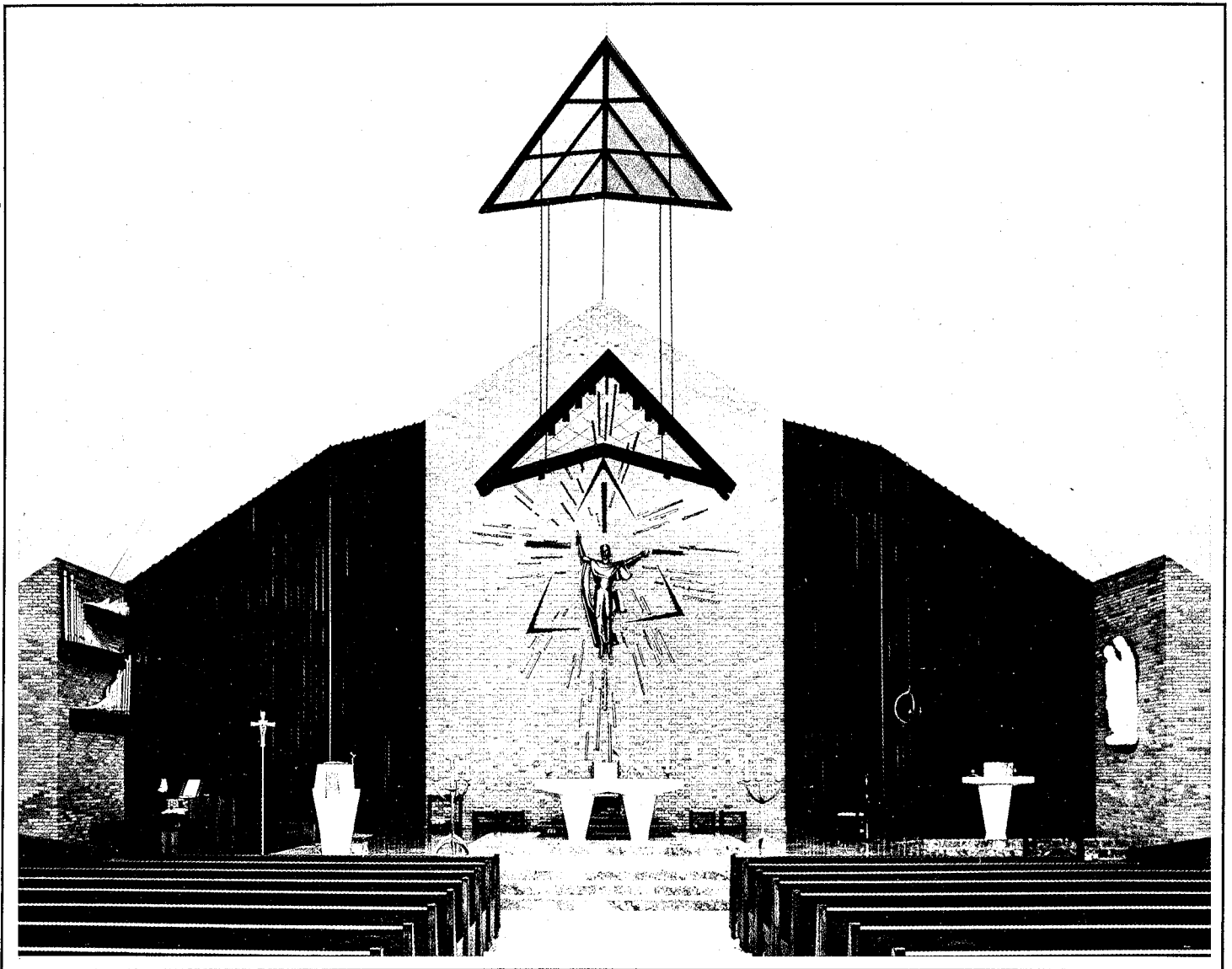
Carolyn felt that this picture deserved a better presentation than we gave it in *Sound System Engineering* and I concur:

The loudspeaker system is up behind the very large triangular grill in the peak of the ceiling. It has a modernistic "crown" hung from it as part of the religious decor. This system came about when the committee saw the size of the array with genuine dismay. The architect told Burt Boettcher, then of Continental Sound in Milwaukee, "You aren't going to put that ugly thing in my church." Burt replied in essence, "You didn't say that to the structural engineer when he

told you the size of the beams necessary to hold up the roof, and you didn't say that to the plumber when he told you the size of the pipe to carry the waste away, so why are you saying it to me? It's my job to make it sound good, it's your job to make it look good." To which the architect replied, "You know, you're right," and he then designed the sound system into the building as part of the ceiling and roof structure.

A contractor who knew what he was doing and an architect that was truly creative designed a successful system in a difficult environment.

SAC



SYN-AUD-CON SEMINAR AND WORKSHOP SCHEDULE

2-Day SEMINARS

**Anaheim, CA
November 1-2, 1988**

**San Francisco Area
February 8-9, 1989**

**Vancouver, B.C.
February 15-16, 1989
February 17-Optional 3rd Day for
"On Location" measurements**

**Dallas, TX
March 9-10, 1989**

Don & Carolyn Will Take a Sabbatical

It has been a hard decision for us to make, but we will take a sabbatical from conducting on-the-road seminars. (March 9-10 will be our last scheduled on-the-road seminar.) If there is sufficient interest, we will conduct sound engineering seminars at the farm during April, May and June. We will not conduct any workshops, though it is hard for us to give up these valuable learning experiences. BUT, if we are going to get two books written that we are committed to write, we have to stay home to get it done.

Price Increase for seminars:

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

Effective Immediately

3-Day WORKSHOPS

**Syn-Aud-Con will participate in 2-Day
conferences sponsored by**

**EV/International
October 13-25, 1988
Frankfurt
London
Stockholm
Milano**

**Concert Sound Reinforcement
Los Angeles
January 17-19, 1989**

*Workshop Chairman:
Will Parry, Maryland Sound*

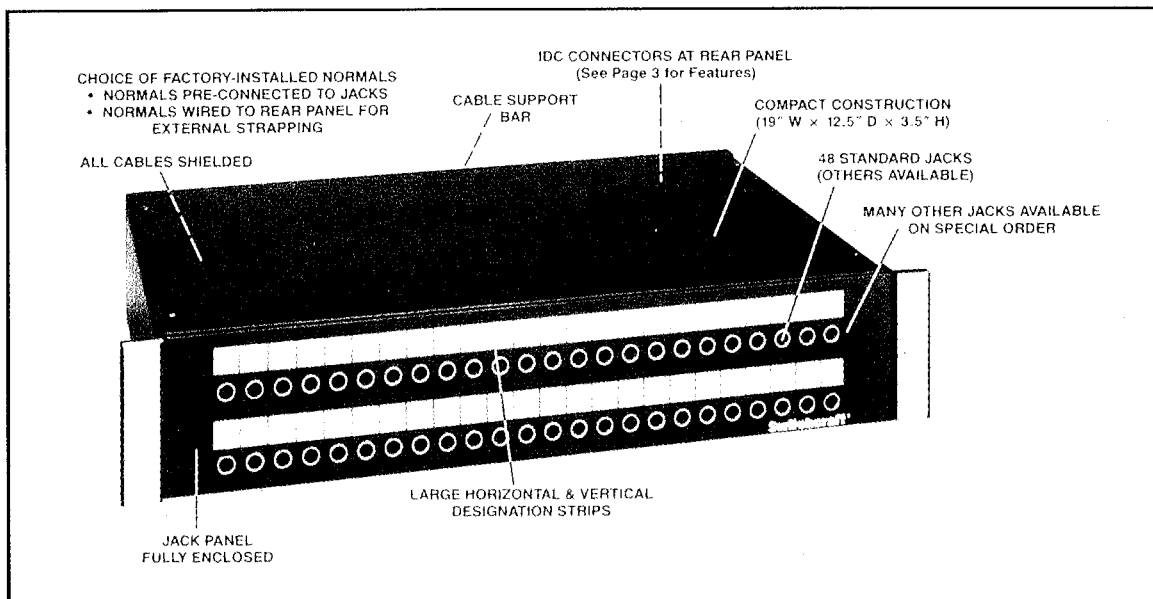
**Grounding & Shielding
Holiday Inn - Anaheim
January 27-29, 1989**

Note: This is a new date. Was November 1988

*Workshop Chairman:
Allen Burdick, Benchmark Media Systems*

**TEF Tutorial Conference
Dallas, TX or Phoenix
March 3-5, 1989**

This conference is intended to bring together owners of TEF analyzers in order for everyone to share how they are using the TEF analyzer. It will not be a "hands on" workshop but an exchange of information.



Switchcraft Introduces Audio Patch Panel

Switchcraft has introduced a new audio patch panel that appeals to us as one of the easiest to wire reliably that we have seen. We like the insulation displacement connectors, IDC. We hope to eventually use these patch panels in our lab, once we finally nail down where everything should go.

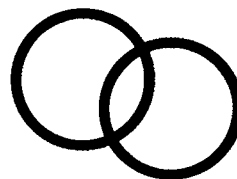
The unit is available in a variety of configurations. It comes completely assembled, fully shielded, ready for 19" rack mounting. Another version has the front panel for rack mounting with the rear panel for remote mounting with all cabling factory installed. The rear panel only, is available with IDC (Insulation Displacement Connectors) inside and outside for quick, easy terminations, with all circuits clearly identified.

Each patch panel has two large horizontal designation strips and two vertical designation strips to identify the 48 premium quality 3 conductor jacks.

The patch panels will be available in September and in distribution in the 4th quarter. The cost will be about \$700. ■

Switchcraft
A Raytheon Company

**Sonic
Associates
Weds
IMAX
Systems**



In 1974 Bill Shaw attended our class in Minneapolis. He showed us a new film strip that he had developed which he called IMAX. IMAX uses the largest film frame in motion picture history and the most advanced projector. IMAX/OMNIMAX also uses one of the finest sound contractors in the country to install all their sound systems—Sonic Associates of Birmingham, AL.

Our good friend, Lynn McCrosky of Sonic Associates, has attended Syn-Aud-Con seminars and sent employees since 1973. Now we hear that IMAX Systems has acquired 51% of Sonic Associates. It couldn't be a more beautiful wedding. ■

Showco Debuts the Prism at the Garden

Seems like we are often making fun of some article in the magazines, so it is refreshing to be able to talk about an article that has much that we agree with.

Mix Magazine wrote about Atlantic Records' birthday party at New York's Madison Square Garden. Showco was there to be sure that everybody heard everything. *Mix* used the occasion to interview veteran Showco senior engineer, M. L. Procise. We liked what he said and we would like to quote a small part from the article where he is stating the design objectives of their new sound system:

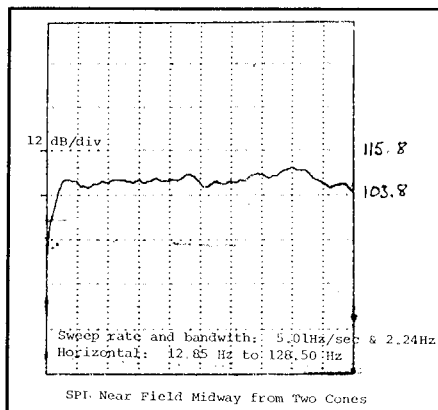
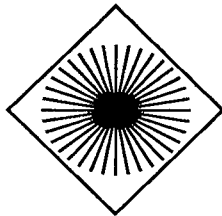
"Number three was to design a P.A. system that had more direct

sound versus reflected sound. We don't feel reverberation in the hall at high SPL is the problem, but reflections created by uncontrolled waveforms of conventional systems are. A huge problem that conventional P.A.s exhibit is the effect of interference from multiple transducers operating in the same frequency band. Conventional systems have in their design a cabinet that sounds great to (their manufacturers) and they force an even larger number of these cabinets into an acceptable array. Some of the resulting problems are interaction and diffraction problems in the house, phase cancellation in general with comb filtering throughout the hall. This system doesn't have those problems." ■

TORONTO CLASS



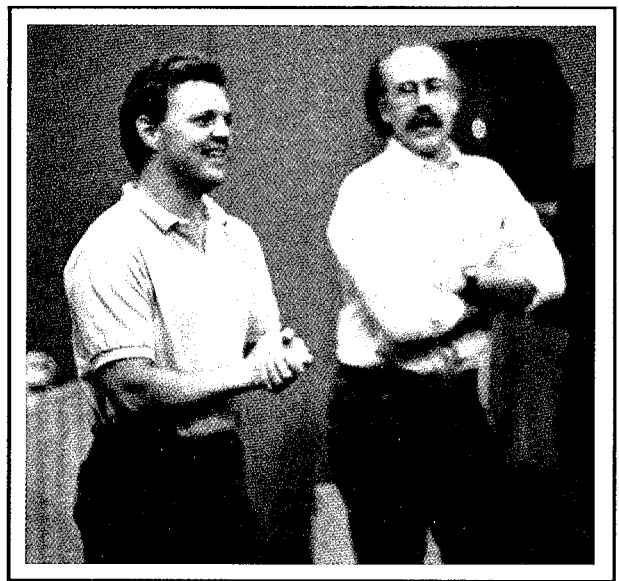
Watch for Randy Weitzel of Yamaha



In the Syracuse, New York class we had in attendance an enthusiastic, well trained young audio engineer named Randy Weitzel. Randy has an enviable record with some famous pop concert artists. Now he works for the Yamaha Corp. of America.

Randy is a fountainhead of information on monitor loudspeakers and performers' use of them. We gave him time in the class to discuss how he used monitors and how various performers reacted to them. Randy's technical descriptions were accurate and correct. He introduced us to several new ideas about monitors.

Keep an eye out for him on his travels for Yamaha. He is going to conduct training seminars for his new employer. He's worth spending time with.



Intersonics Develops a Speaker for Africa's Elephants

That's Barney Cole of Calf Audio, Ithaca, NY (right) with Randy Weitzel.. Barney Cole is the fellow that introduced Intersonics to his next door neighbor, David Wickstrom, a consultant working for Cornell University -- who was studying long-distance elephant communication in Kenya. African elephants can communicate by flexing their massive rib cages, creating sounds down to 15 Hz which can be transmitted over five miles. The speaker Intersonics developed for Cornell can develop 112 dB at 15 Hz. (A feature article coming up in National Geographic). It's a small audio world.

Audio Activities In Japan, Australia New Zealand

Larry Frandsen, President of Electro-Voice's international division, invited us to travel to Japan and Australia in May to address special gatherings of their distributors and consultants who work with their equipment. We then added New Zealand on the way home.

Japan

Mr. K. Takane of Electro-Voice/Japan was our host in Tokyo. He had arranged for two meetings while we were in Japan. We stayed at the Century Hyatt hotel in the Shinjuku district. Maybe a few of the people who attended early Syn-Aud-Con classes remember a magnetic connector that we showed in classes for a couple of years. They are now used in the Century Hyatt hotel.

Japan has a way of quietly entering your consciousness by excelling at ordinary tasks. Mr. Takane's Nissan "Gloria" sedan was as quiet and smooth as a Rolls Royce. The elevators were as smooth as glass; traffic, while extremely heavy, was well mannered. Japanese civility toward each other makes Tokyo seem far less crowded than it is.

What countries like Japan, Germany, Korea have done is to copy the American philosophy with which we once led the world—namely that it is wise to educate and invest. The attitude of those congressmen who bring on a world-wide depression with a so-called "Fair trade" bill is to effectively say, "How dare our competi-

tors train more engineers when we choose to produce more liberal arts graduates?" "What wickedness to insist on their children learning the hard disciplines of science, mathematics, and languages while we graduate functionally illiterate children?" "How diabolical to save and invest their capital in productive assets when we have decided to spend our capital—and theirs—in a prolonged period of con-

sumption and budget deficits."

A hard fact recently released is that less than 20% of American exports are affected by the trade regulations of other countries.

We saw American goods widely used in Japan—those goods that are truly competitive anywhere in the world—Coca Cola, McDonalds, American aircraft, EV & Altec, etc. Mr. Takane's company is prospering on the sale of international products.

Another aspect of Japan that bores in on you is the high prices. We were grateful to be the guests of a gracious host. (A former neighbor in California now lives in Tokyo. She told us that she rides her bicycle to the grocery store and carries home \$150 in groceries in the basket on the bike.)

We had the privilege of visiting Japan's leading independent consultant, Dr. Minoru Nagata -- a remarkably intelligent man.

Later in the day we visited one of the leading sound contractors, Fuji Sound Co. Mr. Matsuoka, Fuji's managing director, showed us work in their research and development laboratory that rivals anything being done on a contractor level in the United States. They had just completed a major inflated dome system using EV components. They developed the computer program used in the design of this sys-



tem, included some of the best graphics we have seen and allowed loudspeaker overlay patterns to be generated on a 3-D view of the space. Both amplitude and intelligibility predictions were included in the program. When I asked if they ever verified their predictions, they pulled out a large

Mt. Fuji Conference

The second meeting was a serious two-day affair at the Mt. Fuji hotel at the base of the famous mountain with the same name. Here over 100 people participated and we met contractors, consultants, broadcasters, and recording engineers from all over Japan as well as Singapore. We demonstrated basic TEF analysis, discussed the new intelligibility techniques, and went over basics such as acoustic gain, loudspeaker array design, and LEDE control rooms.

Fuji honored us by



Our advice to anyone going to Japan—be sure you have a guide, take lots and lots of money and expect to be astounded at a people practicing what we preach and proving it's still totally effective.

Australia

Tokyo, Fuji, Hong Kong -- we were beginning to feel like Terry and the Pirates as we approached



That is Mr. Takane in the back row towering over everyone. He was an Olympic candidate for the volleyball team and looks like he is still in training. His most valuable asset is a loyal and dedicated staff (he knows it).



Mr. Asahina, who has been to the United States 10 times, is the assistant manager at EV/Japan. He was in charge of the logistics of the conferences. You only have to show Mr. Asahina a new concept once. Then he moves way past you.

collection of printed overlays with the measured RASTI scores as read from a B&K RASTI instrument. It is this program that Altec/EV have introduced in the United States. We went out to hear the system in "the big egg" (yes that's its name) and saw a well designed, carefully installed circumferential system that was computer controlled as well as computer aided design.



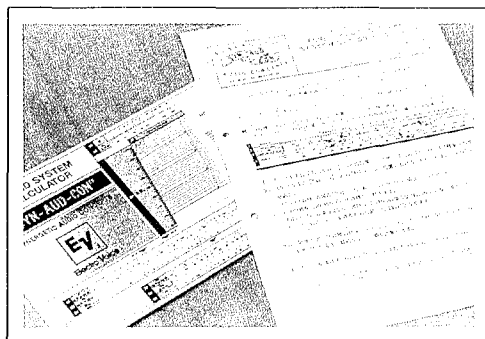
Mr. Kenya Tsuda (L) and Mr. Chiaki Yamasaki (on our right) of Nihon Tsushin Ono Tokki Co in Osaka. And Mr. Takane on our far right.

coming out of the clouds on each morning so we could view the summit from the hotel gardens. As we were leaving the hotel the Japanese Porsche club was arriving for the weekend proving it's a small world after all.

We attempted no driving in Japan inasmuch as it is a "left lane" country and we felt (as we do in England, Australia, New Zealand etc) that it's not wise to risk having "right lane" reflexes take over in an emergency situation. We did find that the drivers we rode with were skilled and handled their cars with ease in streets really too tight for a bicycle, let alone a full size sedan.

Sydney, Australia after flying over the Philippines, New Guinea, the south Pacific Islands in the Coral Sea and the north of Australia on Cathy Airlines.

Sydney's airport easily qualifies as inadequate for the demands being made upon it. Sydney airport will only page someone in life and death emergencies so finding our contact upon arrival became a problem because where we emerged from customs and immigration had a mob of a couple of thousand people all jammed together. I thought I had unintentionally propositioned a young attendant, judging from



Mr. Asahina ordered in 100 Sound System Engineer and 150 sound system design slide rules for the meetings. The instructions for the slide rule were translated in Japanese

the look of horror on her face when I asked if I could page our Australian host, Colin Formston.



Our host, Colin Formston, Managing Director of EV Pty. Ltd.

We approached Australia innocently believing we had a common language. Fortunately, our hosts, Mr. Formston and Ian Johnstone, were good at translation and soon arranged for us to experience koala bears, kangaroos, wombats and tons of fresh fruit (huge kiwi fruit for less than 10 cents each.) One of the first tests we made was watching water go down the drain. (The Coriolis effect is apparent-

ly too small and the level of the basin is the determining factor.)

You can't help but like Australians. They are sports fanatics and watching their sporting events leads one to believe that they are as violent as their American cousins. Australians have the great "out back" and it's one of the few spots left in the world where you can find areas where no human has yet trod.

Along with the U.S, Australia reminded us of a quote from Gibbons Decline and Fall of the Roman Empire.

"It was with the utmost difficulty that ancient Rome would support the institution of six vestals."

The EV Conference

The meeting of approximately 50 audio professionals followed much the same pattern as in Japan with demonstrations of basic TEF analysis and discussions of fundamental design tools. In the process of this meeting I acquired a rabbit fur felt hat and now look like Crocodile Dundee III.

We have now had the opportunity to work with Mark IV (ie: EV, Altec) personnel on four continents and have been truly impressed by the quality of the people and the singleness of their purpose.

The new EV Delta-Max was the star fea-



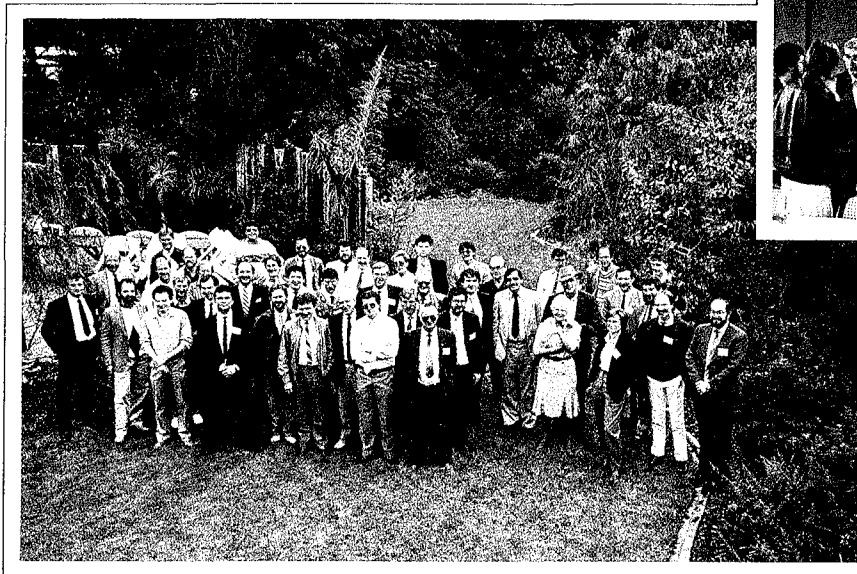
Don wearing his new Australian hat

ture in both the Japanese and Australian meetings. It is GOOD! and EV is justifiably proud of it.

A Spectacular Facility

Sydney has the brand new National Acoustic Laboratories special acoustical test facilities.

Mr. Bruce Gore, Chief Engineer and Manager of the acoustic test facilities, was our guide to this remarkable establishment and we were pleased to find that Syn-Aud-Con grad, Robert Grunberg, was using the facility for some TEF analysis work on 3-D's of the pinnae response. Noise levels in



the large anechoic chamber fall near $L_p = -20\text{dB}$ (2.0×10^{-6} pa.) and the plane wave tube with controlled source is reliable to 100Hz. Such resources are rare and we sincerely hope researchers of equal quality will be the users.

J.E. Benson

We mentioned our desire to meet J.E. Benson, if possible, and one of the men at the meeting knew how to

Syn-Aud-Con Newsletter



Mr. Benson gave us a copy of what we feel is a very precious picture taken almost 25 year ago. From L to R: Paul W. Klipsh, Bob Ashley, Neville Thiele, Mr. Benson and Richard Small.

have been privileged to hear. In fact as his choice of program material proceeded, it became impossible to concentrate on technical points since the two loudspeakers allowed the music being reproduced to totally seize our attention and we found ourselves as well as our friends closing our eyes and feeling like we were hearing a great per-

formance. We'll have more to say about this remarkable man during the coming year. Our original interest in Mr. Benson was because of his 1968 paper "A Feedback-Mode Analyzer-Suppressor Unit for Auditorium Sound-System Stabilization." In this paper he conducted the experiment that demonstrated the step function behavior of systems going into and coming out of acoustic feedback. We have referenced this work in Sound System Engineering, 2nd Edition, pages 423-426.

We also visited Richard Priddle of Transound Systems PTY LTD who is involved in designing and building loudspeaker systems for both theater and home use. They were in possession

reach him at his home. Mr. Benson is retired but maintains a laboratory in his home. Mr. and Mrs. Benson allowed us to come to their home for a visit and we soon discovered that we were in the presence of the Australian Harry Olson. Mr. Benson's three papers entitled "Theory and Design of Loudspeaker Enclosures" includes a generalized analogous circuit proposal, the analysis of which leads to a solution in the form of S-plane transfer functions representing the various possible modes of operation of the system. The first paper is 57 pages long the second 68 pages and the final 115 pages for a total of 240 pages of remarkable scientific work distinguished by complete academic integrity and gifted insights.

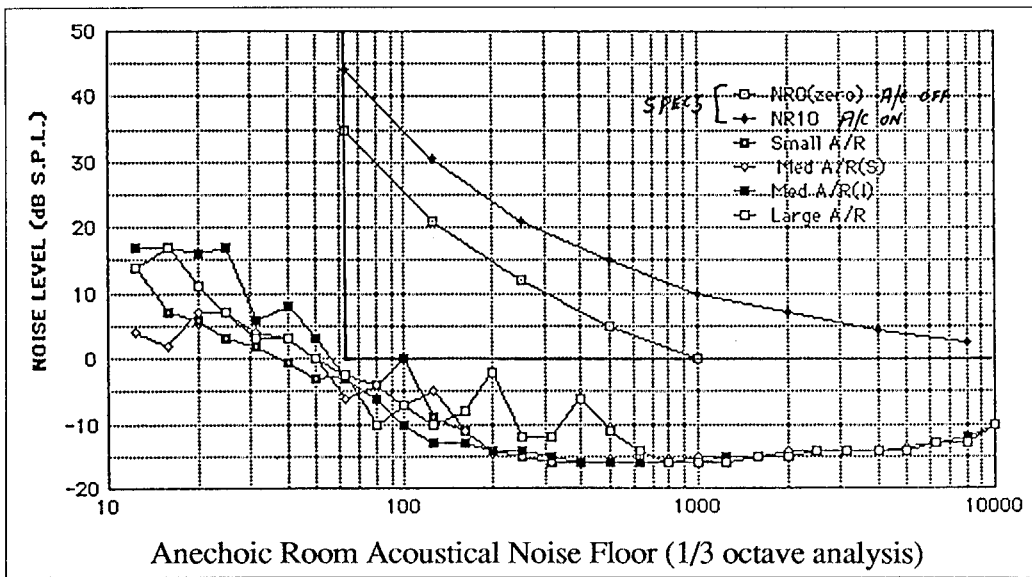
Part One's subtitle is "Electro Acoustical Relations and Generalized Analysis." Part Two is "Response Relationships for Infinite-Baffle and Closed-Box Systems." Part Three is "Introduction to Synthesis of Vented Systems." Mr. Benson was the examiner for Richard Small's PhD paper.

We know of nothing comparable anywhere in the literature today. While at Mr. Benson's home, we discovered he had a 5 x 5 Bessel array in his laboratory and had extensive experience with the concepts in all its various forms. We also heard a pair of personal loudspeakers he had constructed that produced some of the best imaging we

The National Acoustic Laboratories Special Acoustical Test Facilities
126 Greville St. Chatswood N.S.W. 2067

<p style="text-align: center;">The Environment.</p> <p>The Laboratories are located in a wooded valley which was chosen for low ambient noise and ground vibration levels and is adjacent to the Lane Cove National Park. The valley side has been excavated such that it contains the rear wall and back of the Special Acoustical Test Facilities Section of the building. The remaining sides and front of N.A.L. have offices which have views over a picturesque section of the park and provide an acoustical buffer for laboratories in the centre of the building. Native plants and trees which blend with varieties in the National Park have been planted with the purpose of eventually hiding the structure thereby presenting a more visually pleasing installation in the middle of what would otherwise have been a completely residential suburb.</p>	<p style="text-align: center;">The Performance.</p> <p>The combined capability of the acoustical test rooms provides a means of measuring airborne energy (sound) in a frequency range which includes 14 Hz up to 20 kHz. With the air conditioning in operation, the anechoic rooms have background acoustical noise levels well below N.R.0(zero) and are the quietest locations above ground in Australia. The Plane-Wave Tube is 2 Metres square by 245 Metres long and is the only Tube of its type known to be capable of testing from as low as 14Hz. It is big enough to walk inside and is fitted with the largest quarter-wave acoustical wedge in the world.</p>	<p>All rooms except the Large Quiet Room and the Horizontal Plane-Wave Tube are mounted on springs for vibration isolation. There is a Large Anechoic Room with inside clearance dimensions of 11 x 9 x 7 Metres which can operate from 50 Hz, two Medium Anechoic Rooms with 6 x 3.9 x 4.5 Metres between wedge tips and with measurement capability from 90 Hz and a Small Anechoic Room which has a space of 2.5 x 2.1 x 2.7 Metres, a Faraday shield for radio frequency interference shielding and operates from 180 Hz. The upper frequency limits of all four rooms have not been measured but were stated by the German designers, G&H Montage to be 20kHz or higher. Two side-by-side 200 cubic Metre Reverberation Rooms are capable of measuring sound transmission loss, sound absorption and sound power and are equipped for providing a range of reverberant fields for intelligibility testing. A Large Quiet Room for subjective type acoustical tests and two High Intensity Rooms for use in research studies involving extreme levels of sound complete the Facility.</p>
<p style="text-align: center;">The Facilities</p> <p>The special Facilities comprise ten rooms. Four are anechoic and two are reverberant. Two are designed for high intensity noise</p>	<p style="text-align: center;">projects and there is a Large Quiet Room and a Horizontal Plane-Wave Tube. The Facility is operationally unique in being the only single group of test rooms in the world specifically designed to be capable of undertaking acoustical measurements spanning the full frequency response, dynamic range (loudness) and perceptive characteristics of human hearing.</p>	<p style="text-align: center;">THE FACILITIES ARE AVAILABLE FOR HIRE TEL. (02) 412 6800</p>

THE ACOUSTICAL TEST FACILITIES



Grant would like to hear if anyone is interested in more information about his program:

Grant Elliott
P.O. Box 66-050
Beach Haven
Auckland 10
New Zealand

On Monday we were the guests of Dr. George Dodd at Auckland University. A small group of audio fans gave up part of their holiday (the Queen's birthday) to spend the

of a beautiful facility in downtown Sydney with an ideal large room (with overhead crane) for testing loudspeakers and a young and enthusiastic group of workers.

program and an instruction manual (printout) for CADP to AutoCAD Translation Program. We want to list a few features from the little "manual":

morning with us. Mark Poletti, who works with Dr. Dodd, has done extensive research into the theory behind TEF analysis. Both the AES and ASA Journals have very important articles in the July issues. Mark Poletti is a truly remarkable young man developing his talents under the watchful eye of Dr. Dodd.



Larry Elliott

New Zealand

We flew from Sydney to Auckland New Zealand and were met there by Syn-Aud-Con grad, Larry Elliott. Larry, in spite of not receiving notice of our impending arrival until just the week ahead, arranged for us to meet Mr. and Mrs. Harold Marshall and Chris Day of the Marshall Day consulting firm.

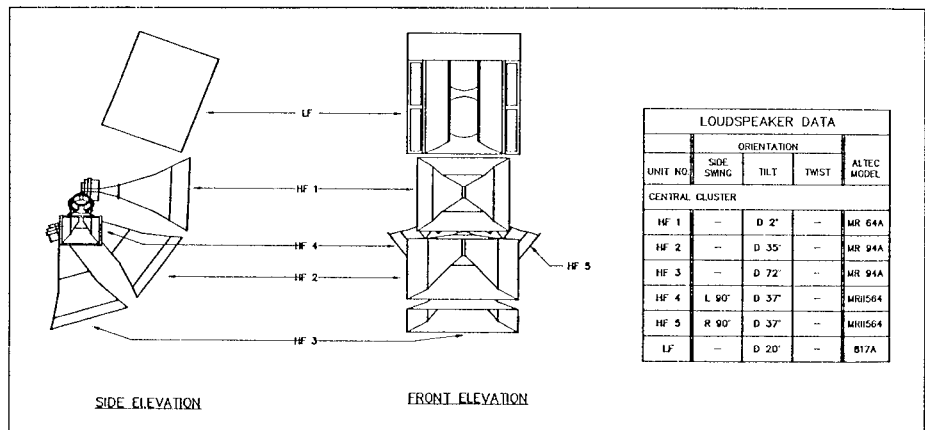
On Monday we had the privilege of visiting Larry's home, meeting his truly talented youngsters, and having a real home cooked New Zealand lamb dinner done to perfection by his wife, Colleen.

Larry's 16 year old son, Grant, is

- Translates cluster into Auto-CAD at full size enabling three drawings to scale.
- Brings each loudspeaker or horn in on it's own layer and each horn is separately accessible. These two features allow easy moving of the loudspeaker and each loudspeaker can be a different colour or even turned off).
- Translator handles subdirectories
- Translation can be in Imperial or Metric Units (inches or millimeters)
- Will import JBL CAD

Home

We had the interesting experience of leaving on Monday evening from New Zealand and after an all night flight arriving in Hawaii on Monday morning. Not so interesting was the nearly 24 hours of actual flight time to get home. ■



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.



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
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Goble Building, Suite 120
San Jose, CA 95112
(408) 436-6040

Tom Paddock
Acoustical Systems Engineer

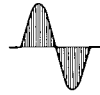
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JERRY G. LILLY, P.E.
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"The Great One"

My favorite "guilt by association" photograph is this one. Reading from right to left, that's Paul Wilbur Klipsch, Richard C. Heyser, and yours truly. From the expressions on the young faces around us, you would suspect something profound was going on -- actually we were exchanging our favorite oxymorons.

Paul, now in his eighties, fits the biblical description of "some great one." I consider my life in audio to have been mightily influenced by a few key mentors when I was young and brash: Ralph Townsley, Paul Klipsch, Frank McIntosh, Saul Marantz, Dr. Paul Boner, John Hilliard, Arthur C. Davis, Jim Noble, Alex Badmaieff, and H. S. Morris (the last five were my mentors at Altec Lansing during the 14 years of apprenticeship there.)

Dick Heyser, Gene Patronis and others belong to my "adult" years but the men on the list above dealt fairly and compassionately with me in my ignorance and immaturity. I can honestly say I have walked and talked with giants. ■



A Very Special Group in our Toronto Class

Syn-Aud-Con classes are often divided into two main groups: The people who sell the sound system and the ones who use it. Of course there are exceptions but it is generally true.

In our Toronto class, out of a class of 40 people, 11 were operators of sound systems. We're so pleased with them that we would like to list them here. ■

Glenn Clarke
Ontario Place Corp.
955 Lakeshore Blvd. West
Toronto, Ontario
CANADA M6K 3B9
416-965-0576

Scott Forbes
Cats c/o Centre on the Square
Queen St.
Kitchener, Ontario
CANADA
519-745-1423

Ron Fox
Ferguson Audio Engineering
263 Estelle Ave.
Willowdale, Ontario
CANADA M2N 5J4
416-222-1424

Keith Handegord
Stratford Shakesperean Festival
P.O. Box 520
Stratford, Ontario
CANADA N5A 6V2
519-271-4040

Peter Harris
Headquarters Entertainment
366 Adelaide St. East #436
Toronto, Ontario
CANADA M5A 3X9
416-363-7363

Ted Herman
Professional Staging Techniques
1645 Bonhill Rd. #14
Mississauga, Ontario
CANADA L5T 1R3
416-678-7540

Robert Jardine
Thunder Bay Community Aud.
450 Beverly St.
Thunder Bay, ON
CANADA P7B 5E8
807-343-2318

Michael Pala
Queen's Way Cathedral
1536 Queensway, Box 700 Stn. U
Toronto, Ontario
CANADA M8Z 5P9
416-255-0141

Jack Ralph
Corp. of Maissey Hall &
Roy Thomson Hall
60 Sincoe St.
Toronto, Ontario M5J 2H5
416-593-4822

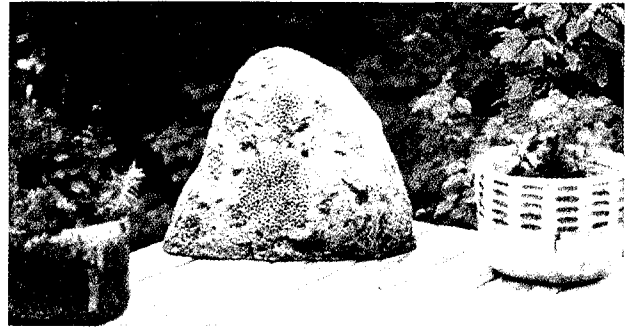
Arthur Skudra
Queen's Way Cathedral
1536 Queensway, Box 700 Stn. U
Toronto, Ontario
CANADA M8Z 5P9
416-255-0141

Paul Templin
University of Toronto
7 Harthouse Circle
Toronto, Ontario
CANADA M5S 1A1
416-978-8676

ROCKUSTICS

The photograph of our new "woofer" sitting in front of our "Rockustics" on the deck is our excuse for a dual progress report. The "Rockustics" stays out in the weather (even below freezing) while the "woofer" named Patch is learning to stay just inside the door on stormy days.

Judy II passed away last November and Patch came to us last July. She is a black and tan German shepherd of even gentler disposition than our previous two. Rockustics now has "Her Master's Voice". ■



Chips Davis Receives Recognition

Let me state unequivocally at the beginning that I am not Chips Davis' son nor vice versa.

As any reader of these Newsletters should be aware, we admire talent. When we get to know truly talented individuals, we take pleasure in watching them grow. When they have been close to us in introducing new technology such as LEDE™ and part of that special group of people who loved and appreciated Dick Heyser, then we follow their triumphs with special pleasure and joy.

Chips has recently had two recognitions come to him: *MIX* Magazine awarded him their 1987 Technical Excellence and Creativity Award for Acoustics/Studio Design. The second recognition was his joining Paoletti/Lewitz acoustical consulting firm in San Francisco. We expect major accomplishments from this collaboration.

Our congratulations to Chips Davis on his continuing demonstration of success in audio. ■

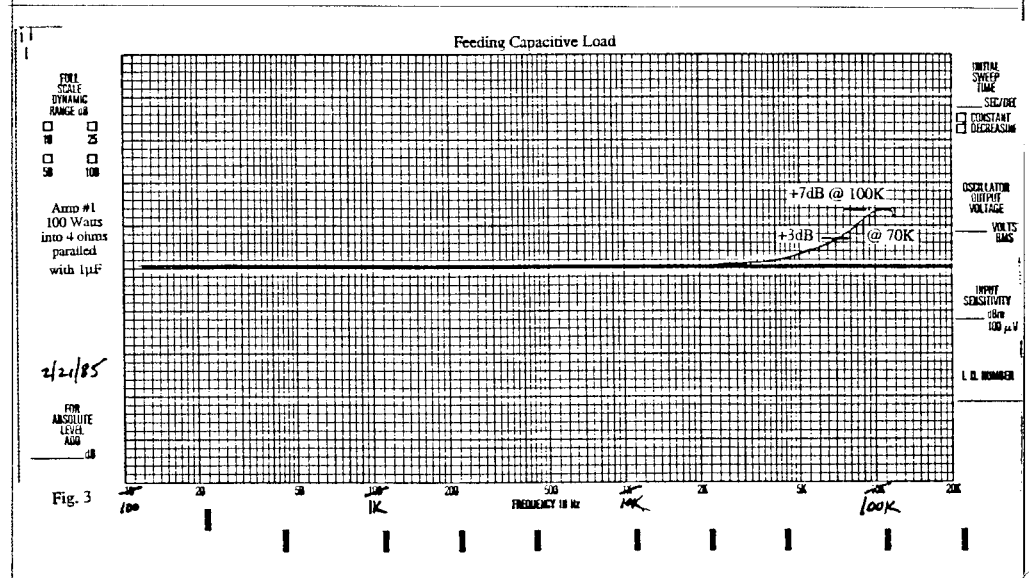
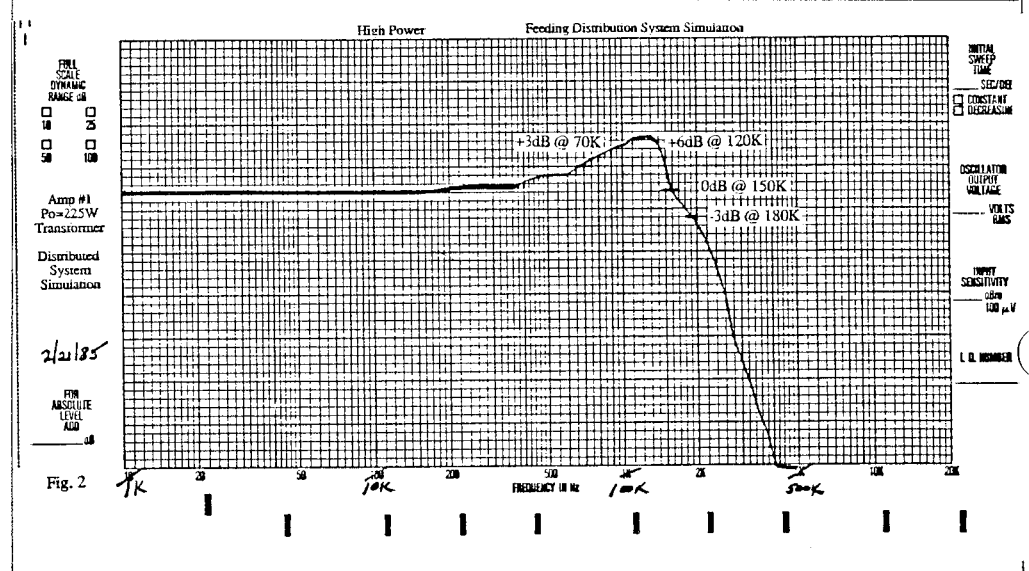
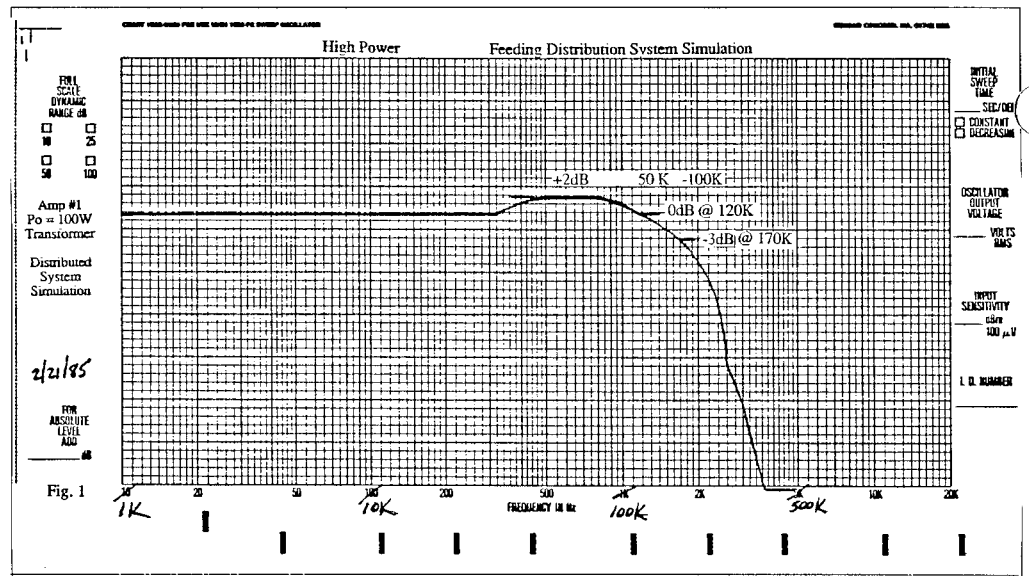


More on Transformers and Amplifiers From

D. Wayne Lee, Jr.

After reading Don Washburn's article in the Newsletter Vol. 15, No. 3 about Line Matching Transformers, I decided to dig out some old work I had done at Altec on amplifier stability and transformers. This information should nicely continue his informative discussion on transformers by looking at them as they affect the amplifier.

Many power amplifier circuits are not designed to drive the highly reactive load that a transformer, especially a poorly designed one, can present. The impedance of the load can vary wildly with frequency as will be seen. Couple that with a high cable capacitance seen in long run distributed system loads and the situation gets worse. The real problem here is in causing the amplifier to go unstable where it can destroy itself and other components involved. The reactance present in the load, at high frequencies, causes the current wave-



Frequency Response Curves of an amplifier under different load configurations.



form to lead the voltage waveform at the output of the amplifier. In negative feedback amplifier circuits this reduces the Phase Margin which is a measure of the margin of stability in the circuit. As the Phase Margin decreases, eventually positive feedback (oscillation) will occur as seen when analyzing the loop gain of the circuit. The Nyquist Stability Criteria states that a negative feedback amplifier is stable if the magnitude of the loop gain is less than unity when the phase angle reaches 180 degrees.

The following study shows frequency response curves of an amplifier under different load configurations. The two load configurations used were paralleled resistance and capacitance and a simulated distributed system consisting of step up transformer, shunt capacitance, step down transformer and resistive termination. Please note the frequency scale and that the chart paper was cheated to show high frequency instability. Some of you may recognize the amplifier in Figure 4. Additional measurements were performed on various loads to show their impedance, phase and Nyquist characteristics. These are the TEF measurements and they are described by the remarks on the print out. The items of interest to compare are poor quality transformers vs. quality transformers and capacitance values employed.

At this point I must thank Dr. Patronis for his TEF measurement assistance, his on-going advice and for several years ago helping a young green Georgia Tech engineer get a proper start in this controversial business we all love so dearly.

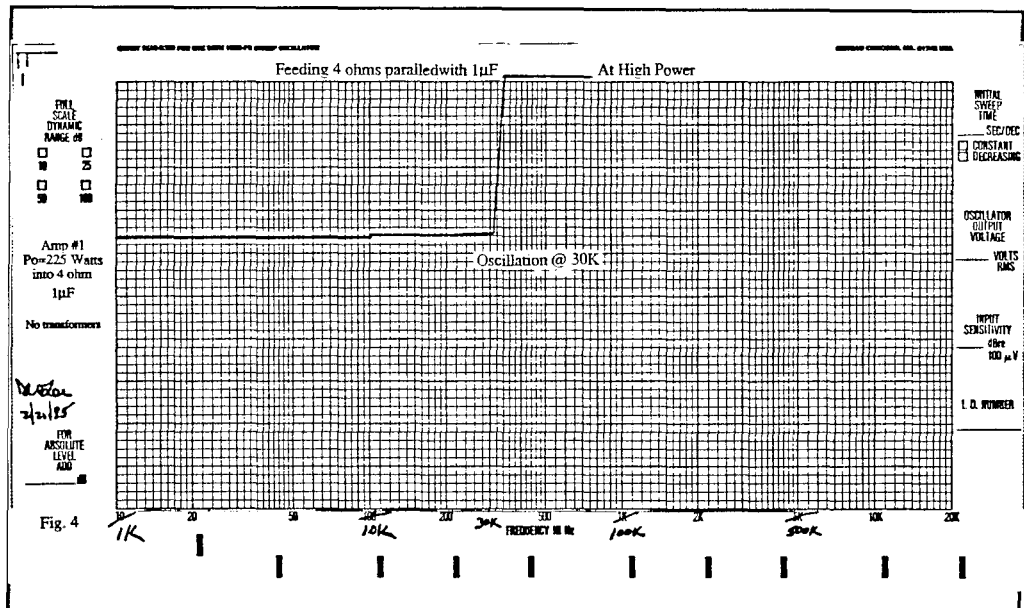


Fig. 4

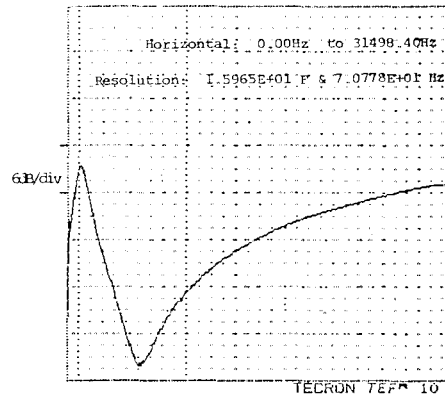


Fig. 5 Step up step down with .1 MFD in between 8 ohm.

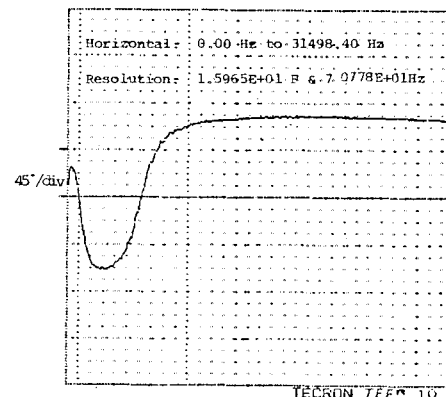


Fig. 6 Step up step down with .1 MFD in between 8 ohm.

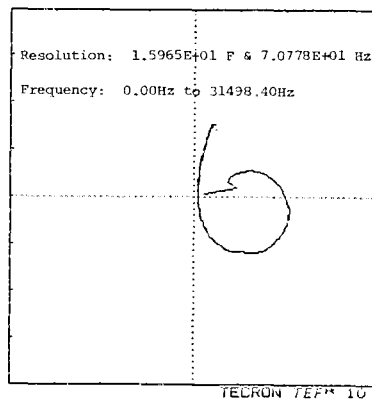


Fig. 7 Step up step down with .1 MFD in between 8 ohm.

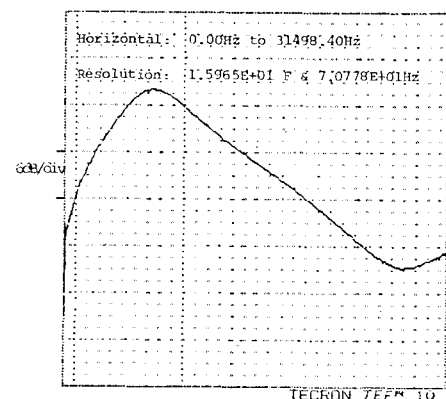


Fig. 8 Step up step down No C 8 ohm

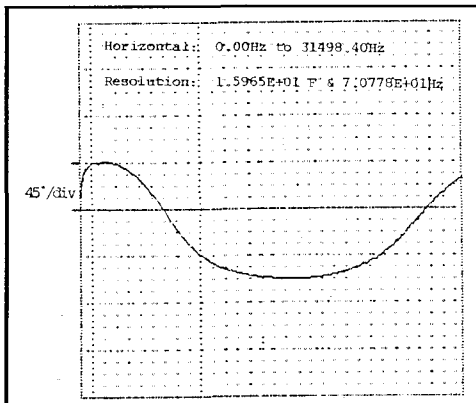


Fig. 9 Step up step down no C 8 ohm

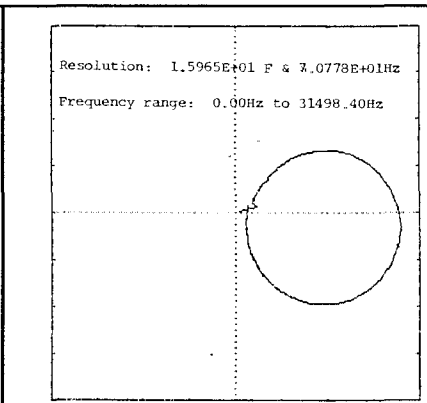


Fig. 10 Step up step down no C 8 ohm

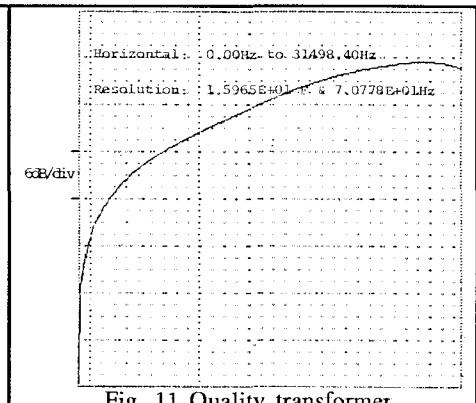


Fig. 11 Quality transformer step up step down 8 ohms

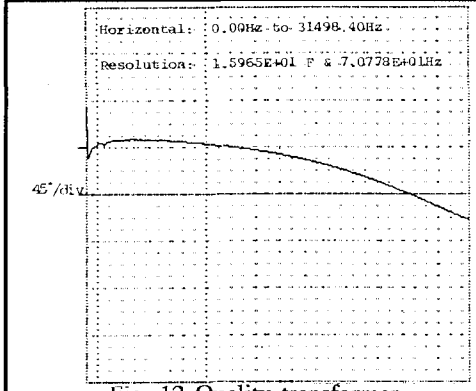


Fig. 12 Quality transformer step up step down 8 ohms

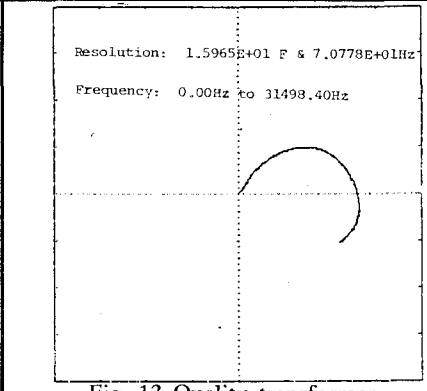


Fig. 13 Quality transformer step up step down 8 ohms

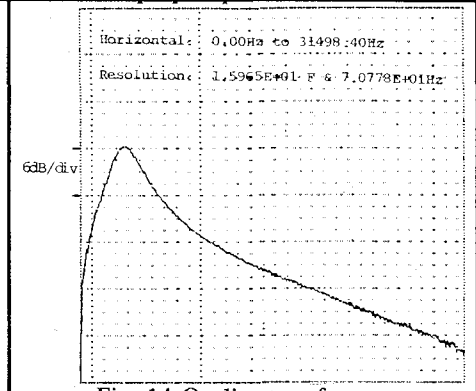


Fig. 14 Quality transformer with .1 MFD in between

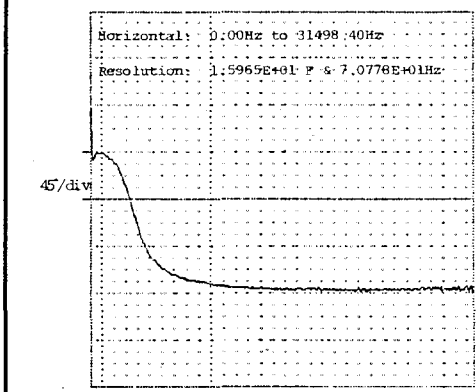


Fig. 15 Quality transformer with .1 MFD in between

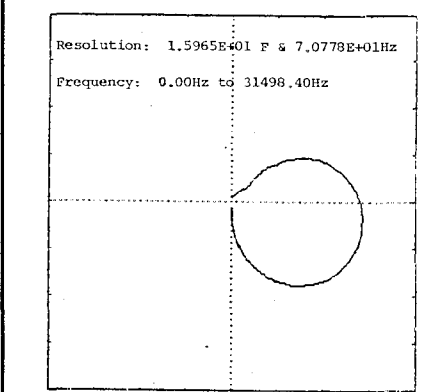


Fig. 16 Quality transformer with .1 MFD in between

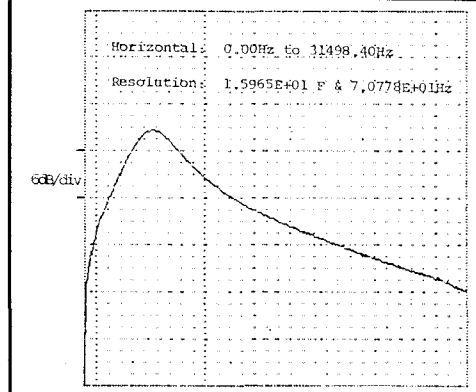


Fig. 17 Quality transformer with .047 MFD C in between

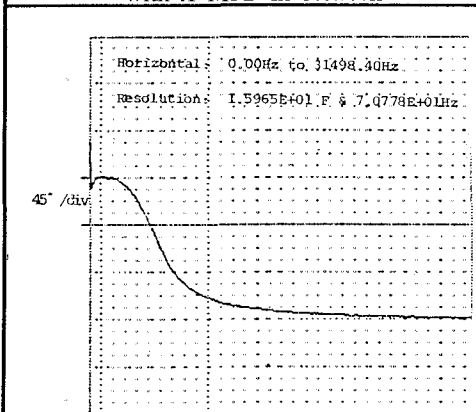


Fig. 18 Quality transformer with .047 MFD C in between

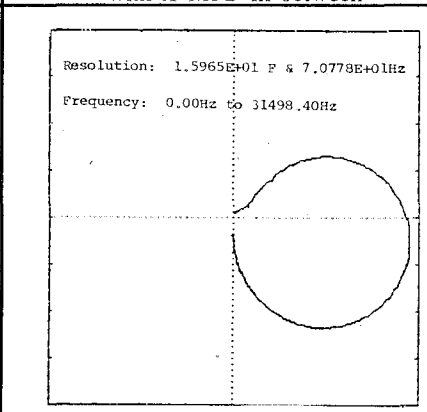
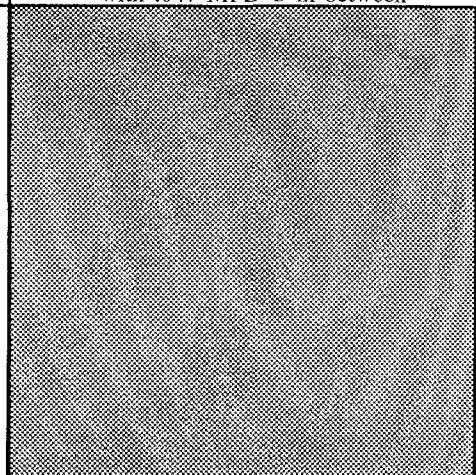
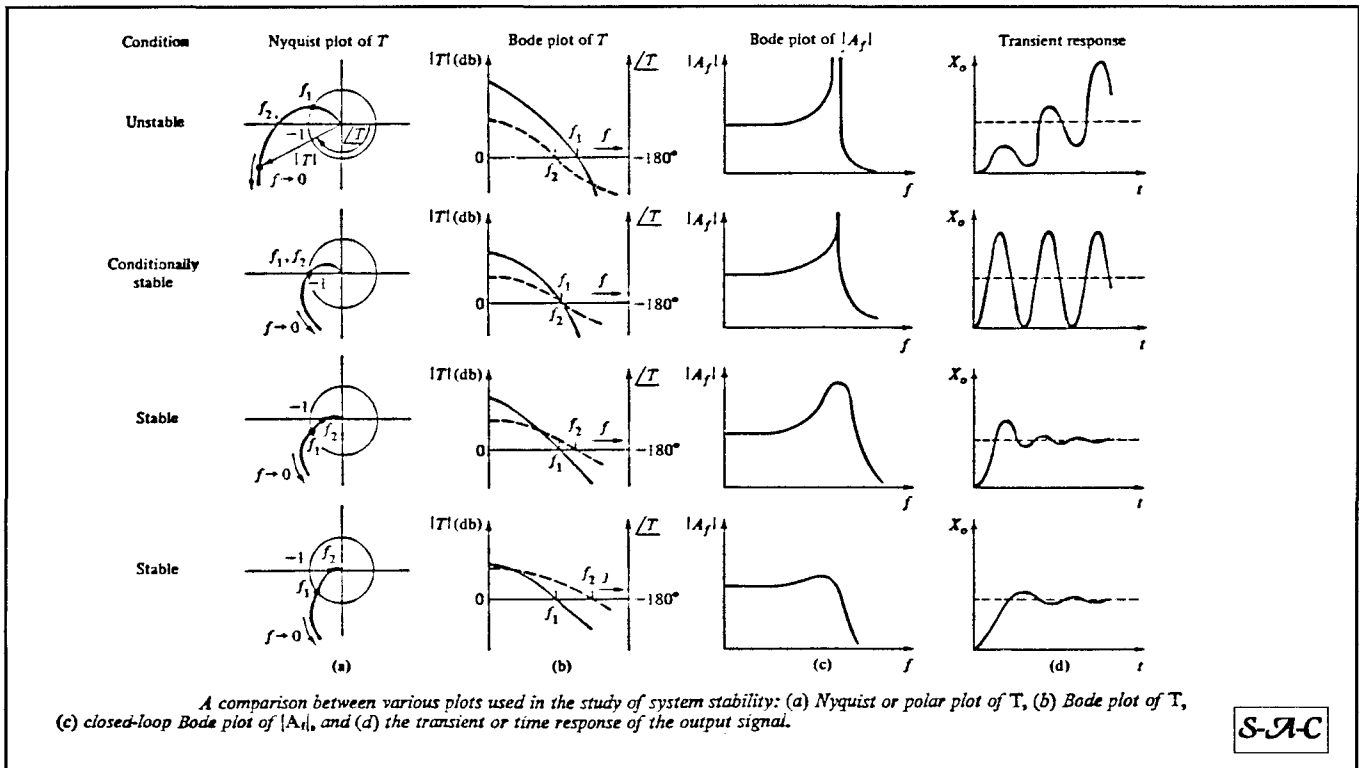


Fig. 19 Quality transformer with .047 MFD C in between





SAC

Men May Pass but Great Ideas are Immortal

It was with real regret we heard of the death of two giants in audio and acoustics. Hugh Knowles, founder of Knowles Electronics which includes Industrial Research Products Inc., and James Moir, England's great acoustic consultant.

We had the privilege of knowing both men having served on the Board of Governors of the AES with Hugh Knowles, and having had the Moirs as house guests when we lived in California. The work of both men is legendary and a great deal of it from World War II is unpublishable.

James Moir was one of the English team that came to the United States to share radar and ask Western Electric's help in building the radar network that saved England during the air blitz by the Nazis.

Hugh Knowles' work at Jensen before the war, and his expert knowledge of transducers was a national asset during the war years. His chapter elev-

en in "Loudspeaker and Room Acoustics" in Henney's **Radio Engineer-**



ing **Handbook** is a prize classic in the Syn-Aud-Con library. My fifth edition was printed in 1959. His writing is as useful today as it was thirty years

ago; that's the real test of a classic.

James Moir was one of the panel for the very first Syn-Aud-Con graduate meeting back in 1978, other participants were Dick Heyser, VMA Peutz, John Hilliard, and Don Davis.

Upon hearing of Mr. Moir's passing I dug out my tattered copy of his "High Quality Sound Reproduction" published in 1958. Paging through it raised an army of memories. It was Moir's book that described the pulse testing of theaters and discussed the quality of a theater seat as dependent upon the ratio of direct-to-reverberant sound.

Watching the output of technical journals today reinforces the concept that the total amount of intelligence is a constant and the technical population is increasing.

Yes, giants did walk the earth and their books are their footprints. Only giants leave traces still worth reading and studying. ■

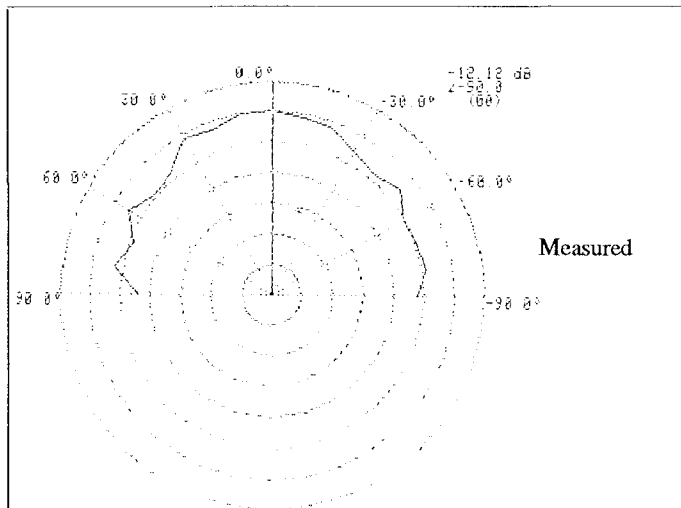
1:20 Scale Model Diffusor Measurements

by Hellmuth Kolbe

Hellmuth Kolbe has one of the best equipped private acoustic laboratories in the world with both Bruel & Kjaer TDS and Techron TEF capabilities. The B & K equipment is useful for scale model work, thanks to its 200 kHz upper response. Reproduced here are examples of his work with a 1:20 model in terms of calculated and then measured polar data on model diffusors. Hellmuth Kolbe is becoming increasingly well known for his concert hall design work and deservedly so. Consider the background work that went into either the calculation of such polar plots or their measurement in a scale model. ■

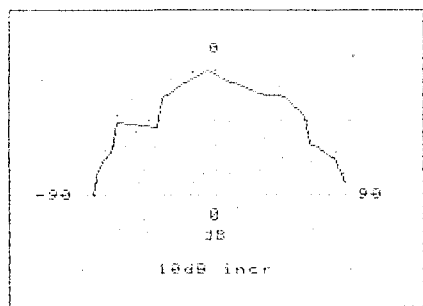
From Hellmuth Kolbe's Letter:

"Here are some data of model-diffusor measurements - scale 1:20. The QRD's I have built for the 1:20 model of a new multipurpose-hall I am planning here in Switzerland at Cham. I might also be able to use them for a new hall at the IRCAM in Paris."

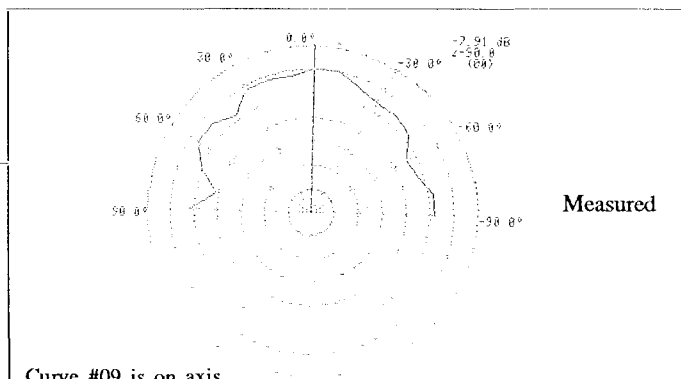


Measured

Curve #09 is on axis
Grid spacing of 10.00 dB and data gathered at 10.0 degree increments

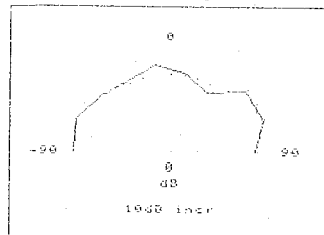


Calculated

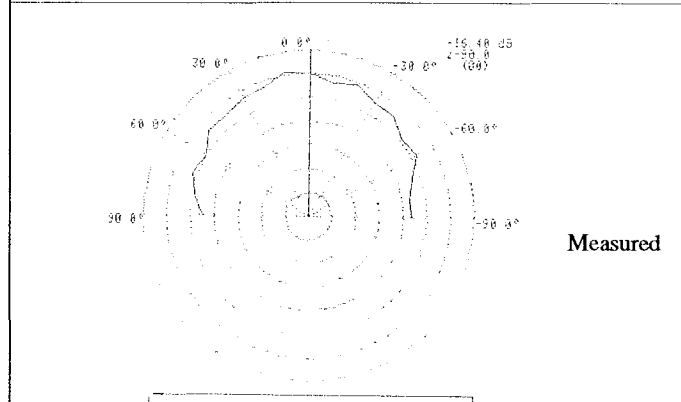


Measured

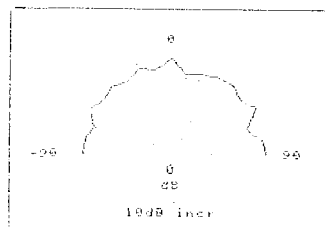
Curve #09 is on axis
Grid spacing of 10.00 dB and data gathered at 10.0 degree increments



Calculated



Measured



Calculated

Syn-Aud-Con

Fax Number

is

812-995-2110

Hardly a business day has gone by that someone hasn't asked us what is our Fax number. When we tell them that we don't have one, they say, "what a pity, I could have had that very important information to you today if you had a Fax machine." So we did it.

Our new Fax number is 812-995-2110

Signal Tracer

A few issues back we wrote about the Signal Tracer that J. W. Davis sells (also Music Supply in Dallas). William Newton from Dallas wrote us an interesting comment:

I recently tried the Signal Tracer, and was surprised at how well it works. It's rugged and ideal for PA installers.

I have been "asked" to look into a few PA problems, and it is unbelievable what I found, like the 600 ohm telephone line for paging connected without a 600/600 ohm isolation transformer and into the mic input without a pad! It talks and that is about all you can say. No telling how many sound systems are sold when, if they were properly installed, the existing equipment would work just fine.

SYRACUSE CLASS



Biamp

Sales

Manager

Biamp has a sales manager that is highly attentive to the needs of the professional sound contractor. Biamp is creating high quality-low cost equipment and is very interested in feedback from the field to further its evolution into the preferred component line. Ron Cameron (R) was in our Seattle class, and we were pleased to find him a customer service oriented individual. For further information on this rapidly expanding line write:

BIAMP
 P.O. Box 2160
 Portland, OR 97208-2160
 503-641-7287

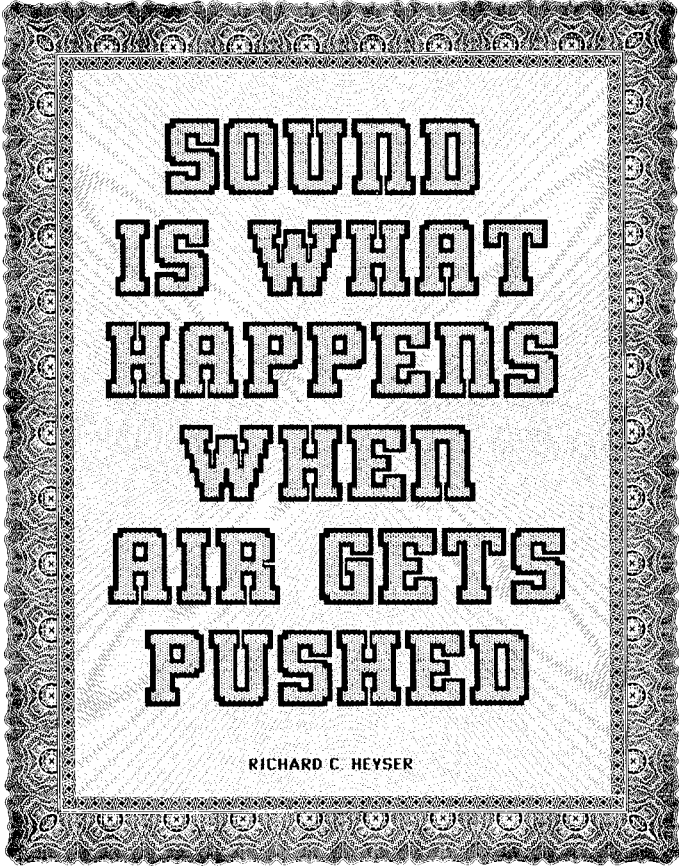


SOURCE OF AUTOFORMERS

Many class members, after doing the exercise on the morning of the second day, ask "who makes autoformers."

Altec Lansing recently announced a new addition to their autotransformer list. Remember they can be used to step up ratios as well as step down.

Voltage Ratios	Impedance Ratios	
	<u>Down</u>	<u>Up</u>
1.0	1.0	1.0
0.0707	1/2	2
0.58	1/3	3
0.5	1/4	4
0.41	1/6	6



**Bob Richards
of
McClea Place
Will Design
Six Recording
Studios
for
CBC
Broadcast
in Toronto**



We were pleased to hear of the success of Bob Richards in being chosen to design the audio recording control rooms for the CBC Broadcast Centre in Toronto.

The job is huge: over 1,000,000 square feet of floor space in the whole building. There are six full sized control rooms for multitrack recording, two large recording studios, and, at present, an unknown number of smaller edit and production rooms.

Bob is the owner of the McClea Place Recording studios in Toronto. He has attended many Syn-Aud-Con Studio Design workshops. In fact we went back over our records to see just

how many he had attended -- all, except the one held in Hamburg, Germany. We included a bio of everyone attending the 1st LEDE workshop in 1982.



From that we learned a little about Bob. He has a degree in electrical engineering. In 1976 he joined RCA Records in Toronto and became technical director. In 1979 he purchased McClea Place, which is prime real estate in downtown To-

ronto. Anyone who has been to Toronto recently knows the dollar signs that such real estate represents.

Bob says that he will include in his design team for CBC Broadcast Centre other Syn-Aud-Con grads for specific applications. ■

CLASSIFIED

WANTED

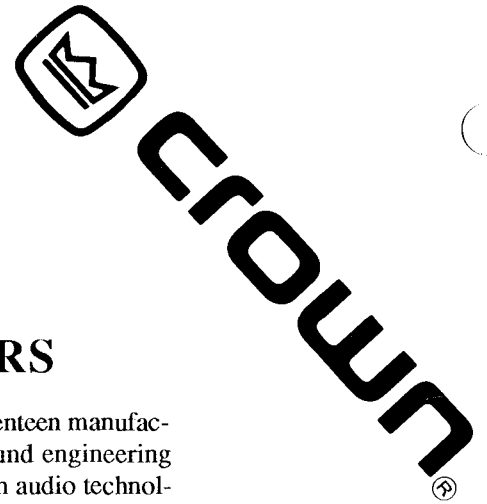
Used TEF 10 or 12. Contact Ken Barron, 3284 Heather St., Vancouver, Canada V5Z 3K5—604-872-2508

EMPLOYMENT OPPORTUNITY

Oxford Speaker Company, a major supplier of loudspeakers for OEM markets, is seeking a qualified individual to design speakers for Hi-Fi, Public Address, Musical Instrument, and Commercial applications. New expansions in this business have created this opportunity, which includes customer and

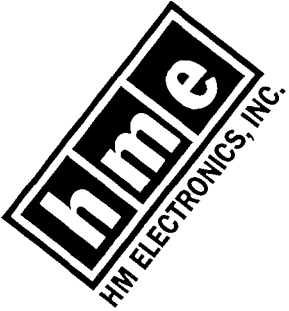
vendor contact; and product design from concept to production. The ideal candidate will have a BS degree and 4 years experience in loudspeaker component design. Experience in operating automated test equipment is a plus. Educational background in mechanics or acoustics is desirable.

This position, Product Design Engineer, reports to the Chief Engineer in our Chicago office, and carries attractive compensation and benefits. Interested parties please send resume and salary requirements to: Oxford Speaker Company, 4237 W. 42nd Place, Chicago, IL 60632—Attn: Daniel Field



Innovative Electronic Designs, Inc.

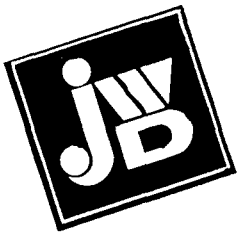
SYN-AUD-CON SPONSORS



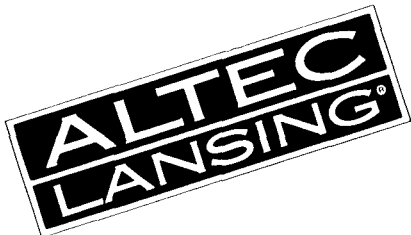
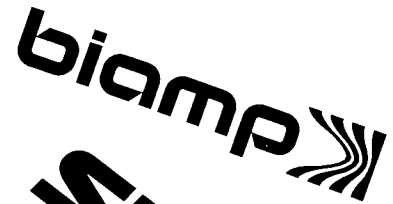
Syn-Aud-Con receives tangible support from the audio industry. Seventeen manufacturing firms presently help underwrite the expense of providing sound engineering seminars. Such support makes it possible to provide the very latest in audio technology while maintaining reasonable prices relative to today's 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.
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- Industrial Research Products, Inc.
- Innovative Electronic Designs
- JBL Professional/UREI Electronics
- J. W. Davis Company
- Shure Brothers Inc.
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- West Penn Wire Corp.



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