



newsletter

VOLUME 6, NUMBER 4

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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.

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

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SYN-AUD-CON FALL SCHEDULE

The most persistent "feedback" we receive from our questionnaires, correspondence, and visits with graduates can be summed up with the following:

1. "Hands on" experience is deeply desired
2. Smaller classes with more personal face-to-face relationship with the instructor
3. A chance to actually work at real problems

Syn-Aud-Con "thinks" that we know how to do this but only your response to our ideas counts. We feel that the time has come for Syn-Aud-Con to cease classes "on the road" (except for a few special TEF™ workshops) and develop a facility for audio research and workshops in a building specially equipped to allow small classes of approximately 21 participants to experience "hands on" practice and engage in actual system analysis, correction, and adjustment work.

This Fall promises to be the most exciting period in Syn-Aud-Con's seven years of existence. We have been appointed by the California Institute Research Foundation as their licensing agent for Dick Heyser's remarkable measurement system. We are calling the system the "Time-Energy-Frequency" (TEF™) measurement system.

TEF™ allows us to let you have "hands on" experience in advanced acoustical investigations that would have been undreamed of even a year ago. What's really startling to contemplate is that there is no university in the world today that can duplicate what we are going to do in our Fall classes. Just a few of the hands on experiments you can participate in are:

1. The establishment in a normal everyday classroom of an anechoic space one foot wide with over 60 dB of discrimination against undesired reflections
2. Real time viewing of the first 400 reflected spectra with instant determination of
 - A. The direction from which each spectrum arrived at the microphone
 - B. The time of travel and distance traveled
 - C. The relative energy density levels of each spectra
 - D. The distance between the microphone and the sound source

Imagine using this equipment to measure:

1. Loudspeaker alignment
2. Actual absorption coefficients
3. Actual response of reflections
4. Microphone characteristics including front-to-back ratios, effect of windscreens, etc.
5. Transmission loss measurements
6. Effects of diffusion and how to optimize it
7. Study Haas effect delays both subjectively and objectively

The cost is \$750 per person and includes four nights hotel accommodations, lunches, dinners, morning and afternoon snacks, textbook, *Sound System Engineering*, a full laboratory manual and transportation to and from the airport. It is our plan to hold one class per month, starting in late September, and each class will be limited to 21 participants. The class will be three days, laboratory style, with a maximum of hands-on experience and a minimum of lecture time. Classes will be from 9:00 a.m. to 5:30 p.m. each day with the evenings free to ponder the day's discoveries and to enjoy group discussions among your fellow participants. A fourth day will include a field trip to a point of audio interest in the S. CA area and delivery to the LA International airport in time for a late afternoon flight home.

You will spend three intensive days learning to use all the tools of the professional audio business including scientific calculators, 1/3- and 1/1-octave band analyzers, impedance measuring devices, level measuring devices including voltmeters, level recorders, and sound level meters, and reverberation meters. You will return from one of these classes with the know-how to avoid the errors committed by a vast majority of audio engineers. You will know how to separate the direct sound level from the reverberant, and ambient noise sound levels. You will have measured and experienced the psychoacoustic effects inherent in the early sound field.

Remember, your \$750 includes:

- *transportation to and from the LA or Orange County airport to the hotel
- *room for four nights at the hotel
- *4 lunches, 3 dinners plus morning and afternoon snacks
- *textbooks, laboratory manual, slide rules and other classroom materials
- *a year's subscription to the increasingly sought-after Newsletters and Tech Topics
- *the three day workshop plus an additional fourth day of tour of a local audio manufacturer and a 24-track recording studio.

The only additional expense you need pay is your transportation to and from Los Angeles.

It is our plan that your hotel will be in a resort town in Orange County, should you want to plan a vacation with your family before or after the Syn-Aud-Con class.

We hope that we can have a definite schedule in the mail to you within a month or so. Our May Workshop over-subscribed in 10 days. If you want to be in touch with us ahead of our mailing indicating your interest in such a class, let us hear from you.

SYN-AUD-CON GRADUATES

We capitalize the names of our graduates in our Newsletters. We used to list the class attended, but that became impractical as we got multiple-time graduates. In fact, out of 3,000+ graduates, hundreds have attended at least three times and we have many that have been 4 and 5 times, and we have a few that attend more than one class a year (Yes, that is ED BANNON that you see in the March San Diego class and the June Los Angeles class.) We thought we should explain why you see one name in small letters, like Ed Long, and RON WICKERSHAM in caps. No disrespect, we just want the person to be identified as a grad without going thru the class listing.

NEW TEF™ PROGRAM

Syn-Aud-Con has a new licensing arrangement with the California Institute Research Foundation (Cal Tech) whereby Syn-Aud-Con is appointed to sub-license those firms or individuals wishing to practice Time Delay Spectrometry (TDS), Energy Time Curve (ETC) and Frequency Time Curve (FTC) measurements as covered by patent #3,466,652 issued to Richard C. Heyser and administered by The Foundation, and by a patent pending in the U. S. patent office.

Syn-Aud-Con's package including the license is called "Time-Energy-Frequency Measurements" (TEF™), which allows essentially "real time" high resolution measurements of:

1. Energy density vs frequency
2. Energy density vs time
3. Frequency vs time
4. Time of arrival, distance traveled, and direction of arrival for acoustic signals

The TEF™ package costs \$500 and includes

1. Authorization and license to assemble and use one TEF™ measurement system
2. Full instructions, equations, and sample exercises in the basics of TEF™ measurements
3. A subscription to a special TEF™ measurement bulletin service
4. One set of interface modules for the interconnection of a TDS analyzer to an FFT analyzer for Energy Time Curve (ETC) measurements

There are currently over 120 licensees to the TDS license originally offered by The Foundation. This license is no longer available. Those licensed under the original TDS license need to pay \$400 for the TEF™ measurement package

The TEF™ Measurement System

A few of the basic measurements that the TEF™ system allows the user to easily handle are:

1. The energy density vs frequency of a signal. In the past this measurement has been thought of as *the* frequency response with "energy density" usually labeled amplitude in dB. We now call this viewpoint of "frequency response" the *energy density frequency curve* (EFC). Also called TDS.
2. Another extremely useful viewpoint of "frequency response" is the one of energy density vs time. We call this the *Energy Time Curve* (ETC)
3. Still another viewpoint is that of frequency vs time. We call this the *Frequency Time Curve* (FTC). This viewpoint is the obvious choice for doing alignment of acoustic centers, or Acoustic Centering™, which we have trademarked (called in the method used by Ed Long, Time Alignment™.)
4. In addition to the above measurements, the ETC technique allows easy, accurate and rapid determination of the signal's *direction of arrival, its travel distance, and its travel time.*

TDS+ETC+FTC form the basis for the new name we have given Dick Heyser's measurements. Dick assures us that he has only begun to disclose the measurements that the basic TDS patent allows. We hope that the name "Time Energy Frequency" measurements is sufficiently broad to include much of what he will be presenting the measuring world.

That these are unbelievably powerful techniques is obvious. The ease of their implementation is surprising. The wealth of new insights they make possible is staggering. The unprecedented power of analysis TEF™ measurements allow must literally be seen to be believed. Every time we turn on our TEF™ equipment, which is often, we learn something new.

TDS-TEF™ WORKSHOPS

We have contacted Dick Heyser and he has indicated a willingness to participate in at least two special Workshops this Fall. TEF™ licensees will be given first consideration for these Workshops, followed by TDS licensees. We don't have the exact dates at this time but the first one will be either late September or early October in Las Vegas at Chips Davis' Las Vegas Recording.

In our book, the opportunity to attend a "hair down" Dick Heyser discussion of his major invention and its present and future manifestations is alone well worth the cost of the TEF™ package.

The May Workshop for the Twenty hosted by Filmways-Heider in Hollywood showed us the value and importance of an on-location "hands on" type workshop.

DIFFERENCE BETWEEN AN ENGINEER AND A SCIENTIST

CRAIG ALLEN from the Naval Ocean Systems Center in San Diego gave us a definition of the difference between an engineer and a scientist: When a scientist makes a mistake in a paper he publishes, he publishes another paper to correct his mistake. When an engineer makes a mistake in a paper, the bridge comes down.

Along that same line is a quote from Publisher's Letter in Electronics from an article by Al Hayes, "There's nothing I like better than to take a set of theoretical equations having little or no practical use, and to convert them into a set of useful cookbook-type formulas that can be quickly and accurately solved with the great tool now available to the engineer: the calculator.

"An engineer's prime function," he continues, "is to transform the theory into meaningful results. That's what differentiates the engineer from the physicist. The calculator is the tool that permits the engineer to fulfill his function.

LIST OF TEF™ LICENSEES

There were 120 TDS licensees before CIRF decided to discontinue the TDS license and arranged for a broader licensing arrangement with the TEF™ license. There are 3 manufacturers licensed to TDS: UREI, Klipsch and Assoc., and Sunn Musical Equipment Co (a company filled with bright young talent). Already there are 2 manufacturers licensed for TEF™ measurements: Rauland-Borg and Crown. This is extremely encouraging.

TEF™ licensees are:

Ed Bannon
127 Haynes St.
Canoga Park, CA 91307

Dr. Eugene Patronis
1774 Northridge Rd.
Dunwoody, GA 30338

Robert Todrank
Valley Audio
P O Box 40743
Nashville, TN 37204

Farrel Becker
10120 Ashwood Dr.
Kensington, MD 20795

Kenneth Wahrenbrock
Wahrenbrock Sound Assoc.
9609 Cheddar St.
Downey, CA 90242

Joe G. Mitchell
1120 Stonehedge Dr.
Schaumburg, IL 60194

Dan J. Zellman
Howard M. Schwartz Recording
420 Lexington Ave
Suite 1934
New York, New York 10017

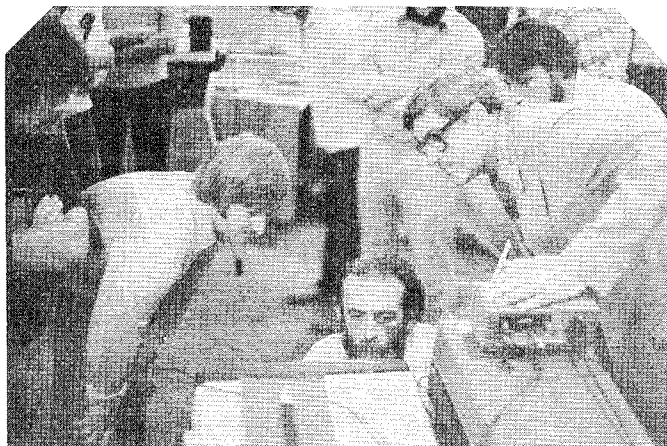
Steve Langstaff
The Audio Workshop
84 Long Ave
Belmont, MA 02178

Bernie Cahill
Rauland Borg Corp
3535 W. Addison Ave
Chicago, IL 60608

Richard Lee
Compass Point Studios
P O Box N-4599
Nassau, Bahamas

Gerald Stanley
Crown International
1718 W. Mishawaka
Elkhart, IN 46514

Michael A. Chafee
Michael Chafee Enterprises
2215 Alpine Ave
Sarasota, FL 33579



ED BANNON, during the June Los Angeles class checking out his new Time-Energy-Frequency instrumentation.

2 TEF™ ACCESSORIES FROM SHURE BROTHERS

Two old "friends" turn out to be invaluable accessories to our TEF™ measurements.

A Measurement Amplifier

Since the TDS analyzer we use in our TEF™ measurements goes out to 50 KHz and so does our measuring microphone, a legitimate question arises as to the integrity of the power amplifier used to drive the test loudspeakers.

We mentioned our concern to Bill Bevan, Chief Development Engineer, Electronics at Shure Brothers and asked him for data on the SR105 units we use due to their reliability and stability. Response is -6 dB at 10Hz and only 1 dB down at 100 KHz. Over the range of interest to us no allowance need be made for the power amplifier. It is absolutely flat.

Testing was done at both 1 watt (which is closest to the highest levels we use in testing) and 10 watts. Either level can be used up to 50 KHz without compensation. The high impedance input to the amplifier was used and the load was 8 ohms. Remember, we are using the amplifier under stringent stability conditions without reservation. That's saying quite a lot these days.

A Smooth High Quality Cardioid Microphone

When examining absorption characteristics of building materials by means of either TDS or ETC in the TEF™ measurement system a smooth response cardioid with a minimum of 20 dB front-to-back ratio is a valuable accessory. We use the Shure SM 7 for this work. It is the most uniform response we have encountered in a moving coil dynamic-type cardioid, has sufficient output to be connected directly to our TDS analyzer and has proven to be both rugged as well as looking like a piece of precision test equipment. (I can't bring myself to use some of the gaudier brushed chrome et al cosmetic units as "measurement" instruments in front of a consulting client.)

Conclusion

It's all too easy to overlook the obvious when exploring today's truly thrilling measurement systems. It's still necessary to examine in detail every cable, connector, and other accessory with utmost care. The units discussed here won't embarrass the validity of your TDS-TEF™ measurement data.

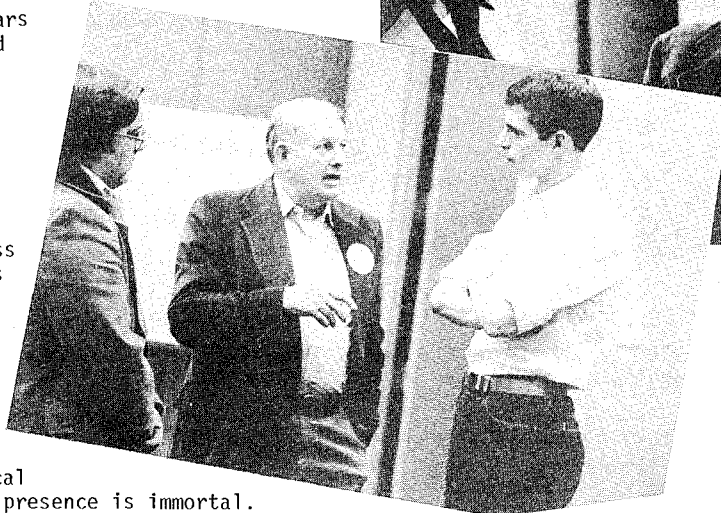
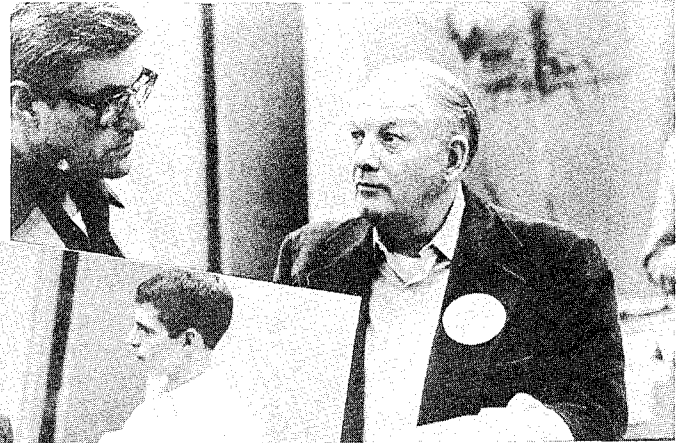
SAM ADAMS UNTIMELY DEATH

A dedicated soldier, adept in weaponry, tactics, and totally devoid of fear, he personified the very best qualities of a professional soldier. Artist-photographer, loving and faithful husband and father, eager enthusiastic student of audio, Sam's humbleness, enthusiasm and absolutely contagious love of mankind were his weapons against the enemies that attack a man's mental dominance.

Sam attended six consecutive years of Syn-Aud-Con classes, produced the Syn-Aud-Con TECH TOPICS on the questions and answers in *Sound System Engineering*, which helped literally hundreds of Syn-Aud-Con graduates in their understanding of audio.

Sam was that rare being, a real man, a gentle man - fearless full of integrity, humble in his own estimation but regarded by others as artistic, dedicated, and consistently kind, optimistic and helpful.

Sam was no man to trifle with and I'm sure the angel sent to call him to his Father did so with caution. His physical presence is gone but his mental presence is immortal.



ATLANTA CLASS 1978

PERSONAL PA BROADCASTING SYSTEM

Williams Sound corp.

5024 Valley View Road Minneapolis, Minnesota 55436 612/929-0885

June 30, 1978

Mrs. Carolyn Davis
Synergetic Audio Concepts
P.O. Box 1134
Tustin, California 92680

Dear Carolyn,

Just a note to express our appreciation for referring one of your recent Syn-Aud-Con students, Murrel Miller, to us for our Personal P.A. Broadcasting System. We shipped a basic system to him for his church in Torrance today.

We have shipped over 300 of these systems now and the glowing letters of appreciation and reorders for receivers gives us great joy. I'm enclosing our new brochure and price list. If you would like a quantity of them, let us know.

We recently petitioned the FCC to change Part 15 of their rules to allow an increase in power to 250 milliwatts and to establish standard frequencies for hearing support devices so that an orderly market might be developed. If you are interested in the details, I'd be pleased to send a copy of our petition for rule making.

Thanks again for the referral. I hope you are both well and that your ventures are all going well.

Sincerely,

Gerald L. Williams
Gerald L. Williams
President

GIW:llw

Williams Sound Personal PA Broadcasting System

What It Does . . .

Meets the needs of worshippers with hearing impairment. They can hear the service wherever they want to sit while controlling their own sound level!



QTY.	DESCRIPTION	PRICE	AMOUNT
	Basic Personal P.A. Broadcasting System consisting of the Power Unit, Transmitter Unit, 3 Receivers with batteries & earphones, 50 ft of Interconnecting Cable, Installation & Service Manual, Installation Hardware, Wall Plaque and Prepaid Shipping & Insurance via UPS	\$295.00	
	Additional Receivers, with the system	16.00	
	Ordered Separately, if less than 4	18.00	
ft	Additional 4-conductor Interconnecting Cable, to be added to the 50 foot standard length	15/ft	
	Additional Earphones	1.00	

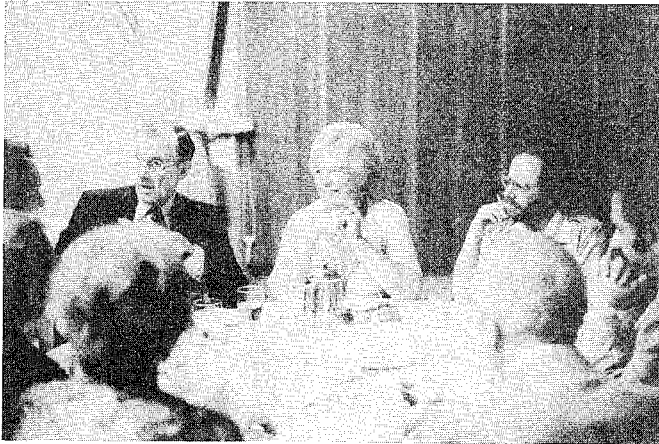
Write GERALD WILLIAMS for an up-to-date price list and catalog.

In our 1978 Los Angeles class we gave the above info to MURREL MILLER. Murrel attended the class in order to help his church with their sound problems. He wrote us a note this year: "Thanks for recommending the Williams Sound Co. Personal P.A. System for the hard of hearing. It works beautifully in our church and has a transmitting radius of about 100 ft. The output of our Shure M67's is just right to modulate the system."

THE ILLUSION

JEFF LONG from PL Sound in Fresno called to say that he had tried to order an "Illusion" from Eling Industries in Santa Barbara but the phone number that we have on the literature available in class is no longer current. We wrote Eling Industries and received the following information: Current price on the Illusion is \$32 + \$2 freight. (They point out that it is selling for \$60 in stores.) New phone # is (805)682-3591. P O Box 6075, Santa Barbara, CA 93111.

HELEN RANGE TAKES LEAVE OF ABSENCE



Helen Range, Syn-Aud-Con's well known and well-liked office manager has taken an extended leave of absence "to devote her time to relaxation by the swimming pool" and judging from her sun tan she is being very successful in her new activity.

If the Newsletter is a little late and it has a few more mistakes than usual, it's just one of the ways that we miss Helen.

Picture of Helen taken at our April 30, 1978 Graduate Meeting in Los Angeles.

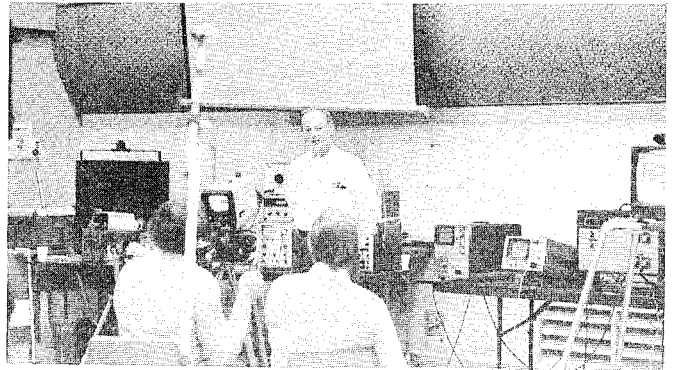
CAVEAT EMPTOR

For those being tempted by the idea of using one of the small home-type computers along with an impulse device as a "frequency response" analyzer, please read Dick Heyser's comments:

You can produce a spectrum analysis with numbers down to dc for a 10 millisecond time slice, but you are fooling yourself if you use that display to interpret the equivalent frequency spectrum to better than about 100 Hz resolution.

Don't let any con artist tell you to the contrary. The fact that you "see" things down to some frequency below this limit does not mean that such things are meaningful.

The above was told the TDS Workshop that Dick conducted for two days at the Filmways-Heider Studios in Hollywood in May for 20 TDS licensees.



TELEVISION DAMAGING TO CONCENTRATION

Essayist and novelist Susan Sontag remarked recently in U. S. News and World Report

"Young people today are less literate than a decade ago. They seem to have less intellectual energy. Television must have a lot to do with it. I have a suspicion that it really changes the way people pay attention and, in effect, damages powers of concentration.

"People may have a different way of using their minds as a result of watching television. It's almost like a neurological retraining: If you watch television all the time, it is in some profound way incompatible with reading."

It our brief excursions into the literature of brain functioning such as *The Elusive Right Hemisphere of the Brain* by Eran Zaidel in Engineering and Science, *Putting the Other Half of the Brain to Work* by George Prince in Training, and *THE ORIGIN OF CONSCIOUSNESS IN THE BREAKDOWN OF THE BICAMERAL MIND* by J. Haynes (a book) leaves the reader with great respect for "unintentional learning" and other non-conscious processes by which we program ourselves without telling our conscious self about it.

General Patton defined access to the right cerebral hemisphere beautifully when he defined "luck" as "The instantaneous realization of a problem by the inner mind before the outer mind could get into gear." (from *PATTON'S THIRD ARMY AT WAR* by George Forty, a new book on General Patton.

Cultivation of the strengths inherent in every man, in other words, the full man, seem present in us all. We deliberately dilute these strengths by succumbing to the drugs of the world. Mental drugs such as TV, desire for power over others, etc., as well as the more material ones. A legitimate question any of us can and should ask ourselves, "Have we lived up to our real potential today?"

SBA TO BE SHIPPED SOON

Latest word from the J. W. Davis Company in Dallas is that they will be shipping the SBA systems in the next few weeks. (SBA is the Signal Biasing Amplifier designed by Dick Heyser and being manufactured under license by the J. W. Davis Company - See Newsletter Volume 6, Number 2 and 3 for a detailed description of the remarkable design concept.)

Don't miss this opportunity to get in on the ground floor of a new systems technology. For further information, call Chappie Chapman, J. W. Davis Co., Ph 214-352-8405.

PROGRAM FOR FINDING "N"

ED LETHERT'S efforts in the solution of the general case for 'N' are having profound ramifications in the field. For many years we desired to know the Q of an array.

Upon close examination of a typical array the Q of an individual directional control device (DCD) remained the same with the remainder of the array on or off. What changed was the critical distance, D_c .

Many times we have measured the rise in the reverberant sound field level at a given point as additional DCDs were turned on in the array. What caused the reverberant field to rise was the increased 'N', not decreased Q. The proof of this lies in the fact that the total sound level, LT, went up as this happened.

Combining DCDs in very close proximity can at certain limited frequencies provide a narrower coverage angle (C_L) but the Q is not changed as it does so because the phase cancellation precipitating the narrower C_L has also reduced the L_D and L_T .

Thus, what we need to know about a large array in an arena is not its Q as a whole but its 'N' factor. Then we can accurately predict sound levels in that arena.

Ed's Program - 'N' for Mixed Acoustic Sources

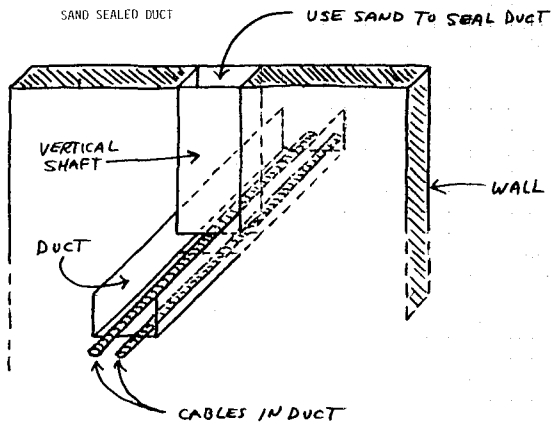
- Step 1. # Types A.....initialize
 - Step 2. $L_s + Q$ R/S....mWan (repeat for each type)
 - Step 3. $W_{en} + U_{tn}$ R/S....mWa total (repeat for each type)
 - Step 4. $U_{Dn} + \text{Types}$ R/S....'N' (repeat for all types providing direct coverage to a particular point)
- B.....Reset to Step 3
C.....Reset to Step 4

'N' FOR MIXED ACOUSTIC SOURCES

001	*LBLA	21 11	049	RCL1	36 46
002	CLRG	16-53	050	R/S	51
003	P2S	16-51	051	X2Y	-41
004	CLRG	16-53	052	P2S	16-51
005	STOE	35 15	053	RCL1	36 45
006	*LBL1	21 01	054	P2S	16-51
007	ISZI	16 26 46	055	PRTX	-14
008	RCL1	36 46	056	X2Y	-41
009	R/S	51	057	PRTX	-14
010	X2Y	-41	058	X	-35
011	PRTX	-14	059	STO1	35 45
012	X2Y	-41	060	X2Y	-41
013	PRTX	-14	061	PRTX	-14
014	LOC	16 32	062	X	-35
015	1	01	063	ST+0	35-55 00
016	0	00	064	PRTX	-14
017	X	-35	065	RCL1	36 46
018	1	01	066	RCL1	36 15
019	0	00	067	X2Y?	16-32
020	7	07	068	STO2	22 02
021	.	-62	069	RCL0	36 00
022	5	05	070	SPC	16-11
023	+	-55	071	PRTX	-14
024	-	-45	072	SPC	16-11
025	1	01	073	*LBL0	21 13
026	0	00	074	SPC	16-11
027	=	-24	075	SPC	16-11
028	10*	16 33	076	R/S	51
029	EEK	-23	077	*LBL3	21 03
030	3	03	078	0	00
031	x	-35	079	STO9	35 09
032	P2S	16-51	080	R4	-31
033	STO1	35 45	081	STO1	35 46
034	P2S	16-51	082	R4	-31
035	PRTX	-14	083	RCL1	36 45
036	SPC	16-11	084	PRTX	-14
037	RCL1	36 46	085	X2Y	-41
038	RCL1	36 15	086	PRTX	-14
039	X2Y?	16-32	087	SPC	16-11
040	STO1	22 01	088	X	-35
041	*LBLB	21 12	089	ST+0	35-55 09
042	SPC	16-11	090	RCL0	36 00
043	SPC	16-11	091	RCL9	36 09
044	CLX	-51	092	+	-24
045	STO0	35 00	093	PRTX	-14
046	STO1	35 46	094	SPC	16-11
047	*LBL2	21 02	095	R/S	51
048	ISZI	16 26 46	096	STO3	22 03
			097	R/S	51

SENSI	99.00	***	SENSI = 99.00	***		
Q	7.00	***	Q = 7.00	***		
	20.18	***		20.18	***	
				20.18	***	
WATTS/DRIVER	5.00	***	WATTS/DRIVER	5.00	***	
# OF DRIVERS	100.00	***	# OF DRIVERS	4.00	***	
				403.56	***	
				403.56	***	
				100.90	***	
# OF DRIVERS PROVIDING DIRECT SOUND	2.00	***	# OF DRIVERS PROVIDING DIRECT SOUND	2.00	***	
			N = 5.00	***	N = 2.00	***

ISOLATING DUCTS THROUGH WALLS



A common problem in broadcasting, television, and recording studios is the need to pass a great number of cables through studio walls in ducts or trays, and yet not being able to correctly seal the opening because another cable will have to be installed the minute you do.

Here's a clever solution to the problem that was used by Jack Purcell (shared in the Acoustical Society Convention in Hawaii, 1978).

Build a vertical shaft in the wall above the duct that penetrates to 1/2 the depth of the duct. See illustration. Fill the vertical shaft with dry, high density sand. The sand will flow out in the duct covering the cables and very effectively supporting a column of sand in the shaft which seals the opening through the wall most effectively.

HANDLING LOW FREQUENCY ACOUSTICAL PROBLEMS

THEORETICAL ACOUSTICS. Our visit to the MIT campus for the ASA convention in June led to still another acoustics book in our collection, *Theoretical Acoustics* by Philip M. Morse and K. Uno Ingard, both professors of Physics at MIT.

Theoretical Acoustics is a 927 page book published in 1968 but somehow I hadn't gotten around to picking up a copy of it until now. It is a concise, well written book intended for an audience familiar with calculus, Bessel functions, and other academic shorthand. In spite of this assumption of reader competence, there are jewels present that require only practical experience to enjoy and appreciate.

The chapter on Room Acoustics, for example, is neatly divided into Wave Acoustics and Geometric Acoustics. The dividing point is beautifully delineated,

When the ratio of wavelength to cavity dimension is between about 1/3 and 3 of the smallest room dimension the normal wave analysis is most useful. For shorter wavelengths the geometrical analysis is preferable.

In a control room with a 10 foot ceiling

$$f = \left(\frac{1130}{10/3} \right) = 339 \text{ Hz}$$

Or, for a 12 foot ceiling

$$f = \left(\frac{1130}{12/3} \right) = 282.5 \text{ Hz}$$

Under the discussion of Symmetry in Rooms,

We can state as a general rule that the more symmetrical an enclosure (room) is, the larger will be the range of frequency over which the resonance properties fluctuate, and the less desirable it will be for listening purposes.

Rooms having very irregular walls, will approach the smooth average curve still more rapidly. (See Figure # 1)

At another point they add:

These irregularities of response are more pronounced, the more symmetric the shape of the room, or the narrower the frequency band of the sound source.

Thus, a 1/3-octave plot certainly looks better than a sine wave plot at low frequencies whereas at higher frequencies they look remarkably alike.

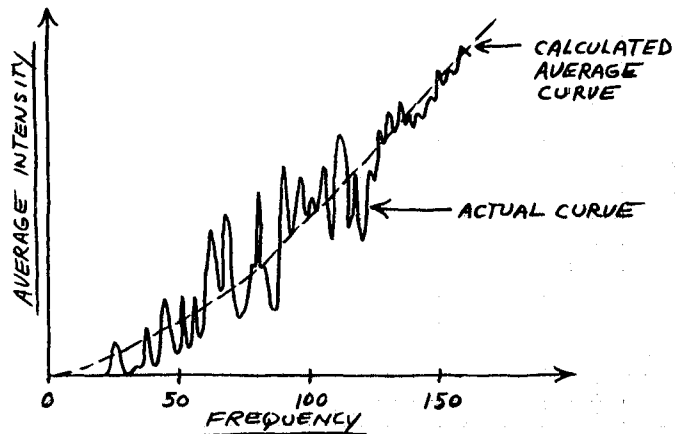
The book is replete with excellent clarifications of when to use one technique vs another in room acoustics.

What Some of the Above Implies

In an LEDE design, for example, it should be obvious that the geometry design that constitutes the LEDE approach is carried down to approximately 200 to 250 Hz. Below those frequencies, what you have on the walls as absorption treatment, diffusion et al begins to become acoustically transparent to the low frequency signals and only the structural boundary walls then enter into the design. This means an avant-garde LEDE room has first an irregularly shaped, very rigid boundary design into which the LEDE geometric design is placed.

We recommend *Theoretical Acoustics* as an excellent text book on all phases of wave and geometrical acoustics and when to choose which.

STANDING WAVES IN SMALL ROOMS



THE MORE IRREGULAR THE TRUE RIGID BOUNDARY SURFACES THE SOONER (IN FREQ) THE ACTUAL CURVE APPROACHES THE AVERAGE CURVE

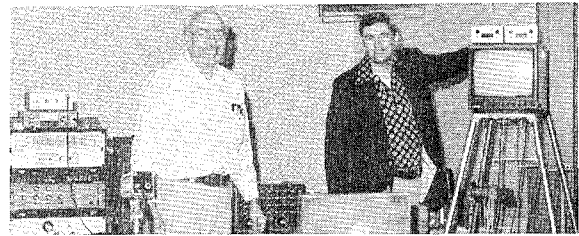
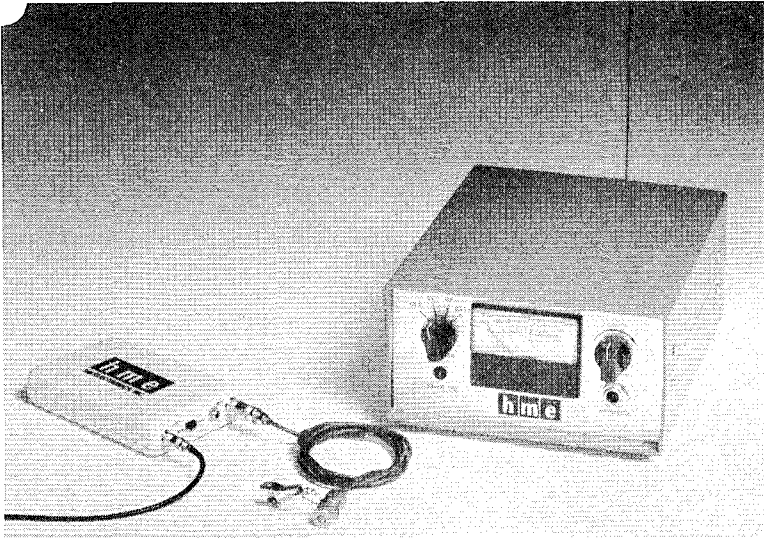
A WIRELESS MICROPHONE FROM HME

We have been using the HME wireless lavalier microphone in recent classes. It is sturdy, compact and reliable.

This particular unit is on a Canadian Hydrological frequency as is the Swintek that we were successfully using.

We now know of at least two wireless microphone systems, that from our experience with them, are perfectly satisfactory for extended classroom use.

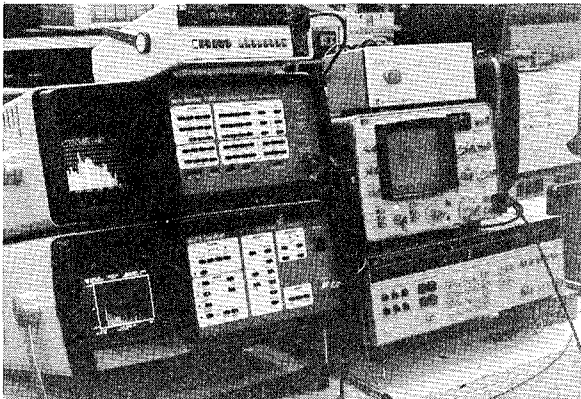
As a note of interest, we change batteries in the morning and noon each day for safety sake though the HME was inadvertently used one entire day without a battery change and the quality was good all day.



This picture shows Ken and I in the midst of discovering that the HME microphone system is the reverse polarity of the Swintek. (See a write up of Ken's new Polarity Tester elsewhere in the Newsletter.)

SYN-AUD-CON'S NEW TEST EQUIPMENT

We have acquired a number of new test instruments in the past year. The key items are shown in the illustration.



1. The GenRad 1995 1/3 and 1/1 octave band analyzer
2. The GenRad 2512 FFT analyzer
3. The HP 3580A Spectrum Analyzer
4. The HP 3325 A Synthesizer
5. The HP 3466A 4½ digit Multimeter
6. The B&K 4136 ¼" microphone cartridge + UA 0035 adapter with GenRad 1560-P42 preamplifier and GenRad 1560-P62 power supply
7. The Heyser Time-Energy-Frequency (TEF) module

KEN WAHRENBROCK has designed and built, for Syn-Aud-Con, a series of "black boxes" that have materially assisted in the interfacing of this equipment in "hands on" instruction.

With the instruments shown we can measure acoustically with great accuracy and rapidity:

1. The total sound level in 1/3 or 1/1 octave bands from 20 to 20,000 Hz.
2. Narrowband total sound measurements to 50K Hz
3. Impulse measurements to 100K Hz
4. TDS measurements to 50K Hz
5. Energy-Time-Curve measurements from 10 msec full scale to 500 msec full scale
6. Frequency-Time-Curve measurements to a resolution of 20µsec (0.271"). This is an elegant way to study offset acoustic centers in multiway arrays of all sorts and adjust them for optimum performance.

The ease of operation, the clarity of the displays, the repeatability of the data (remember these are acoustical measurements) and the mind-bending insights this equipment provides is indeed spectacular.

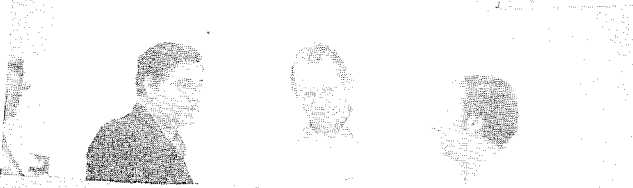
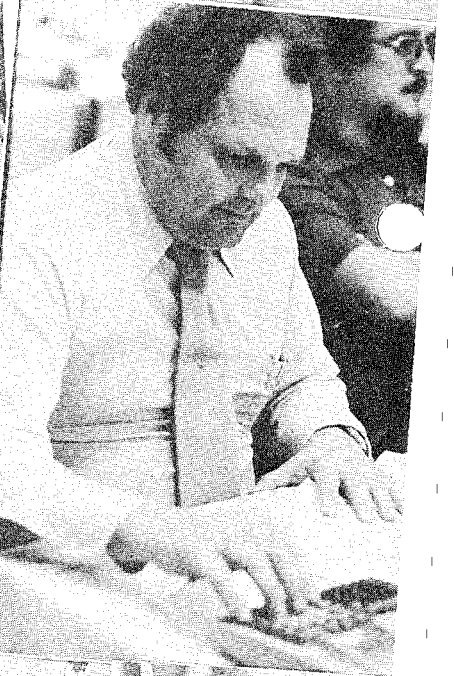
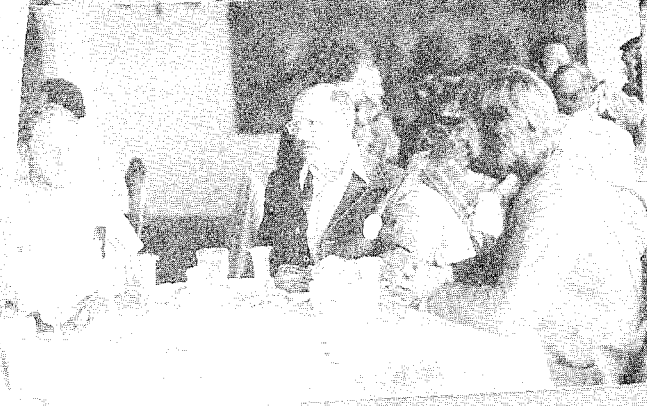
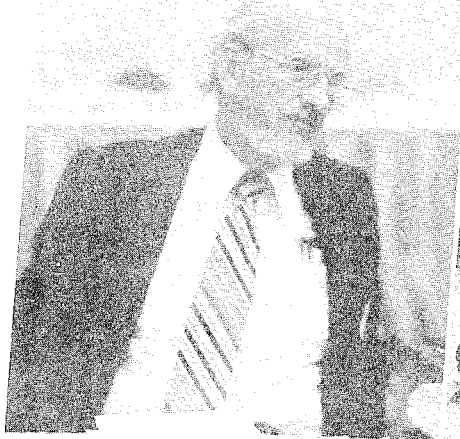
Working with this equipment and especially when it is used in its TEF measurement mode requires direct experience with the instrumentation to really come to an understanding of what it is doing and what it can do. We hope you will be one of the members of the new small classes this Fall that experience "hands on" this equipment.

HOLLYWOOD JUNE CLASS

Some classes are extra busy and interesting and I forget to take lots of pictures. The Hollywood class was one of these in which I only took one roll of film but each picture was "perfectly exposed, artistically composed, and each subject dynamically involved". When I got home to take the roll of film out of the camera, I had failed to put a roll of film in the camera. Several GOOD photographers were taking pictures during class. If you will send me your negatives I will have copies made - and be very grateful to you.

cd

SAN DIEGO CLASS, 1979



SECRETS OF THE GREAT PYRAMID

While in Boston for the ASA convention, I stopped in at the MIT COOP (bookstore) and found several books of great interest to me. The first of these is a large soft back entitled, *SECRETS OF THE GREAT PYRAMID* written by Peter Tomkins and published by Harper Colophon Books for \$8.95 in 1978. BUY IT! An absolutely marvelous book with remarkable illustrations covering the entire 4,000+ years of pyramidology.

The Appendix, *Notes on the Relation of Ancient Measures to the Great Pyramid*, written by Professor of the History of Science, Livio Catullo Stecchini, develops a very comprehensive insight into ancient weights and measures. A single example of his scholarship will suffice to involve anyone with an interest in measurements.

A variant of the fairy tale about the English foot is provided by historians who tell us that it was not a matter of the foot but of the arm of a king which decided the length of a yard...usually the arm of King Henry 1 (1068-1135) is mentioned in this connection.

I grant that it takes a specialized historical training to trace the linear standard of England and Russia to the ancient Orient, but I may also observe that there are well known Greek temples which have been planned in English feet and that archeologists of English and American nationality have studied them without realizing what they had before their eyes."

Stecchini goes on to prove that as early as King Athelstan of England (924-940) that 1° of latitude was defined as 365,000 English feet, which is the length of a degree of latitude near the town he ruled from - Winchester, England.

Ancient measures, it appears, were vastly superior to the present day metric system in that they were a linear measure of the sidereal time. (The sidereal year is approx. 20 minutes longer than the solar year and it is obtained by observation of the apparent rotation of the "Vault of Heaven, i.e., star positions).

To quote from the Introduction to the book,

Whoever built the great pyramid, it is now quite clear, knew the precise circumference of the planet, and the length of the year to several decimals - data which were not re-discovered til the Seventeenth Century. Its architects may well have known the mean length of the earth's orbit around the sun, the specific density of the planet, the 26,000 year cycle of the equinoxes, the acceleration of gravity and the speed of light."

This is because the dimensions of the great pyramid include all these figures as part of its basic construction.

The sacred cubit used in the construction of the Great Pyramid is to .03 mm one ten thousandth of the polar axis. Both the sacred and the royal cubit were used in the construction of this pyramid in such a way as to allow all major dimensions to be even numbers in either system: The base of the pyramid measured 440 royal cubits or 363 sacred cubits; the height 280 royal to 221 sacred cubits. Pi (π) to 3 places is incorporated into the dimensions as well.

In mathematics it has been shown that the Fibonacci series, the function of π , and of phi were incorporated into the dimensions in a manner clearly intended as a "time capsule" form of preservation.

Statistically, the Great Pyramid is staggering. A 13 acre base less than 1" out of level anywhere after 4,000+ years. A constant 68° F temperature year round in the inner chambers. 22 acres of polished limestone on the original faces. More hewn rock than in all the Christian churches in England.

Even more fascinating is meeting our friend the Jesuit father Athanasius Kircher (originally of Cracow, Poland) who had moved to Rome, sponsored a young Venetian Tito Livio Burattini to measure in detail the great pyramid using among his instruments Galileo's then brand new pendulum clock. Burattini sent Kircher a letter with much of his data reported in it which was fortunate because robbers in Europe stole all of his notes on his way home.

If you have ever had the slightest desire to know more about such things, this book is a gold mine.

ASA 50 -- CAMBRIDGE

I gave an invited paper at the 50th Anniversary celebration of the Acoustical Society of America's meeting at MIT, June 11-15. The paper, entitled, *Contemporary Electroacoustic Investigations*, was presented in the first session of the meeting, "Architectural Acoustics - Electroacoustics in Auditoria". The chairman of this session was Ron McKay of BBN in Canoga Park, CA.

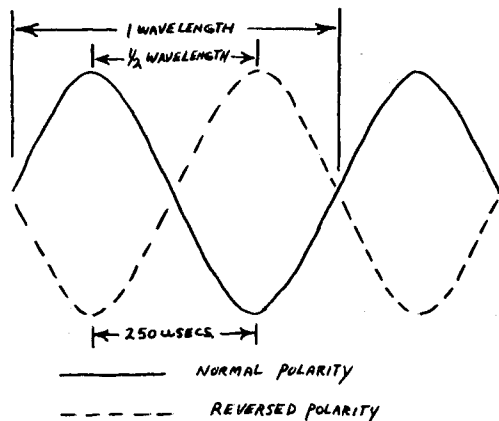
Syn-Aud-Con graduate and Harvard Alumni, TED UZZLE, generously devoted days of his time to our entertainment and edification. I was guided to the "Mother Lode" itself, McKay Library at Harvard, wherein repose every acoustical journal known to man, complete from Vol # 1 to date. In researching the rare books card file elsewhere in the University, we found massive collections of works by Mersenne, Kircher, Shott et al that stagger the imagination. There is no question that a scholar could indeed spend a fruitful lifetime "in the stacks" at Harvard.

During the time we spent at the Harvard Campus we also visited Saunders Theater. (It was the seat cushions from this theater that Sabine used as absorption in his famous experiments at the turn of the century. They have since been replaced and so far as we know, only one of the original cushions still exists and it is now owned by BB&N in Cambridge). Standing quietly in this old theater one can still "feel" the impact visually, and aurally that prevade such turn-of-the-century rooms and sense, if only slightly, the mental atmosphere that went with the physical environment.

One of the true joys of acoustics is that the day of the essentially amateur investigator has not yet passed and we can still make meaningful individual investments of time, talent and money in acoustic research of interest to us alone. Once again, we are grateful for the Synergy of combining the old literature with the new questions and finding that the Dick Heyser's of the world are, on their own time and for their own enjoyment, devising the tools we need to progress in our understanding.

WAVELENGTH TIME INTERVALS

An interesting question is to ask what the wavelength time interval is at differing frequencies. For example, if I reverse polarity at say 2,000 Hz I have shifted all positive going portions of the signal by 180°. What time interval does that represent? See illustration



$$\text{ONE WAVELENGTH} = \frac{\text{VELOCITY OF SOUND IN FT/SEC}}{\text{FREQUENCY}}$$

$$\frac{1130 \text{ FT/SEC}}{2000 \text{ HZ}} = 0.57' \quad \frac{1130 \text{ FT} \cdot 0.57'}{1 \text{ SEC} \cdot X \text{ SECS}} = 500 \text{ USECS.}$$

$$\frac{500 \text{ USECS} / \text{WAVE LENGTH}}{2} = 250 \text{ USECS} / \frac{1}{2} \text{ WAVELENGTH}$$

We have demonstrated in recent classes that reversing the total polarity of a *single* channel is highly audible. At first blush, it would appear that, yes indeed, it's easy to hear 250 usecs. But remove the "live" talker from the room and total polarity reversals are very difficult to hear on the same speech signal. That would indicate that what's really being heard is the reversal of the non-symmetry of the "live" human voice. At least it bears investigation.

In reading a series of recent articles both pro and con on time alignmenttm I have gradually come to the conclusion that there is an infinite supply of authors willing to discuss sophisticated, detailed phenomena they do not understand. One of the fundamental reasons why so much research goes astray is the failure to clean up the whole measuring chain before proceeding. For example, listening for time domain effects in a loudspeaker being fed from a recording full of microphone response anomalies. Time *will* tell.

"HIGH DEFINITION" SPEAKER CABLES ?

Audio amplifiers have now achieved such wide bandwidths and low distortion often *at the expense of stability* that many of their manufacturers are suggesting "high definition" speaker cables at up to \$2.60 a foot. GORDON WOLFE at Olesen Electronics in El Monte, Ca, sent us an article on this subject recently which contained the illustrations shown below. (from AudioVideo International)

COMPARISON OF AUDIO CABLE AND SPEAKER CORD		
	Audio Cable	Speaker Cord
Role	Voltage transmission	Power transmission
Sending impedance	10 ohms ~ 1K ohms	Almost zero
Load conditions	20 ohms ~ 100K ohms Changes somewhat with frequency and is constant without regard to signal level slight input capacitance only no reactance	Impedance 4 ~ 14 ohms Changes considerably with frequency; changes with signal level reactance component is large and complex counter-electromotive force produced by SP
Effect on performance	Small	Large
Effect on tonal quality	Small	Large
Change with length	Small	Large
Extraneous induction	Easy	Difficult
Effect of characteristics of cord	Since the load conditions other than the C component are large effect is small	L, C and R have a large effect

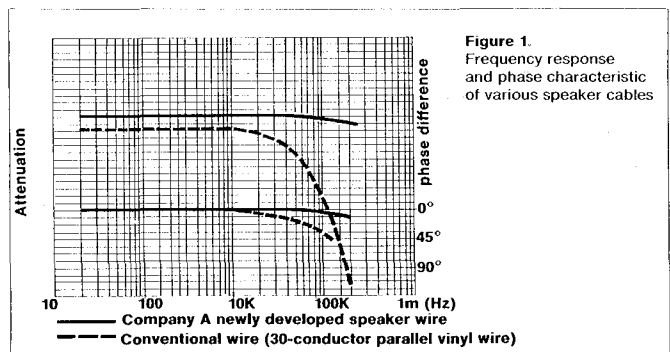


Figure 1. Frequency response and phase characteristic of various speaker cables

Note in Figure 1 that the *length* of the tested cable is nowhere mentioned. Several of these special cables (with capacitances of over 2000 pf per meter - they use the term "picofords") solve the problem with finality by simply blowing up the power amplifier they are attached to.

It is conceivable, just as 1,000,000 monkeys at typewriters *just might* type something intelligible, that the special cable might in a very rare case provide the conjugate reactance the unstable amplifier requires.

In a world where many of these same engineers measure gain with voltmeters across zero impedance sources, the discovery of *power* at the output of their electronic devices must indeed be shattering. I, for one, can't wait for them to discover what *the load* they are attached to is really doing.

It's hard to take this kind of marketing seriously when you realize that these same engineers haven't discovered as simple an influence as total polarity.

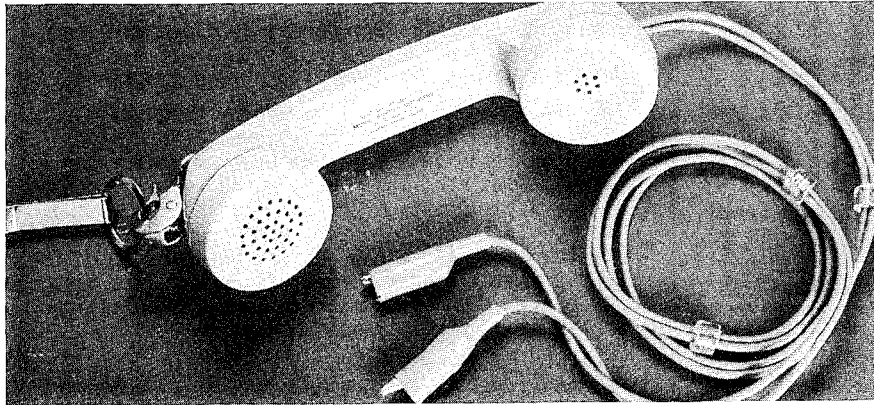
UZZLE UTTERANCE

TED UZZLE of Cambridge, MA states that there are three things he always forgets: " I always forget names, I always forget faces, and I always forget the third thing." Ted dropped us a letter recently telling us who originally said the above, "It was not Italo Calvino, as I had thought. I looked it up; it's from Italo Svevo. You see, I always forget names." Ted Uzzle is one person Syn-Aud-Con is not likely to forget.

SYNERGETIC AUDIO CONCEPTS USEFUL TOOLS

We have many almost unbelievably precise instruments today. Some are complex combinations of microprocessors and other super sophisticated devices.

If we are handed a cassette recording of a complex sound and asked to use these modern analyzers to determine if the signal on the tape is speech, music or gibberish, it is humbling to realize that we wouldn't be able to do so. But if we clipped Music Supply Co.'s model TS-1 Testset we would know instantly. We are reproducing a portion of their data sheet on this instrument to give you an idea of its versatility.



While this is a most useful piece of test equipment for the serviceman on location, it is equally handy while making repairs in the shop. It is capable of checking the output (for audio response) of any pre-amp, amplifier, or intercom, whether they be tube or solid state. You can use it to check the audio output of a 4 speed record player cartridge, ceramic or magnetic.

With a signal input to an amplifier, this TestSet may be used to check the progression of the signal throughout the amplifier. We do not imply that this TestSet will take the place of a scope. It is a utility test set that is designed for the man on location where it is not feasible to have such elaborate test equipment.

The TestSet is designed so that it will not be damaged by high D.C. voltage or high A.C. voltage. There is no danger of damage to the TestSet even though you should.

- 1 touch the leads to a 1000 v.d.c. power supply voltage in a large amplifier. Only a slight pop would appear in the ear piece. Then you would hear the ripple (if any) of the power supply
- 2 touch the leads to 110 v.a.c. 220 v.a.c. or even 440
- 3 touch the leads to output of a 200 watt amplifier (or larger) even if it was running full volume
- 4 drop it from the top of a 20 ft scaffold. We do not recommend dropping it

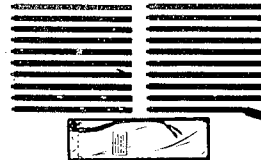
Still another useful tool from Music Supply Co is their "push-pull" rods. How many times I could have avoided the relathing and replastering of a ceiling or wall.

The PUSH-PULL rods were developed to get wire and cable into the "impossible" places. They have been time tested for years. They do the job, and they are practically indestructible.

SET CONSISTS OF THREADED RODS IN CARRYING BAG.



Artist conception of how rods are joined together above ceiling to PUSH wire from one point to the next point.



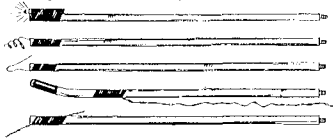
Tape your wire or cable to the "lead" rod and push it to the next point as illustrated. Or you can tape the wire to the last rod and pull the wire to its destination.

To install large cables, PUSH a "Pull" string (or rope) into place. Then, tie it onto the large cable and PULL.

One rod is slightly bent so it will go by objects that may be in the way. The end of the rod has a plastic boot on it for insulation.

As many as three (3) sets of rods (60) have been used together to PUSH a wire 135 ft. across a ceiling!

Their usefulness is up to your ingenuity. Great for going under carpet.



The above illustration shows how various hooks, or a light, may be taped to the end of a rod. If you can get your head above the ceiling line and need a light, simply tape a pen-lite to the end of the first rod and "light the way".
NOTE: Hooks and pen lite are not included. Wire clothes hangers (available on most all jobs) are ideal for making various hooks as needed.

Each rod 27" long - 3/8" O.D. -- 5 oz.
Made of Aluminum Alloy

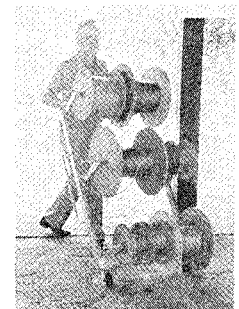
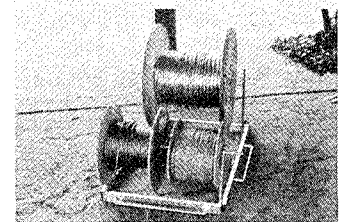
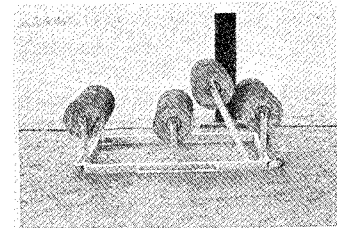
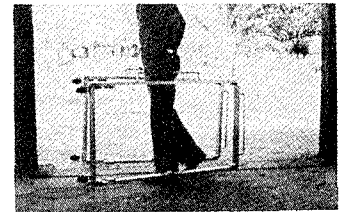
Available COATED (insulated) or PLAIN (not insulated)

20 to a Set, 45 Ft. 10 to a Set, 22 1/2 ft.
Each Set comes in VINYL "tote" bag.

SETS ARE MADE UP AS FOLLOWS:

- 20 COATED (insulated) rods, PPR-20-C
- 10 COATED (insulated) rods, PPR-10-C
- 20 PLAIN (not insulated) rods, PPR-20
- 10 PLAIN (not insulated) rods, PPR-10

The COATING IS TOUGH AND DURABLE
SPEC SHEET AVAILABLE



EASY KARY™ Wire Roll Holder

In large warehouse areas or other "exposed-type" ceiling structures where you cannot use a rolling scaffold due to material stacked in the way, you can very handily use these rods to push or pull your wire great distances. For example, 20 rods give you a 45 ft. span between ladder "setups".

Even with the handy lay-in ceiling, using the Push-Pull rods really beats trying to "throw" the wire a few "blocks" at a time or trying to use a fish tape. Fish tapes are for use in conduit and not for use in open space.

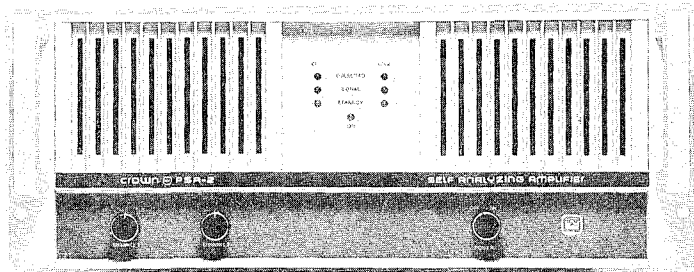
Finally, their Easy-Kary™ wire reel holder. "When all the components are stowed away in the hollow frame, you carry it like a brief case 20" by 28" and only 2" thick. When it is put flat on the floor of your truck it is so low profile that it takes up no room in the truck. The two casters allow it to become a two-wheeled truck as you lift it by the handle opposite the two casters."

If you are interested, contact: Music Supply Co., Inc, P O Box 4080, Dallas, TX 752-208, Ph 1-800-527-1522, Texas call 214-946-8450 collect.

SELF-ANALYZING AMPLIFIER FROM CROWN

The following data on the Crown PSA-2 amplifier should be of interest to everyone in audio as developments of this type foretell the real promise of digital electronics in audio in the not-so-distant future.

While Crown accomplishes their results with analog circuitry, the real point is that dynamic real time self-analysis is becoming a reality. We can imagine the eventual inclusion of control tracks on our records that provide pre-history of the signal about to be sent to the amplifier, thereby allowing real optimizing of entire system performance.



(from Crown)
The Crown PSA-2 stereo power amplifier is characterized by the manufacturer as a self-analyzing design that provides more useable power per output device than was possible with previous designs.

The PSA-2 amplifier is regarded by Crown as the first of a new generation of amplifiers...The design of the PSA-2 is based on a research program undertaken by Crown a number of years ago, which has provided unique data on output devices for the circuit designers at Crown. In this program, every output device used by Crown during those years has been tested on the SOAR transistor analyzer, a research device designed and built by Crown to measure the safe operating area (SOA) of power transistors.

Designers of electronic circuits for audio have long known that the safe operating area of a power transistor varies depending on the conditions which it is experiencing. What was not known was how to evaluate the history of the transistor's operation, combine that with continuous operating information, and use the combination to optimize the use of the device.

As a result, audio amplifiers have been designed with circuits which limited output on a basis of voltage or current or a combination of these, according to a pre-computed and arbitrary number which for the sake of safe operation was derived from a worst-case condition. As soon as this arbitrary number was reached, the amp's output was limited, with sometimes annoying effects in the signal quality.

In many cases, it was known that such limiting was unnecessary; that the output device could have continued to function under certain circumstances while remaining well within its safe operating area. But in order to effectively use this additional operating area, some means of evaluating the effect of voltage and current on the operating condition of the output device had to be devised.

The self-analyzing feature of the PSA-2 is derived from several major ideas:

1. Crown's SOAR III research program for output devices provided Crown designers with a great deal of data on the SOA's of output devices under many different conditions. From this data, predictive formulations were derived which enabled Crown circuit designers to develop sensing and control circuitry.
2. Sensing devices were added to the PSA-2 which monitor the operation of the output devices
3. An analog computing circuit was developed for the PSA-2 which integrates the data from the operating history of the output device (where it has been) and its present condition (what it is being asked to do). The computer then decides, based on factory programming, whether that output device is within the SOA for those conditions. If so, it is allowed to continue to operate. If the computer decides that the SOA will be exceeded, the amp output is limited automatically and immediately.
4. The limiting is self-correcting and as soon as the excessive stress to the power transistor has been removed, the full power is automatically restored.

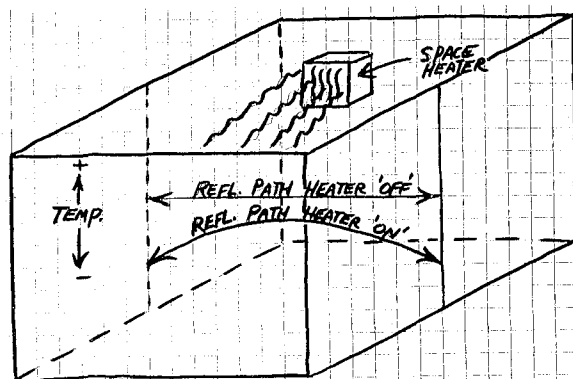
The end result of this design is that an unusual amount of power is available for driving speakers when the amplifier is processing music signals. The PSA-2 output devices will continue to provide power when other less sophisticated designs would limit output.

In laboratory measurements of development circuits equivalent to those now included in the PSA-2, Crown engineers fed a pink noise signal into the amplifier circuit which was hooked up to a 4 ohm load. Their instruments indicated an instantaneous peak power of 900 watts per channel. With a 2 ohm load the amplifier circuit developed 1500 watts per channel of instantaneous peak power. The conclusion of Crown's engineering staff is that the PSA-2 will provide sufficient power to handle any music peaking requirements without overloading or limiting.

EFFECT OF A SPACE HEATER ON FLUTTER ECHO

Velocity of sound increases with increase in temperature. Therefore, the effect of an increase in temperature with an increase in height results in a downward bending of the sound path.

This certainly illustrates why feedback modes change as air conditioners, heating, or crowds dramatically change the temperature of a room.



T/60 MEASUREMENTS USING HP 3580A

RICHARD JAMIESON is a remarkably talented human being. He has directed 70 mm widescreen technicolor motion pictures of genuine beauty and artistic value. He has designed outstanding audio visual experiences including the Smithsonian's "Age of Flight" theater. Dick is a very skilled consultant in audio, acoustics, all forms of visual artistry including video tape, slides, motion picture film, etc. He was naturally one of the first to obtain a TDS license through Syn-Aud-Con and was one of "The Twenty" this May at our TDS Workshop at the Filmways Heider studios.

The two photos of Dick setting up an HP 3580A for reverberation time measurements says a great more than a thousand words per picture. We particularly liked the look of joy expressed by Dick as the measurement was successfully concluded. His full description of his hookup is reproduced here. His orderly complete and documented approach is typical of this thorough engineer.

This is Jamieson and Associates' approach to getting more out of the HP 3580A Spectrum Analyzer (trying to work smarter and also to help justify the investment in the 3580A).

The following guide lines should be of help if you wish to experiment with this method of measuring reverberation time at any desired frequency.

Equipment needed: HP3580A Spectrum Analyzer
Frequency Counter
GenRad 1933 Precision Sound Level Meter
GenRad 1932 Random Noise Generator
Audio Power Amplifier and Loudspeaker
Precision Attenuator Comparator
Assorted Inter-connecting Cords



I. POSITION OF FRONT PANEL CONTROLS ON 3580A

Adaptive Sweep	OFF
Display	All Buttons Rel
Amplitude Mode	Log 10 dBv/DIV
Amplitude Ref Level	Normal
dBv/LIN	dBm 600
Input Sensitivity	0
Vernier (Amplitude)	CAL
Frequency.....IMPORTANT....	Set to Hz to be Measured
Start-CTR	Start
Resolution Band Width	Below 100 Hz use 30 Hz Band Width Above 100 HZ use 100 Hz Band Width
Display Smoothing	Medium
Frequency SPAN/DIV...IMPORTANT	0 Hz
Sweep Time/DIV	0.05
Depends on T/60	0.1
	1.0
SWEEP MODE	Clear Write
	This will cut off tone at beginning of sweep)

II. T/60 REAR PANEL CABLES AND SETTINGS

- Plug banana plug coaxial cable into "tracking osc. output" and the other end into "pen lift". (This will short the "tracking osc. output" during the "clear write" cycle..thus killing tone in room.)
- Tracking Osc. Internal Ref.
- Tracking Osc. Output to Audio Power Amp and Loudspeaker through precision attenuator comparator test set (to improve operator control)
- Tracking Osc. Output..IMPORTANT... to Frequency Counter
- Tracking Osc. Output (testing) for "System Testing" to "input" (front panel)

III. T/60 FRONT PANEL CONNECTIONS

- Input from GenRad 1933 Precision Sound Level Meter "A.C. output"
- Input (testing) for "System Testing" from Tracking Osc. output

IV. FOR A MORE CONTROLLED MEASUREMENT (ONE LESS SUSCEPTIBLE TO ROOM ANOMOLIES "WHITE NOISE" MAY BE USED)

INSTRUCTIONS

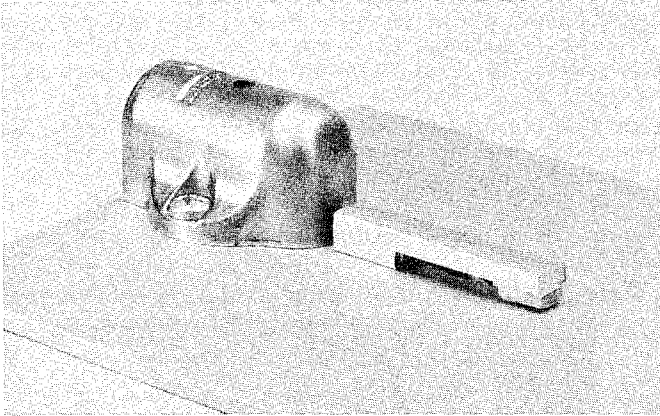
Instead of (as in Section II above) utilizing the tracking oscillator output, now connect the audio power amplifier and test set to a stable source of "white noise" (such as GenRad #1381 Random Noise Generator)...again use the "Pen Lift Output" to short the Random Generator noise output during the measurement process...frequency being read will be read in KHz in the "frequency" window on the upper right of the 3580'a front panel.

Both of the above methods of measurement (sine wave and random noise) have been used by us during room analysis and have been helpful in broadening the amount of measurement work that can be quickly done while using a classic TDS equipment setup.

This method of testing does not preclude the use of other reverberation measurement equipment such as the AcoustaLog 232 Reverberation Timer for further confirmation and refinement of test findings. All of the above methods must be determined by you as suitable to the purpose at hand before proceeding with any major measurement project.



SYNERGETIC AUDIO CONCEPTS
A PZM™ REPORT



KEN WAHRENBRÖCK has reported backlogs on Pressure Zone Microphones as high as 185 units. They are being shipped all over the world today. Many records have been made using PZMs and they have been used on large classical orchestras, operas (including the Metropolitan on tour), Country Western (Nashville seems to have a deep hole they drop PZMs into judging by the number of orders Ken receives from Nashville) in addition to sound reinforcement and measuring work.

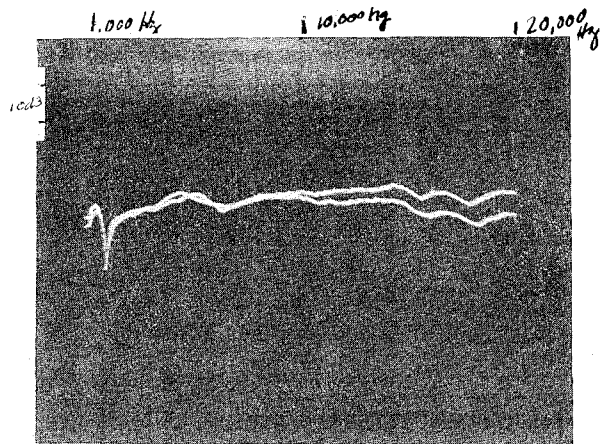
About the only complaint we have heard refers to the appearance of the units. Regarding the performance of the units, the quote from the music review from the July 9 issue of the Los Angeles Times of a performance of the Robert Shaw Chorale at the Hollywood Bowl

The star of the evening, then, turned out to be the discreet and newly generalized microphoning on the Bowl stage. With apparent naturalness and unobtrusively, it delivered the music to the outdoor auditors without distortion. That is, of course, saying a lot.

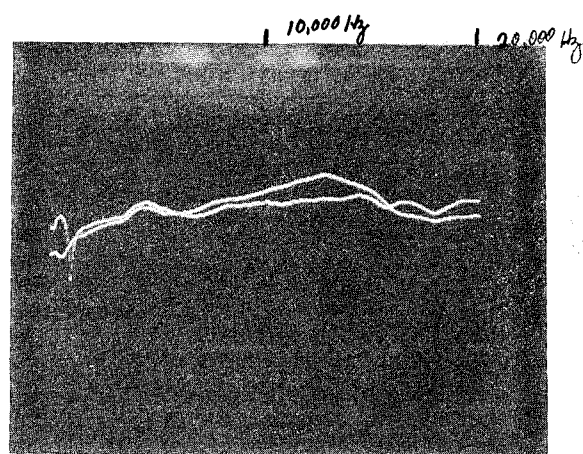
FRANK SUPEC, sound man at the Hollywood Bowl, was told by the musical director that they would not buy new microphones this year. Frank told him he better listen for one minute to the new PZM. After one minute Frank was on the phone to Ken to order 8 PZMs.

RON STREICHER, sound man at Robinhood Dell, who is cautious with his enthusiasm, called Ken at midnight following his first performance using the PZMs on the Metropolitan Opera, and FARREL BECKER, sound man at Wolf Trapp, calls in regularly to tell of another outstanding performance using the PZMs.

New PZM Model 150



PZM 150 Bottom trace, B&K top trace



PZM 130 going in & out of B&K mic

By the 1st of August Ken hopes to be shipping a new model PZM, the PZM 150. The new model (and capsule) achieved its name by receiving 150 dB totally undistorted. The PZM 150 will cost more than the PZM 130 (which distorts above 130 dB). The PZM 150 is recommended for the recording industry because of its ability to handle higher output and the exceptional bass response (manufacturer quotes 20Hz. We haven't measured it yet but recordings indicate better response than the PZM 130.)

ED BANNON, chief engineer at One Step Up Recording Studio, worked with Ken testing the new PZM 150 and was not able to overload the PZM 150 with any instrument in a recording session.

One of the reasons that a loudspeaker with acoustic centers a foot apart for the HF vs the LF units doesn't sound worse than it does is because the loudspeaker usually (but as shown on these pages in past issues, not always) has a well designed crossover network that effectively confines the aberration to less than an octave centered in the crossover region.

The mirror image type of acoustic reflection from a surface near the microphone develops a displaced acoustic center often at a level equal to the primary sound source the microphone is receiving and the resulting mix covers many many octaves. This is the reason that a coherent microphone A-B'd against a conventional device is so easy to identify by ear. So is a correctly aligned loudspeaker but the difference between microphone types is much more audible than the difference between loudspeaker types.

For large musical groups such as orchestras, operas, etc., mounting PZMs on 4'x4' panels (often plexiglas) seems to work better than using the floor. Looking at the vertical polar response of standard orchestral instruments or watching vocalists throw their heads back for fortissimo passages makes this practice a sensible one.

There seems to be no doubt whatsoever that the PZMs are the fore-runner of an entirely new system of microphony.

INITIAL TIME DELAY GAP

Skilled listeners familiar with a variety of control room environments, respond subjectively to an LEDE control room as enabling them to be in the studio rather than the control room. All too familiar is the "shower stall" effect of a too-small control room.

One way to "hear" the room that the recording is being made in is to listen in an anechoic chamber. Anyone who has performed this experiment knows that you can indeed "hear into" the room the recording was made in -- that is, the acoustic clues from that room, such as the initial time delay gap, can now be heard without being masked by the listening environment. Anechoic control rooms are not likely to occur until anechoic consoles, tape recorders, racks, etc., are designed. Even then the lack of a supporting diffuse sound field would demand excessive electrical input powers to monitors with the consequences of higher distortions of all types.

A very basic fundamental overlooked by control room designers today is the fact that:

The direct sound alone carries the information giving the sense of direction, by allowing the listener to observe initial transients clearly during the short time interval before the many-directioned reflections begin to arrive at his ears.

The above quote is from "Application of Acoustical Engineering Principles to Home Music Rooms" by William B. Snow, IRE Transactions on Audio, November-December 1957, pp 153-159.

Even in the "deadest" room, the Haas effect doesn't begin until 1 msec (or 1 foot) and in rooms of the control room type, at about 8 to 10 msec; therefore, we need to consider any prior-to-Haas effect (PHE) reflections as psychoacoustically part of the direct sound field. Those reflections that occur during-the-Haas effect (DHE) as perceived by the desired listener are useful in the establishment of a diffuse supportive sound field but do not provide directional clues. Finally, the after-Haas effect (AHE) reflections become the reverberant sound field.

At this point it becomes evident that effectively eliminating (within the geometric acoustic frequency range in the room) any PHE reflections removes any acoustic clues about the control room itself. In other words, the control room need not, and indeed should not, be totally anechoic but merely anechoic between the monitor loudspeakers and the mixer's ears. If this is accompanied by an initial time delay gap (ITD) just slightly greater than the studio's ITD, then the control room can't mask the acoustic clues from the studio as reproduced by the monitor loudspeakers in the control room. Nor are any additional very short delays being added by the control room itself.

It can be seen that a parameter of utmost importance is the ITD of the recording *studio*. This can be quickly and accurately obtained with our ETC measurement system. I would hazard a guess that an optimum ITD in the control room would be about 5 msec longer than the one measured in the studio.

Calculating an Initial Time Delay Gap

The ITD is not determined by a single frequency but by the first total spectrum reflection containing substantial energy relative to the direct sound. Beranek calculates the ITD for concert halls as the first substantial spectrum reflection within 10 dB of the direct sound level. In control rooms, 20 dB would be a likely figure. Whenever the delay between the first and second reflections is *greater* than the delay between the direct sound and the first reflection, the longer delay time is used. Note that the floor reflection is not normally considered as it falls within the PHE area. (See Beranek's Music, Acoustics and Architecture published by John Wiley and Sons - especially Appendix 3, pp 573-574).

What is needed at the present time is a mass of ETC measurements of ITD in what are considered to be ideal recording studios.

Low Frequency Considerations

When the wavelength of a frequency is larger than about one-third of the shortest dimension of the room the normal mode analysis of the room best describes its acoustic characteristics at lower frequencies. (Theoretical Acoustics by Morse and Ingard, McGraw Hill. Chapter on Room Acoustics.)

This means that you design the LEDE in the geometrical acoustics frequency range and you design the low frequency performance desired into the rigid outer boundary walls.

Audible Results

In a correctly designed and built LEDE control room what you hear at the mixer's position behind the console will be acoustically identical to what you would hear if you placed your ears at the microphone position in the studio plus the diffuse energy from the "live" end of the control room. But! the diffuse sound from the "live" end in the control room is now in the DHE region and *is not heard* as directional information nor as an initial time delay gap. Presto--a calibrated control room dependent only upon the quality of microphone technique used for the recording and the quality of the monitor loudspeaker used in the control room.

π TO 14 DECIMAL PLACES

BURT BOETTCHER of Ken Com in Wilwaukee gave us a method of remembering π to 14 places (depends on whether it is easier for you to remember numbers or words, maybe whether the right side of your brain is dominant or the left).

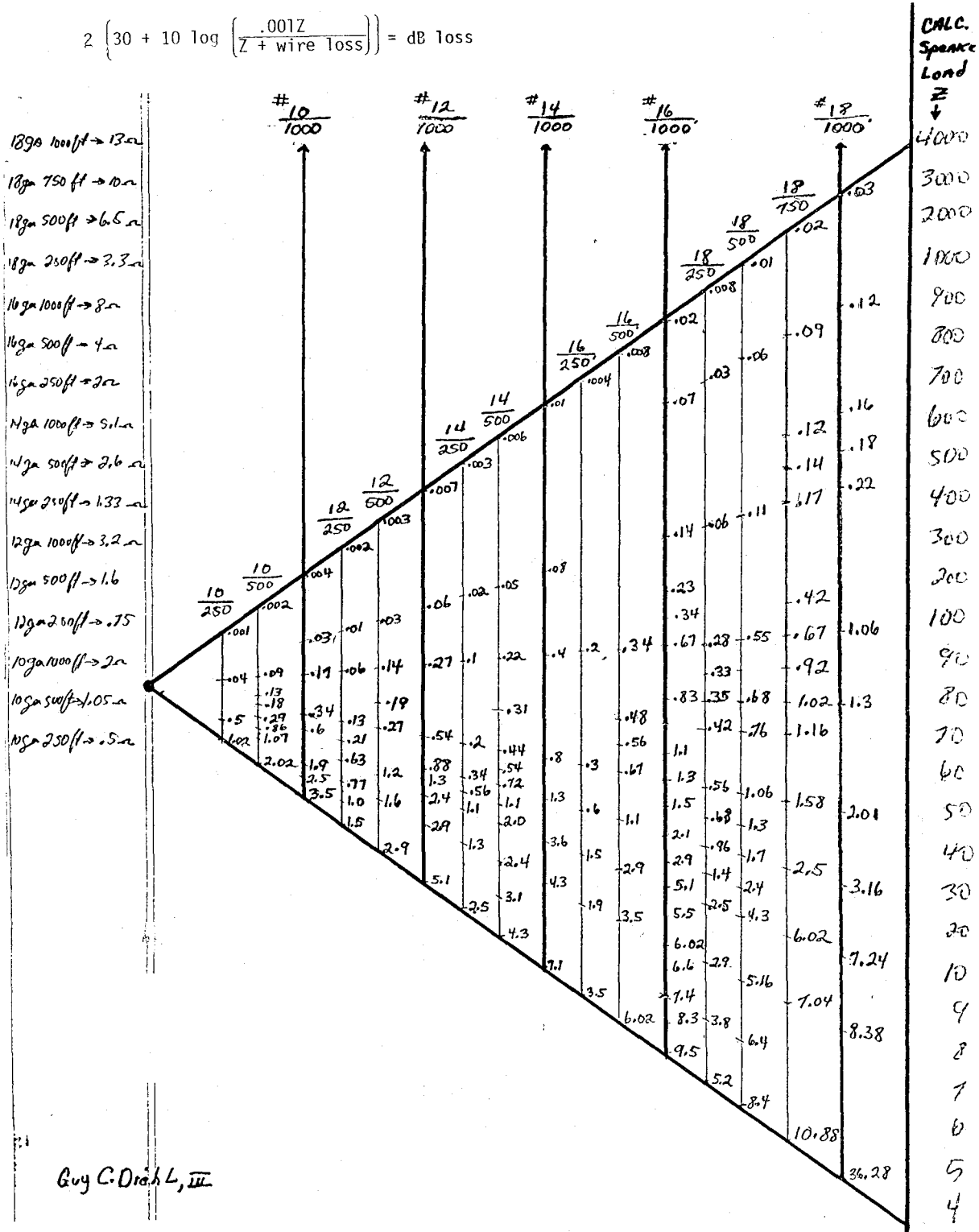
Simply memorize the following sentence, and count the number of letters in each word: "How I want a drink, acholic, of course, after the eight chapters involving quadric mechanics."

The answer: 3.14159265358979

WIRE LOSS IN dB

GUY DIEHL of Rollings, Inc. in Birmingham, ALA gave us this chart in the Atlanta class. His simplified equation is a useful one for use with calculators.

$$2 \left(30 + 10 \log \left(\frac{.001Z}{Z + \text{wire loss}} \right) \right) = \text{dB loss}$$



LOS ANGELES CLASS, JUNE 1979



EXPANDED SOUND SYSTEM DESIGN WORKSHEET

The special classes Syn-Aud-Con conducted for Rauland Corp. led to an extensive review of the sound system design worksheet, which in turn resulted in a needed expansion of the material contained therein.

Carolyn, KEN WAHRENBROCK, NELSON MEACHAM, and FARREL and GINA BECKER, in particular, really got involved in this project (as did every class since the Rauland-Orlando class where we introduced the first revision) and the results are impressive.

Those wishing to construct advanced computer programs for sound system designing will find this new Worksheet an invaluable aid in working out a flow chart.

Of special interest is the inclusion of the pertinent equation for each entry and a reference as to where to find explanations and details on the subject in *SOUND SYSTEM ENGINEERING*, the Newsletters and Tech Topics.

We included a sample design on pages 6 and 7 with answers to help you familiarize yourself with the Worksheet. Let us hear from you if you think we can improve some area of the Worksheet to make it more useful or to clarify some point.

Since the Worksheet is annotated and referenced with all the new design approaches of N, ΔdB, M_e, M_a, etc., the Worksheet should be an excellent home study guide.

One copy of the Worksheet is included with this Newsletter. You may order additional copies for 50¢ each.

COMPANY LITERATURE THAT COMMUNICATES

Many Syn-Aud-Con grads share their company literature with us asking for comments and evaluation. We reproduced the cover of a little brochure from DARYL NATIONS' Sandlapper Sound. The Newsletter can't do justice to a brochure but the message is "He who has an ear to hear...Let Him Hear. But can he hear in your church? And it shows a drawing of an ear superimposed on a drawing of a church steeple. (Volume 5 # 1)

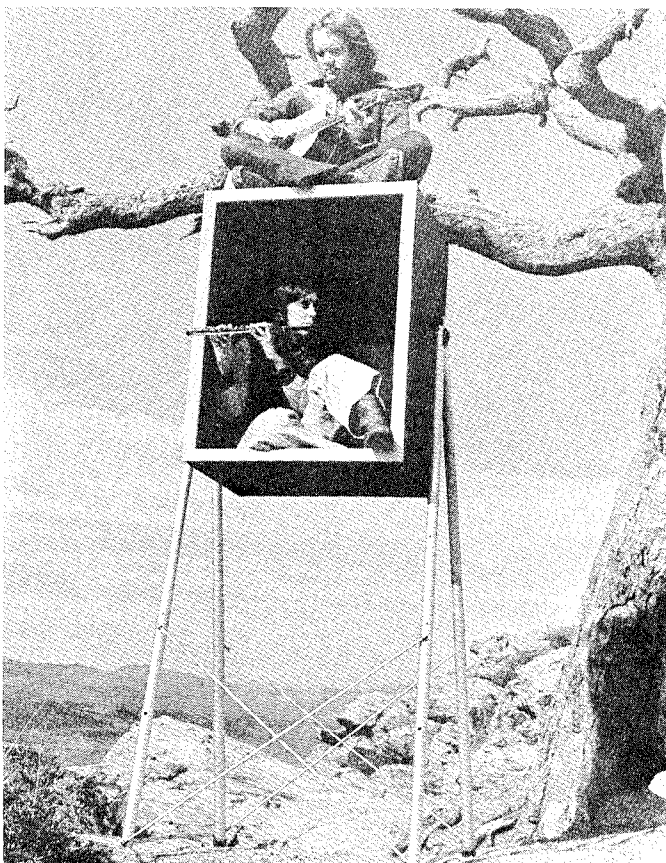
RUSSELL O'TOOLE of Audio Electronics in Romeoville, IL has a brochure aimed at the church need with the message, "...and how shall they believe Him of whom they have not heard?..." Romans 10:14.

One of the most powerful statements on this subject is the TED LeTOURNEAU article that we printed in the last issue of the Newsletter, "Hearing!!! How Did Jesus Talk To So Many at Once?" Ted has rewritten the article and has a dramatic title, "Could Jesus Be Heard in Your Church?"

DON GILBEAU of Delta Sound & Radio, Stockton, CA, gave us his company brochure in our San Francisco class. Every word and picture in an inexpensive brochure communicates their area of activity and professionalism. I would be delighted to have an 8½x11" 3-fold brochure that so completely communicated my message.

ULTIMATE SUPPORT SYSTEMS

Earlier this year we attended the NAMM show in Anaheim. Sunn Musical Equipment Company had an aesthetically beautiful set up of their mixers, amps and speakers. They made generous use of speaker stands and tables that we hadn't seen before. Being the good people they are, Sunn was helping by giving exposure to a new young company getting started. We wrote the company asking for a glossy so that we also could spread the word.



Ultimate Support Systems makes two products: speaker stands and a Versa-Table which provides "support for mixing boards, projectors, lighting controls, keyboards, sound equipment, the works."

Quoting from their literature on the Table.

"Independently adjustable legs (7 height settings on each leg) and the absence of long braces mean that the Versa-Table can straddle a row of seats in an auditorium, sit squarely on uneven ground, and yet provide an operator with a smooth, tiltable surface.

"The table top is 22" x 44" and can support 260 pounds. Set up time is less than 1 minute.

Lightweight (only 13 pounds) and compact, the Versa-Table comes with a waterproof nylon tote bag and carrying handles."

The speaker stands support 300 lbs and weighs 12 lbs. Set up time 2 minutes, two height settings and the speaker can be tilted for optimum audience coverage.

Mounting of the speaker requires almost no alterations to speakers. A non-obstrusive two inch square bracket is fastened on each side with three screws and set up is ready.

Their January '79 price list looked reasonable. You can write: Darrell Schoenig, Ultimate Support Systems, 1818 East Lincoln, Fort Collins, CO 80524. Ph (303) 493-4488.

THE HIDLLEY 6 dB ADD

If you make a control room sufficiently anechoic you can measure at a point equi-distant from two monitor loudspeakers on their axes a 6 dB addition. What does this signify acoustically?

Let's model it. Let's imagine two loudspeakers with hemispherical radiation patterns and a listener sitting in front of them. Their *total* acoustic output would be the sum of the power per unit area of all the areas in the respective hemispheres. At the specific point (the size of the point depends upon the wavelength involved - low frequencies equal a wider point; high frequencies equal a narrower point) where the sound pressure level is exactly equal from both sources and exactly the same distance acoustically, then at that point the power per unit area will be four times the power per unit area of the single source.

It must, however, be realized that there will be another point where the units are sufficiently different in level and in phase to be 1/4 the power per unit area and that, as the law of the conservation of energy states, the sum total power of two sources can *never* exceed twice the sum total power of one source.

Point-by-point measurements have no meaning in terms of acoustic power addition of two sources. The integration of all of the points does. An analogous situation would be finding one point on a loudspeaker's coverage pattern with a $Q = 1$ and another point with a $Q = 4$. Then saying that the power output at the point where the $Q = 4$ is four times the power at the first point when the total acoustic power output is actually constant and each point merely represents as different power per unit area.

With the above in mind, the excerpt from RE/P magazine "Letter to the Editor" from Michael Rettinger, a rigorous engineer with a thorough knowledge of acoustic fundamentals. (The June RE/P contains Mr. Rettinger's letter along with an answer from Kent Duncan and Tom Hidley.)

from: **Michael Rettinger**
Consultant on Acoustics
Encino, CA

On page 78 of your April 1979 issue, in an article by Kent Duncan entitled *Studio Design Requirements for the Next Decade*, there appears the following statement: "If a monitor is placed in a free field and sufficient power is fed to deliver, say 110 dB SPL broadband, and a second identical monitor is fed an equal amount of power, theoretically a 6 dB power increase will result acoustically."

The above statement represents an impossibility even when modified to the extent that the two monitors are placed side-by-side and not opposite each other. Two identical sound sources radiate double the acoustic power of one, and twice the power of any quantity, electrical or acoustical, results in only a 3 dB increase in the power level. For a broadband signal, not even the sound pressure level can increase 6 dB for twice the sound power output.

LOW, MEDIUM AND HIGH IMPEDANCE

RON SIEBERS, Technical Service Specialist with 3M Sound Products in St. Paul, writes:

I want to get your thoughts on a subject that has been on my mind for some years now. That subject is microphone impedance categories. As a technical writer, I've used the terms "high impedance" and "low impedance" many times as I'm sure you have. While we might debate the impedance boundaries defined by these two terms, the terms themselves are quite well established.

It has occurred to me that the evolution of the cassette recorder has produced a third microphone impedance category which I've been calling "medium impedance" for some years now. I've used this term to define microphone impedances in the range of 300 - 15,000 Ohms. Use of microphones having impedances within this range have evolved from two recent developments, the condenser microphone with the 500-600 ohm output impedance of its built-in preamplifier (some units only) and the low-impedance of a solid-state (sometimes IC) preamp on low and medium-priced cassette recorders. These recorder microphone impedances range from 500-1000 ohms to 5, 10 and even 15K ohms.

I've been watching to see if anyone else would use this term and I finally found it in the April 1979 issue of Stereo Review Magazine. It was used in an article by Craig Stark on microphone selection (page 43). To my knowledge, this is the first time the term "medium impedance" has been used in a national publication. Correct me if I'm wrong. Mr. Stark defines the term and I quote, "in the 500 to 1,000-ohm range". I find this range too narrow. (Editor's Note: we agree)

I therefore propose the following microphone impedance definitions:

Low Impedance - 50 - 250 ohms
Medium Impedance - 300 - 15,000 ohms
High Impedance - Above 15,000 ohms

RON SIEBERS interesting letter is based upon very real needs and we have recognized them on our Microphone Rating Calculator (the smaller of your two Syn-Aud-Con slide rules - the one sponsored by Shure Brothers). Scale 21 has the RETMA standard for impedances of microphones. Scale 21 has the RETMA standard for impedances of microphones:

$$\begin{array}{ccc} \frac{38\Omega}{(20 - 85\Omega)} & \frac{600\Omega}{(300 - 1300\Omega)} & \frac{9600\Omega}{(4500 - 20,000\Omega)} \\ \frac{150\Omega}{(85 - 300\Omega)} & \frac{2400\Omega}{(1300 - 4500\Omega)} & \frac{40,000\Omega}{(20,000 - 65,000\Omega)} \end{array}$$

Thus, we have a high and low range for low, medium, and high impedance ratings.

Syn-Aud-Con suggests that Ron's list be modified to read:

Low Impedance 20 to 300 ohms
Medium Impedance 300 to 4,500 ohms
High Impedance 4,500 to 65,000 ohms

Then, we are in basic agreement with well-thought out older standards that need new exposure to our current usage.

UNDERSTANDING THE Δ dB

Stand in a church with a mid-frequency reverberation time of 10 seconds and you will be able to hear a distinct reverberant sound field when you clap your hands. When 100 people are present you will hear the relatively steady reverberant field as a roar.

Stand in an anechoic chamber and this effect will not be present. The question that arises naturally is how does this effect vary as we progress from very "live" rooms to very "dead" rooms? As in all Mother Nature's transitions the effect is a gradual one. The reverberant level drops lower and lower until it finally drops below the ambient noise level where for all practical purposes it may be said to be non-existent.

The Hopkins-Stryker equation assumes a steady high level reverberant sound field. As more and more absorption is encountered, the assumptions that the Sabine reverberation equation depends upon become less and less present - namely, low absorption and good mixing of reflections in the room. Thus, the actual reverberant level gradually falls lower than the level calculated by means of the Hopkins-Stryker equation.

The "deader" the room, the greater the difference between the calculated level and the actual level for the reverberant sound field.

V.M.A. Peutz recognized this problem and constructed an equation that adjusted the difference between what you calculated and what you measured. He called his equation the Δ dB formula

$$\Delta dB = .221 \left(\frac{\sqrt{V}}{h \cdot RT_{60}} \right) \quad \text{metric constant} = .4$$

Where V is the total internal volume of the enclosed space in ft³ or m³

h is the average ceiling height in ft or m

RT₆₀ is the reverberation time in seconds for 60 dB of decay

This calculates the number of decibels the actual signal will be below the calculated signal (using Hopkins-Stryker) at 2D_c. Theory states that there should be 6 dB difference between the direct sound and the total sound at 2D_c or a Δ dB of zero. When the total sound (the total sound is the direct sound plus the reverberant sound plus the ambient noise level) and the direct sound levels are the same or Δ dB of 6 it is said that there is a free field (all direct sound).

All of these factors are illustrated in the figure above.

Whenever Δ dB > 6dB it means that you are in a free field. When Δ dB is less than 1 dB we usually assume a straight-forward reverberant field is present. When you have the Δ dB value you can calculate the reverberant field level by finding the true calculated total level

$$L_T = L_T(\text{calculated from H.S.}) - \Delta dB$$

$$L_R = 10 \log (\exp L_T/10 - \exp L_D/10 - \exp L_N/10)$$

An item of interest is that whenever you can create a Δ dB = 6 you will, of course, be essentially anechoic and you will see a 6 dB summing at a point in front of and equidistant from two loudspeakers. This is merely coherent summing of sound pressure levels at a point, not an increase in power output (some other point is -6dB). This effect will occur in any room where one end is dead -- either end, front or back.

Think about that for a moment and you will realize one of the significant features of a hard rear, diffuse wall, namely that it lowers the level of reflections by division of them along the time scale.

PERTINENT REFERENCES RELATIVE TO LOUDSPEAKER ALIGNMENT

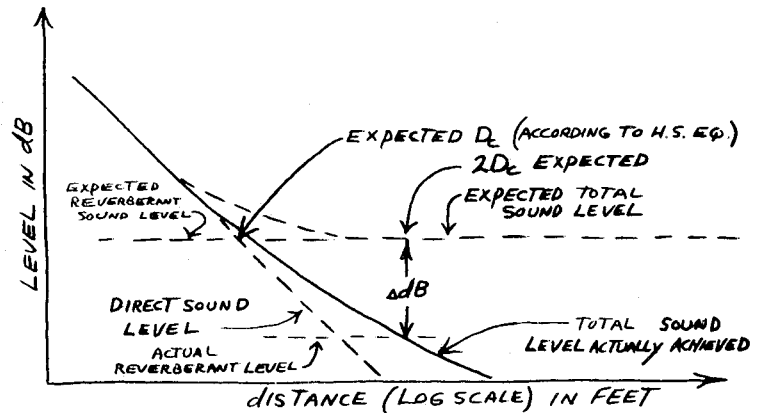
Adjusting the acoustic center of a loudspeaker is increasingly being recognized as audible and worthwhile. What actually causes the audible change is of theoretical interest to many. The following references contain valuable hints:

1. *Monaural Phase Effect: Cancellation and Reinforcement of Distortion Products $f_2 - f_1$ and $2f_1 - f_2$* , J. Acoust Soc Am, Volume 51, Number 6, part 2, 1972 written by J. L. Hall of the Bell Telephone Labs.

The abstract for this paper reads: "When two primary tones in the frequency ratio $f_1 : f_2 = 2:3$ are presented to the human listener, a combination tone is audible at $f_1/2$. The loudness of this combination tone depends on the phase angle between the two primary tones...."

2. A Letter to the Editor of Wireless World in March 1976 by P. L. Taylor of the University of Salford describes the audibility of the rate of change of phase. Mr. Taylor has in his laboratory a Fourier synthesizer capable of generating harmonics up to the twelfth -- all phase locked to the fundamental and then varying either the amplitude or the phase of any harmonic.

Slight differences (0 to 1/4") in Acoustic Centering™ can make dramatic differences in the amplitude response of two full range speakers being used together but a much less noticeable effect on the same two loudspeakers used, one as a woofer and one as a tweeter with a full crossover network well below the frequencies where wavelengths are 0 to 1/4". (Ed Long sent me a copy of this reference.)



$$\Delta dB = .221 \left(\frac{\sqrt{V}}{h \cdot RT_{60}} \right)$$

A LOW COST, HIGH PERFORMANCE POLARITY TESTER

KEN WAHRENBROCK, with creative input from Syn-Aud-Con graduates, JOE MARTINSON of MartinSound in Alhambra, CA and NELSON MEACHAM of WED Enterprises in Burbank, CA, has come up with a very reasonably priced, high performance polarity tester for both acoustical and electrical polarity checks.

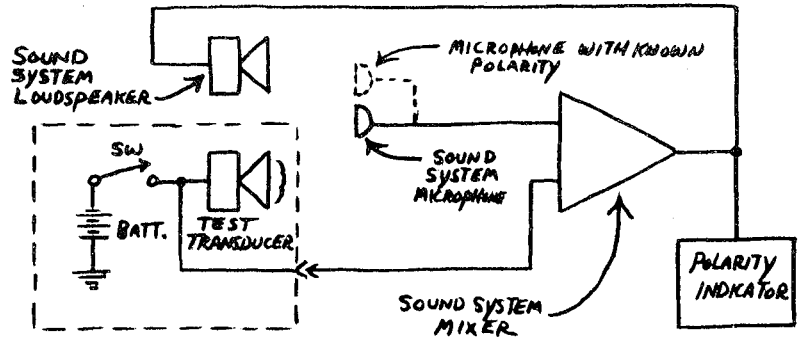
Many units of this type are appearing on the market at the present time with prices above \$500 and labeled "phase testers". (I suppose this means the designers are economists and not engineers.

Ken's unit at \$275 includes a microphone pre-amp so that *any microphone* may be calibrated first and then used to test the remainder of the system.

Ken's polarity tester consists of two components. One is a small output transducer (an adapted headphone reversed into a loudspeaker) containing the impulse generator and battery with both an electrical output signal via an RCA jack and acoustical via the small transducer.

The second component is the detector system consisting of two LEDs, one green and one red. If it's green "go", you are in polarity. If it's red, "stop", you are out of polarity.

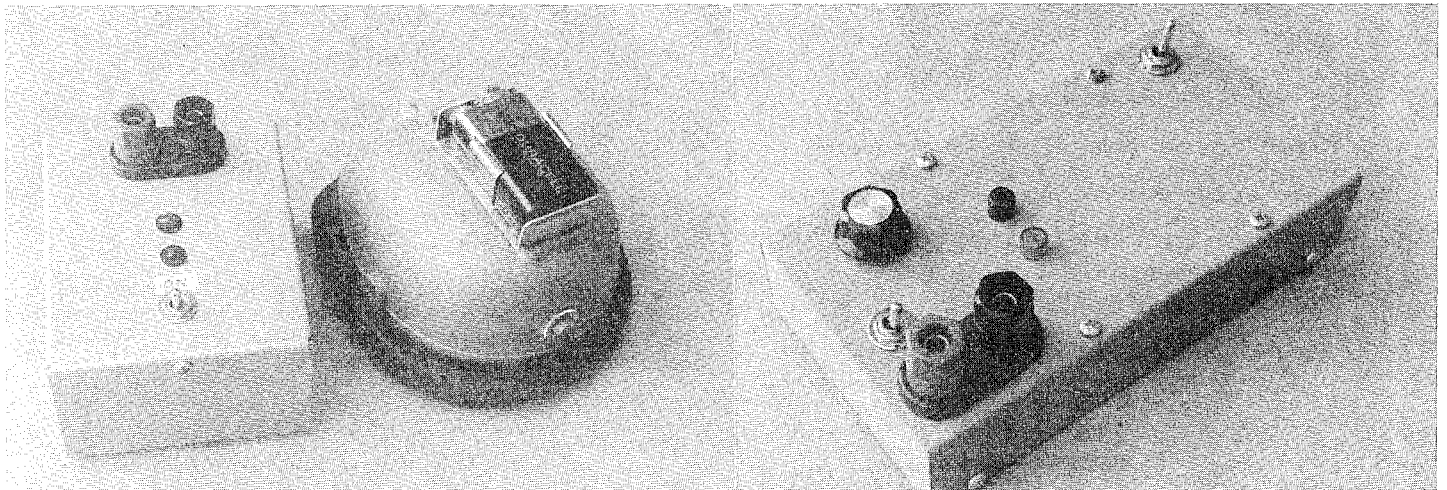
Until you have used one of these to check out what you thought was familiar equipment, you're among the naive.



TESTING FOR TOTAL SYSTEM POLARITY

Procedure

1. Using microphone with known polarity, find correct polarity for mixer output by using test transducer as acoustic input.
2. Connect test transducer electrically to input of mixer and test polarity of total system using microphone with known polarity as the input transducer
3. Using the mixer alone test all sound system microphones
4. Listen to each polarity (on speech signal)

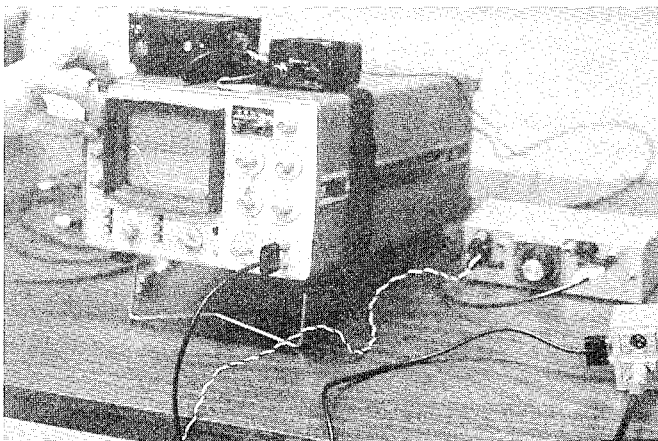


The polarity tester without microphone preamp

Pulsar

with microphone preamp

USEFUL ANALYZER ACCESSORY



FARREL BECKER, head sound man at Wolftrap, VA., spent two weeks doing TDS measurements earlier this year to prepare specifications for new equipment needed. His wife, GINA, fabricated the velcro strap shown in the photograph as a handy way to attach their offset oscillator and counter to their TDS analyzer (which happens to be battery operated - some are, some aren't) which makes an easy-to-transport package.

If you would like to have Gina make a strap for you (I can't remember the charge for it, but it isn't much) contact Gina at 10120 Ashwood Drive, Kensington, MD 20795. Ph 301-933-2211

SYNERGETIC AUDIO CONCEPTS
PEUTZ QUOTES

A great deal of writing currently discusses monitor loudspeakers and the design of control rooms. Those who write such articles without the benefit of "real life" exposure to TEF measurements are, to say the least, handicapped.

In most cases, these writers follow Victor Peutz's observation of those engineers saddled with an incorrect theory in the first place.

If you have a bad theory (basically unsound) and the evidence at hand doesn't support it, then you expand the theory.

"Truth", it has been said, "is known by the fewness and faithfulness of its followers" or as the Arabs say:



When Victor Peutz was here in 1978 for our Special Graduate meeting April 30 he enjoyed a bit of "Americana" at Swensens Icecream Factory in Tustin.

*He who knows not,
and knows not that he knows not,
is a fool; avoid him.*

*He who knows not,
and knows that he knows not,
is simple; teach him.*

*He who knows,
and knows not that he knows,
is asleep; wake him.*

*He who knows,
and knows that he knows,
is a wise man;
follow him.*

Arabian Proverb

GRAD FROM GREATEST DISTANCE



From the land of Benson, Thiele, and Small (Australia), we were pleased to have Nick Armstrong, who owns a recording studio in Tasmania, in our Anaheim class. That is about as far as anyone has come for a seminar.

Reprinted from Newsletter
Volume 3, Number 3

COURT DECISION OF IMPORTANCE

On December 14, 1974, the Federal 1st Circuit Court affirmed a very important decision handed down by the United States District Court, Mass. in the case of Whitten Corp vs. Paddock, Inc. The U.S. Supreme Court has rejected further appeal and further review.

Four major judgments regarding specifications develop from this landmark decision:

1. An engineer may limit his specification to one brand only without being in violation of anti-trust law.
2. The specifier is the sole judge of what equipment may be accepted as "or equal".
3. Only the specifier may change what equipment is allowed.
4. It is up to the supplier to convince the specifier that his equipment is suitable. (He must sell the specifier if he wishes to be included in the specification.)

You can write tight specifications without fear of legal actions forcing acceptance of other products. Remember, however, that while the specifier has greater power now he also can be held legally responsible for any specification that turns out badly, or, for example, causes injury, etc.

METRIC SYSTEM

Increasingly citizens of the United States and Canada are recognizing the metric system push for what it is - a pseudo intellectual fad among academicians. Some of the recent evidence of this resurgence of good old horse-sense is recorded below:



The GAO study was unexpectedly critical of the move from yards to meters, and quarts to liters. Made at the request of Congress, it was based on a nationwide survey and included these findings:

- Complete conversion to the metric system, if it ever comes, will cost billions of dollars, which will have to be paid by the American consumer.

- Most Americans polled in the GAO survey actually opposed any shift to metrication in this country.

- Outside of government, strongest support for conversion comes from the biggest manufacturing firms, who export to metric markets. But 80 percent of those firms surveyed say they do not expect any change in either exports or imports as a result of conversion.

- Most small businesses, according to the GAO survey, see no benefits for themselves in converting to metric, only the burden of increased costs for training and retooling.

- As a result of current shift in wine and liquor bottles to liters, the study states, "most wines and distilled spirits that were converted to metric sizes experienced unit price increases of up to 11 percent greater than those that did not convert." In cases where 3-liter bottles of wine keep the same price as larger 1-gallon bottles, the increase per ounce is much higher.

- A dual measuring system for the U.S. would be "impractical, inefficient, uneconomical and confusing," reports the GAO. It adds that "it is not too late to make the decision as to which system is to be predominant. [But] the decision is not an easy one because valid national conversion costs and the value of any benefits are not available."

The study told Congress that the importance of converting to metric in order to conform with the rest of the

industrial world may have been oversold. GAO puts it this way: "American firms have been trading for centuries with countries that (1) use various measurement systems, (2) have different requirements and laws that must be complied with, and (3) speak different languages."

Shifting to the metric system is not yet an official goal of the government, the report points out, even though many people polled believe it is. Some 42 percent of all small businessmen are said to believe that converting to metric is actually mandatory.

The results of conversion, warns the GAO survey, would be far greater than is generally realized. "Metrication would affect Americans at work, in school, at home, in shopping and in their leisure activities. Every organization, firm, industry and level of government would feel its impact. The impact would surprise many Americans and affect them all in many and varied ways. No country with an economy and population anywhere near the size of the United States has converted to the metric system."

Is it worthwhile? The Comptroller General concludes the GAO report by telling Congress that: "A matter to be considered is whether the use of the metric system throughout the world warrants the effort and expense needed to convert our day-to-day affairs, such as highway speed limits, consumer products and weather reporting into metric measure."

Signs are that this sentiment may have touched a sensitive nerve among Americans who have been showing more and more reluctance to shifting from miles to kilometers and from Fahrenheit to Celsius temperatures as a partial conversion has gotten under way during the past three years. □

Engineering generally would be best served and would serve the economy best if they continued with the foot-pound-second system and adapted whatever is superior in the S.I. system or in that system which follows the S.I. system when S.I. has become obsolete (or intolerable).

The Imperial system has survived by adapting before. The chain (66 feet) has been dropped from general usage - although the rod (16 1/2 feet) survives as it is a convenient measure for farm fences. The stone has also been dropped for most uses (although not dropped where I would have liked it - on the collective heads of the egghead bureaucracies that are trying to force metric S.I. on us). The cubic centimetre, millilitre and gram will survive in medical and scientific work with or without S.I. because the size is convenient for the usage.

The millimetre will not survive as a building measurement because it becomes unwieldy. The pascal has already been escalated to megapascals (pascals x 10 to the 6th power) for many uses and inevitably will become as extinct as the dodo bird in a fairly short time.

In general, the use of S.I. will unnecessarily place a burden on our economy for no useful purpose except conformity with those that can't compete as effectively.

S.I. will have to produce an "elite" class of people who understand it. Most people will be using it by rote, not really knowing what they are doing and the number of mistakes has to increase.

The foot-pound-second system is basically sound, simple, complete and superior and should continue with adaptations towards a superior system when that adaptation is dictated by the sheer value of its superiority. To date, nothing in the S.I. system has been shown to be superior except the elimination of some fractions in favor of decimals.

The brainwashing by the media towards metric S.I. should cease and let the dimension systems evolve on a superiority basis as they always have.

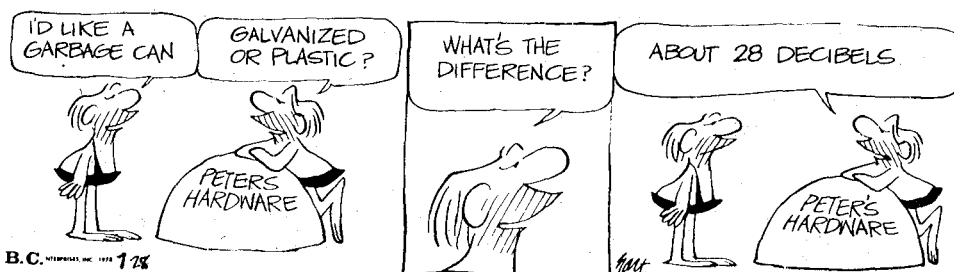
Practical Science is fast becoming most impractical. □

Canadian Consulting Engineer
June, 1978
Sent to us by Lowell Court,
Allsopp, Morgan Engineering
Edmonton, Alberta

On converting to metric
The General Accounting Office has challenged the need for U.S. conversion to the metric system. A GAO report maintains that the conversion will be of "minor importance" in increasing U.S. exports, while the cost would be "significant—in the billions of dollars" and will be passed on to consumers. The GAO also disputed that metric conversion is inevitable, stating that the Metric Conversion Act of 1975 did not commit the nation to eventual conversion. Malcolm E. O'Hagan, executive director of the U.S. Metric Board, called the report "subjective," and added: "They seem to be confused about the intent of Congress. The report displays a lack of appreciation of how the change is occurring."

Business Week, 11/6/78

U. S. News, November 13, 1978



B.C. 1978

SYNERGETIC AUDIO CONCEPTS
ARTICLES OF INTEREST

WHATEVER HAPPENED TO 'PARTICIPATIVE' MANAGEMENT? published in the February 1979 issue of *The IEEE Spectrum* is written by Michael F. Wolff. The article demands attention because it gives some worthwhile details of how Hewlett Packard and Tektronix are managed. HP with 42,300 employees and a 1.36 billion dollar a year business admittedly is a well-managed corporation. Tektronix with 20,000 employees and \$679 million a year in sales is also worthy of management study.

The article written from the viewpoint of participative management discusses Douglas McGregors' *The Human Side of Enterprise* with its theory X for authoritative management and its theory Y for participative management. Theory X essentially assumes that all workers are immature and require some form of threat-reward (carrot-stick) management. Theory Y assumes that workers are mature individuals and given "Management by Objectives" a worker is probably better able to make decisions about the problems he is directly concerned with than some executive way up the line - no matter how smart that executive may be.

Various manipulative variations and each type of management are discussed and illustrated. In reading the article and several of the references cited, *Management-Tasks, Responsibilities, Practices*, by Peter F. Drucker being one, several of the prominent failures of participative management are discussed and again illustrated. A large state university being used in one example wherein "tremendous excitement was created" but also was a total failure.

While so-called "professional management", like politics, is not a subject that pleases the thinking human, they are, like death and taxes, inevitably present. One critic of participative management describes the problem with clarity. Participative management, says Maslow is "inhuman to the weak, the vulnerable, the damaged, who are unable to take on the responsibility and self-discipline which theory Y demands."

This year marks the point in the history of the United States wherein over half the population is dependent for their income on the government and less than half of the population is producing the national income.

Imagine the frustration of being a skillful management in possession of unique original ideas for progress and development and then being saddled with "the weak, the vulnerable, the damaged" in a theory Y management situation. It is only human nature that "the weak, the vulnerable, the damaged" seek out *secure* non-threatening environments. This is not to say that there are not good talented people in non-profit endeavors. We are saying they are a minority there (often given a very hard time, as well).

Compound the situation by picking one of "the weak, the vulnerable, the damaged" and place him in charge of the whole situation. Make him, well meaning but ignorant, religious but unethical, moral but undisciplined, a "good old boy" who feels most comfortable with *his peers* - other "good old boys" and have him manage?? by theory Y "the weak, the vulnerable, the damaged" who elected him in the first place and you have a pretty good handle on our present political situation.

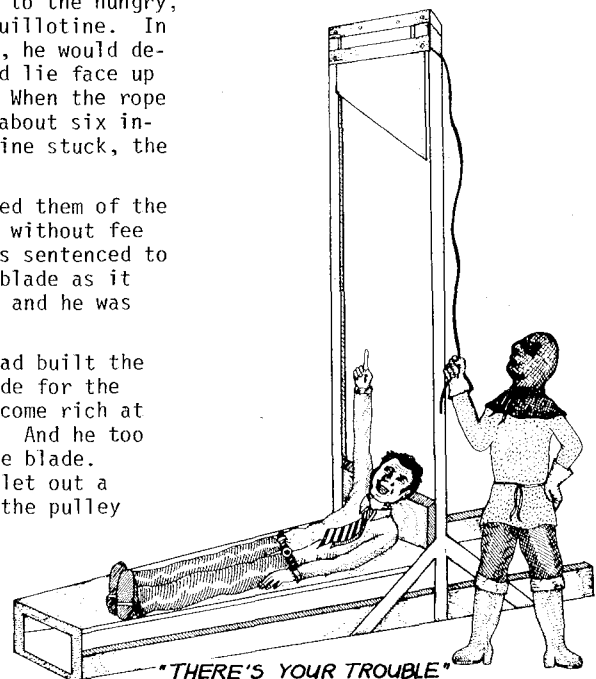
Perhaps a slight swing back towards theory X authoritarian management might be advised since a majority of the workers seem to require it. Those happy and able to cope with theory Y have already sought out either a company like HP, Tektronix, or their own business, or else are one of the unrewarded, unsung heroes trying to turn the tide in the non-profit enterprise.

Myron Tribus of MIT is the author of a very thought provoking article in the April 1978 *IEEE Spectrum* entitled, *The Engineer and Public Policy-Making*. The excerpt that introduces the article illustrates why the typical engineer is rarely involved in politics (one of the descriptions of an engineer: Emphasis on logical analysis, impatience with ambiguity, pride in the elegant solution, the delight in knowing and understanding, suppression of emotion, and the value of integrity -- all are traits that may be considered typical of engineers.)

During the French Revolution, a priest, a lawyer, and an engineer were put on trial as enemies of the Revolution. The priest tried to defend himself by explaining how he had ministered to the poor, brought food to the hungry, and tended the sick. To no avail. He was sentenced to the guillotine. In those days, when a person felt he had been sentenced unjustly, he would demonstrate his feeling by making the supreme gesture - we would lie face up rather than face down in the guillotine. The priest did so. When the rope was tripped, it happened that the blade stuck in the channel about six inches above his neck. It was the rule that if ever the guillotine stuck, the victim was let free. So the priest was spared.

Then came the lawyer. He too argued for his life. He reminded them of the many criminals he had defended, of how he had served the poor without fee and had argued against unjust laws. But he too failed and was sentenced to die. And, like the priest, he insisted on looking up at the blade as it descended. And in his case, too, the blade stuck in mid-air, and he was let free.

Then came the turn of the engineer. He pointed out that he had built the water works. There were public buildings and roads he had made for the people. He had never been engaged in politics, nor had he become rich at the people's expense. But these arguments fell on deaf ears. And he too expressed his contempt by lying on his back, looking up at the blade. Then, just as the executioner was about to pull the rope, he let out a cry: "Look -- I see your trouble. The rope has slipped off the pulley up there. No wonder the thing doesn't work."



BOOKS OF INTEREST

Quoting from the March 1979 Westways, Henri Temianka on critics:

If the critics approached their craft with the same devotion as the artists, classic anecdotes like the following would never gain currency. A German critic during the days when dueling was fashionable, felt insulted by a violinist's remark and challenged him to a duel. The violinist refused.

"You coward," hissed the critic.

"Not at all," responded the violinist calmly. "This would be an unequal contest. If you so much as scratch my little finger, I can't play the violin anymore. Whereas, if I blow your whole head off, you can still write your reviews."

THE ILLUSTRATED DICTIONARY OF MICROCOMPUTER TERMINOLOGY by Michael Hordeski, \$7.95, 322 pages, published by Tab. The book is a reminder that devices not in existence just 20 years ago need a dictionary this size if you're to find your way through the labyrinth of acronyms in use today on this one subject.

I'm not equipped to judge the accuracy with which this book is put together but its very existence intrigues me.

Another interesting Tab Book is *HOW TO CUT YOUR ELECTRIC BILL AND INSTALL YOUR OWN EMERGENCY POWER SYSTEM* by Edward A. Lacy, \$2.95 (in this day of inflation - bless their hearts). This 140-page book has much of interest but as we can testify from experience it describes only the bare basics. Carolyn and I depend upon a motor-generator for our primary power source; in our case, an Onan 5KW two cylinder, propane power unit. Our home in the country is seven miles beyond and 2600 feet above the nearest available power, telephone, water, sewage or gas. It has been our experience that Onan generators are more reliable than public utilities and now days, not really that much more costly. In areas where heavy use of furnaces needing electrical current is present, then public power is a definite convenience but in the great southwest it isn't a necessity (providing you don't need airconditioning). When brownouts or blackouts occur, then the private motor generator is a real luxury. I doubt we would be happy without one in any rural area. Of course, one has to use gas refrigerators and no freezers.

This economical book will give you an overview of many of the basic problems. The price is hard to beat.

TECHNICAL PAPERS OF INTEREST

DAVID L. KLEPPER gave the 'lead off' Invited Paper in the Architectural Acoustics and Electroacoustics session at the 50th Anniversary of the Acoustical Society of America's Spring meeting at MIT in Cambridge.

His paper, entitled *Thirty Years of Sound System Progress*, was excellent. It would be hard to find anyone who has been more intimately involved over the whole 30 years than Dave. Certainly the first really large auditorium system I saw that made me want to meet the designer was one of Dave's. He has pioneered high quality single source systems, time delay systems, proper utilization of columnar arrays, pew back systems, and in the midst of all this, always been ready to recognize and assist others in the same field.

Dave's paper covered all the important advances of the past thirty years with a thoroughness only a veteran could display. He correctly assigns credits and significances of accomplishments. His paper will be one of the more reliable sources for future investigators. Dave is submitting the paper for publication in the ASA Journal

In order to place the concept on record in the technical literature (some writers feel they can "use" without credit, from commercial publications but tend to acknowledge work published in the Journals of the technical societies, Chips Davis and I presented a paper entitled, "The LEDE Concept for the Control of Acoustic and Psychoacoustic Parameters in Recording Control Rooms" at the 63rd AES Convention in Los Angeles (Preprint 150(F-2).

Preprints, if you are interested, are available for \$1.50 for members, \$2.00 nonmembers from The Audio Engineering Society, 60 East 42nd St., New York, New York 10017.

CLASSIFIED

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Four (4) Emilar EA-175-8 high frequency drivers. Like new. All meet factory specs. \$125 each.
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EMPLOYMENT OPPORTUNITY:

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EMPLOYMENT OPPORTUNITY:

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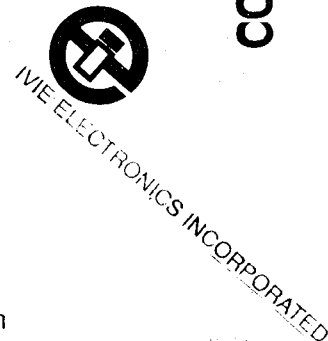
SYN-AUD-CON SPONSORS

Syn-Aud-Con receives tangible support from the audio industry, and ten manufacturing firms presently help underwrite the expense of providing classes in many different cities in the United States and Canada. Such support makes it possible to offer the classes in a convenient location at reasonable prices and to provide all the materials and continuing support to the graduates of Syn-Aud-Con.

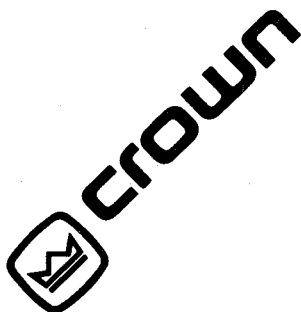
Personnel from these manufacturers receive Syn-Aud-Con training which provides still another link in the communications circuit between the ultimate user and the designer-manufacturer of audio equipment. They are "in-tune" with what a Syn-Aud-Con graduate needs.

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

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