newsletter

SYNERGETIC AUDIO CONCEPTS

P.O. BOX 1134, TUSTIN, CALIFORNIA 92680

VOLUME 3, NUMBER 2
January, 1976

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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SPECIAL GRADUATE CLASSES IN 1976?

Three time graduates of Syn-Aud-Con have caused us to do some very serious thinking about, "Where do we go from here?", especially when a three-time graduate says at the conclusion of the class, "I'll see you next year."

Often the two and three-time graduates are the very brightest and sharpest men and women (yes - we've had women among our two-time graduates) in the audio business. They are eager to learn, not just how, but why. We want to bring these people together.....

We have increasingly discussed with graduates what their interest would be in a special week session conducted at some remote location such as our farm in the hills of S. Indiana (the county south of Brown County). Many have said that a week among peers at such a location would be most meaningful to them.

We have, therefore, begun tentative plans to construct the necessary facilities at the farm to allow for such special classes.

The nature of the class would be to undertake some special project or projects of benefit to the entire audio industry and work on it intensively for that week. The participation of manufacturers likely to have knowledge useful to the projects and equipment for the required experimental work would be sought out.

Each special graduate class would have the data it gathered and the conclusions it reached published as a special Syn-Aud-Con Report on the subjects investigated. For example, one project could be "How the Q varies as devices are combined in arrays." Another project could be the investigation of a device for directly reading critical distance from a sound source. Still another very worthwhile project would be the measurement of the amplitude and phase response of the more commonly available commercial sound loudspeakers and their classification into minimum phase and non minimum phase devices. The list is endless.

Participants would pay their own way to S. Indiana. If coming by air, most likely Louisville, KY, would be the most convenient airport for us to pick up all arrivals and transport to the farm in S. Indiana. We would supply motel accommodations for 6 days (double occupancy), transportation to the farm from motel and return each day (about 3 miles) plus all lunches and dinners - for a cost of approximately $500 per graduate. Breakfasts would be the responsibility of each attendee and the motel we would use for sleeping accommodations has an acceptable restaurant attached.

This would be a "down on the farm" experience where you would have adequate time to enjoy a 500 acre farm with magnificant woods, plus cattle pasture and crop acreage. We would eat meals prepared by local country cooks in an old unrestored 100 year old Indiana farmhouse.

We would work together in a newly constructed laboratory having the facilities to make outdoor anechoic testing convenient, house the test equipment, and allow lecture discussions with adequate work table area for everyone to work on his own part of the project. My entire technical library would be available for reference work.

The project's goals would be to explore in *total* detail the project at hand. We would all finish 6 days later as the leading specialists available regarding our project choice. Our emphasis would not be speed but thoroughness of investigation so that our conclusions really answered the questions.

These classes will be limited to no more than 20-25 Syn-Aud-Con graduates at one time. We are tentatively planning one class in 1976, in August. Should we have more applicants than we can accept in one class, three-time graduates will have priority over two-time graduates, and two-time graduates over one-time graduates.

We need to know. ARE YOU INTERESTED? We are ready to do our part if this idea fulfills your wishes for meaningfully advancing your audio knowledge. Let us hear from you!

THREE LETTERS

Three "letters" from Syn-Aud-Con graduates, Sam Bridges, Cecil Cable and Dave Klepper, are reproduced in the Newsletter rather than as individual Tech Topics because each raises questions as well as answering them. Some of the concepts I have questions about, but we need to think about these concepts. They are being reproduced here because we would like to hear from you and have your ideas. We will share them with you in future Newsletters.

From Sam Bridges, Electronic Design Co., Minneapolis Class 1973, '74, and '75:

I promised to write a complete description of one of my pet gripes. This concerns the so-called "audience preference curve."

My position is that the audience prefers to hear the most natural reproduction possible from the sound system. This means low noise, low distortion and wide frequency response.

Let's look at architectural acoustics to get an idea of what the acoustic designer strives to provide. A good hall will be configured with surfaces to reflect sound to the listeners. The "initial-time-delay gap" should be short so the listener will consider this sound as part of the direct field. The high frequencies must be preserved by the surfaces involved.

The reverberant field is handled differently. The following are reverberation times considered nearly ideal for a 2,000 seat concert hall:

Hz	Reverb Time W/Audience, Orchestra
67	3.3
125	3.0
250	2.6
500	2.2
1000	2.2
2000	2.1
4000	1.6
6000	1.2

It is obvious that the reverberant sound, high frequencies encounter increasing absorption.

The physical arrangement of the orchestra serves to project the high frequencies, too. I could cite a number of examples in reference books concerning the need of high frequencies in music (Harry Olson, Roger Kirk of Ohio State U, etc.). Therefore, the "audience preference curve" documentation, if used to indicate the listener doesn't want a wide range, is false!

When a sound system is equalized, the microphone(s) is placed well into the reverberant field. We already know the acoustic environment is usually hostile toward high frequencies. If the on-axis response of the speaker system is flat, the room itself will roll it off in the reverberant field. Further, speaker Q starts close to 1 at low frequencies and goes up with rising frequency. This means the total acoustic output of the speaker system is greater at low frequencies. The higher the system Q, the greater the roll-off, even though the direct on-axis response is flat.

When you measure filtered pink noise in the reverberant field, you have both the room attenuation and the total acoustic sound output effects indicating a high frequency roll off. But the direct sound field is still flat in response (if you neglect air loss).

NOW THEN:

1. The most significant experiment (Olson) proves that most persons prefer natural sound.
2. The "audience preference curve" is a measure of reverberant field response and does not accurately define direct sound response.
3. I maintain that the listener's subjective judgement of frequency response is based upon direct sound and early reflections, not the reverberant field.

It can be said that the "audience preference curve" automatically compensates for the reverberant field roll-off of high frequencies. This is not necessarily true because the total acoustic output of speaker systems is still a function of PWL only.

It would seem then, that the best approach would be to equalize the direct sound field first, perhaps with tone bursts. The microphone(s) would be included of course so that the total system is equalized. Then the feedback touch up would be done to complete the job.

Don Davis' answer to Sam Bridges:

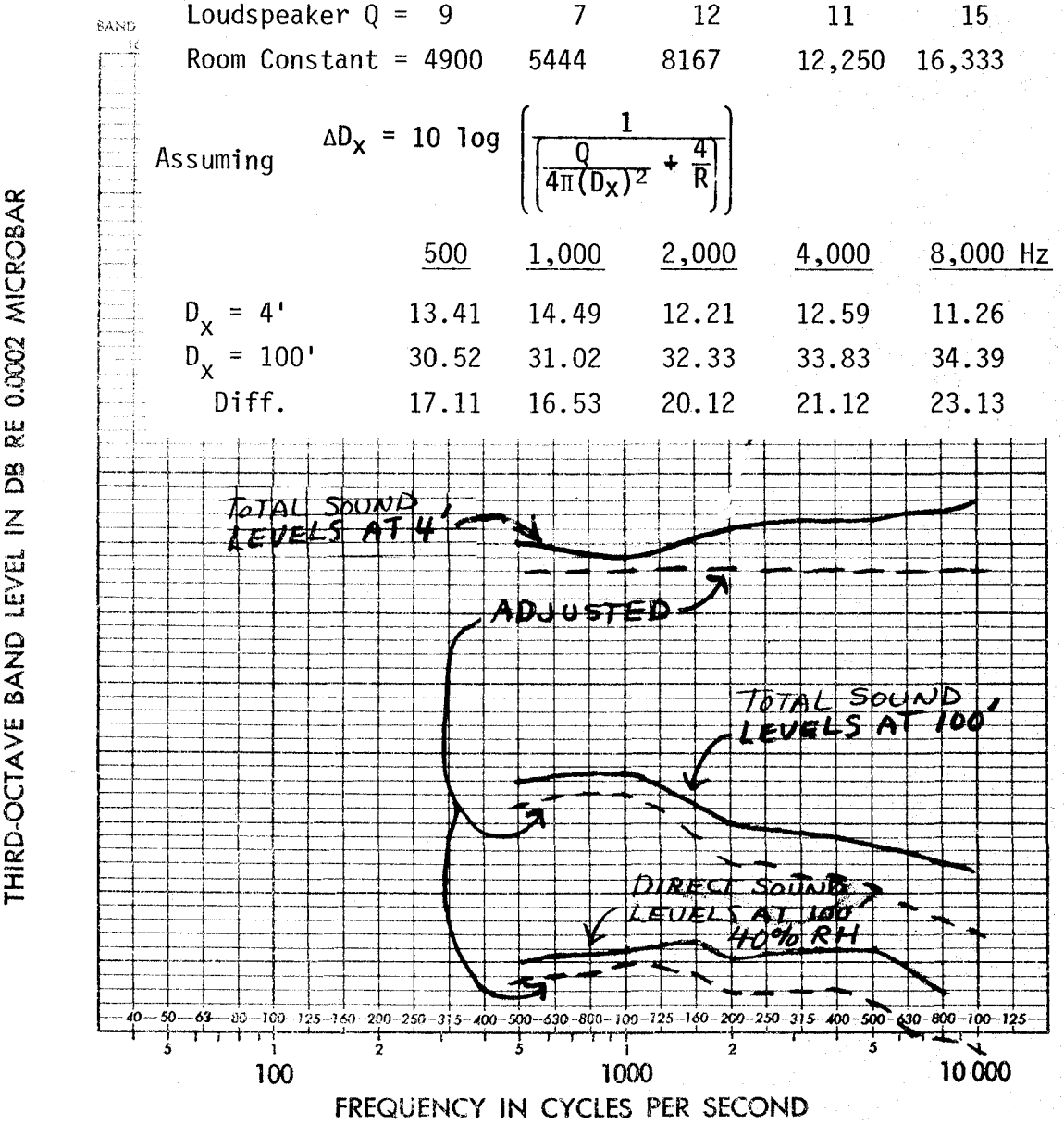
In reading thru your objections to the so-called "audience preference curve" I came up with the following comments:

1. The reverberant sound field is dependent only upon the PWL and is in no way dependent on the Q. Raising Q can allow the PWL to be lowered, thus lowering the reverberant field while maintaining the desired ratio of direct-to-reverberant sound.

Example Room	500	1,000	2,000	4,000	8,000 Hz
Loudspeaker Q =	9	7	12	11	15
Room Constant =	4900	5444	8167	12,250	16,333

Assuming $\Delta D_X = 10 \log \left(\frac{1}{\left(\frac{Q}{4\pi (D_X)^2} + \frac{4}{R} \right)} \right)$

	500	1,000	2,000	4,000	8,000 Hz
D_X = 4'	13.41	14.49	12.21	12.59	11.26
D_X = 100'	30.52	31.02	32.33	33.83	34.39
Diff.	17.11	16.53	20.12	21.12	23.13



2. The direct sound field, at say 100', $D_x >> D_c$, has a shape quite similar to the reverberant field response (direct sound curve due to inverse square law and air absorption.)

3. I believe the majority of us agree that the closer one sits to the sound source the more uniform the response can be at high frequencies, and the sound is good.

4. Cecil Cable has shown with time delay spectrometry that the direct sound field and the reverberant sound field usually have the same relative response characteristics at any given point but that the relative response of the early reflections can be quite jagged.

We are most interested in any experimental work you undertake in your auditorium and would be delighted with a report on it.

I'm sending a copy of your letter to Cecil Cable for his comments.

From Cecil Cable, Edmonton, Alberta, Los Angeles class 1973 and 1974.

Back in October you sent me a copy of some thoughts from Sam Bridges, re: "Audience Preference Curve". This is another subject which can stand some investigation. I believe your illustration of a typical room is substantially correct. I also agree with the general philosophy of Sam Bridges - when measurements are taken in the reverberant field. I think that this is not in disagreement with Schulein's work, JAES Apr/75. As I understand it, the conclusion of Schulein's work is summarized in Fig. 13,14, and 15, Page 183 of the Journal. Although his experimental work in establishing the audience preference curve is most convincing, the conclusions, I believe, are based upon the existence of sound fields which are not fully defined.

Schulein says you must starve the reverberant sound field at high frequencies because of the greater sensitivity of ears to the diffuse field at these frequencies. Sam says the reverberant or diffuse field is deficient because of higher Q's and lower power at high frequencies. Your curves agree. Sam is suggesting that human judgment is based upon the direct field - not the diffuse field - even though the direct field may not be predominate. Schultz: "Acoustics in the Concert Hall", IEEE Spectrum, June 1965, suggests that the direct field may be starved at low frequencies as long as the reverberant field is balanced - that at lower frequencies, judgment is based on the reverberant field. He says nothing about the same thing being true at high frequencies.

I have looked at system equalization based on the direct sound alone - easy to do with Time Delay Spectrometry. However, those sources I have had to work with have been incoherent, giving direct sound so jagged, dependent upon polar position, that I have concluded such equalization would be good for that auditor position only.

If I had my druthers, I would use some sort of averager to take direct sound from a number of polar positions, so that the nulls and maximums would average out, or at least become spaced closer than 1/3 octave. I believe that unless Sam uses a coherent source (like the elusive point source), and uses relatively broad band signals, (not sine wave) for his pulses, he may find as many different direct sound spectrums as he has room positions.

The very fact that most sound reinforcement situations do present very jagged spectrums of direct and early sound makes one wonder if it is really this spectrum we make our judgments on. The late and reverberant field are even more jagged, spectrum wise, but the deviations in level are closely spaced, much closer than 1/3 octave, so are averaged out through the approximate 1/3 octave critical bandwidth of the hearing mechanism. It is this "smoothed" response curve we usually equalize.

Within the terms of Hopkins and Stryker (upon which most of our equations concerning R are based) I cannot allow that reflected sound is separate from the reverberant field. R includes all boundary reflections from the first to the nth. However, we do know that early reflections - say the first 10 dB of decay - are more significant than the subsequent decay.

In the stricter sense of Q I would like to see the early reflections from the floor from his "loudspeaker with a Q of 2", defined as early reflections of the reverberant field, rather than being assigned to the source as adding to the direct sound. This would then yield a loudspeaker Q of less than 2 over large portions of the hemisphere but would not deny the possibility of high Q's over smaller portions of the hemisphere.

Both Schulein's and Sam's observations (and yours as well) assume a loss in the ratio of direct (and early?) to reverberant sound as D_2 increases. If we use loudspeaker Q's, such that a maximum uniform ratio of direct to reverberant sound obtains for every auditor, there is no change in this ratio with a change of D_2 or of D_x. To me, for speech at least, this seems to be a desirable situation. It would then be in only relatively reverberant rooms that the HF loss of the reverberant field (Sam's) or the greater HF sensitivity of hearing response to the reverberant field would become significant.

With the new horns Don Keele is turning out and the equations to define the required Q to lay down uniform fields, such a hypothesis does not seem too unreal.

And, from Dave Klepper, KMK Associates, New York 1975 class, on a slightly different, but related subject.

I agree that Alan Lubell's Tech Topic is a good start on directivity. (Volume 3, # 2, "Applying the 5 & 10 Rule to High Q Acoustic Radiators")

Frankly, I'm eager to do an interesting experiment. Today I believe that there is actually no limit on how high the reverberation time of a space can be, provided all listeners have line-of-sight onto the central loudspeaker cluster, and that central loudspeaker cluster has sufficient directivity. Is there a practical limit on directivity? I think the answer is no. Imagine a plane rectangular room with no sound absorption except you, the solitary listener. The reverberation time will be very high, with you the only absorption, perhaps as high as 40 to 50 seconds. Now imagine a horizontal line source extending from one side of the room to the other at the ceiling line. What is the Q of this line source? Well, in the vertical plane, it is probably only 2, resulting from the simple loudspeaker's location on one surface. But, in the horizontal plane, the Q is infinite. The walls are flat and sound-reflecting, so a mirror image of the horizontal line source is present, extending the line source. A double reflection, including both walls, represents a further extension of the line source. The concept is much more difficult to describe in writing or by equations than by simply drawing it; but you can see that the continuous line source is virtually reflected on both sides to form an infinite line source.

What about the mean Q? Well, what about it? What would be the mean Q between 2 and infinity? I don't have an answer to this question, but I'd like to perform the experiment, find out where critical distance is, and derive a mean Q from the distance. Of course, I would expect the SPL to fall off at only 3 dB/distance-doubling, rather than 6 dB, since we have an infinite line source. Also, I'd like to learn what the $\%AL_{CONS}$ for that solitary listener is.

Suppose the articulation loss is too high, even with an infinite line source. Well, there's another trick up our sleeve. An infinite area source should be able to solve the problem. Imagine the end wall of our rectangular reverberation chamber completely filled with loudspeakers. (Of course, they are small loudspeakers, so that the end wall can be considered a truly plane source, and not a series of point sources.) Since the floor, walls, and ceiling are perfectly sound-reflecting and plane surfaces, again we have images of the plane source, this time in all four directions, as well as diagonally. The actual plane source and its mirror images would form a virtual infinite plane with infinite directivity. Critical distance would lose its meaning, because the only variation in level encountered in the reverberant room would be from the longitudinal standing waves; at high frequencies, as measured in one-third octave bands, there would be no change in level throughout the room.

Now I know that few rooms have perfect plane surfaces that are perfect reflectors. If they did, they would have other acoustical problems, independent of the sound system. But I do want to show that very high Q's are theoretically and practically possible, by using the room as part of the loudspeaker system. And this leads me to believe that there is no limit on the reverberation time of a space, in terms of using a central loudspeaker cluster.

Indeed, the occasions where we have used some form of distributed system (Pew-back, column, or overhead) have not been the result of excessive reverberation per se. In each case, the distributed system was chosen because of one or more of the following reasons: (1) architect's or owner's objection to a large enough central cluster in the proper location, (2) large shadow zones behind massive pillars where a listener would lose line-of-sight on the central cluster, (3) some aspect of the church's geometry that made a central cluster solution difficult. Your own experience includes churches with a high reverberation, higher than many would have thought a central solution to be possible, yet the central systems work.

I am enclosing a copy of a chart prepared some years ago by Russell Johnson, then with BBN, but now with his own firm in New York. We believe that this chart demonstrates our actual practice much better than the reverberation time criteria curves in older text books.

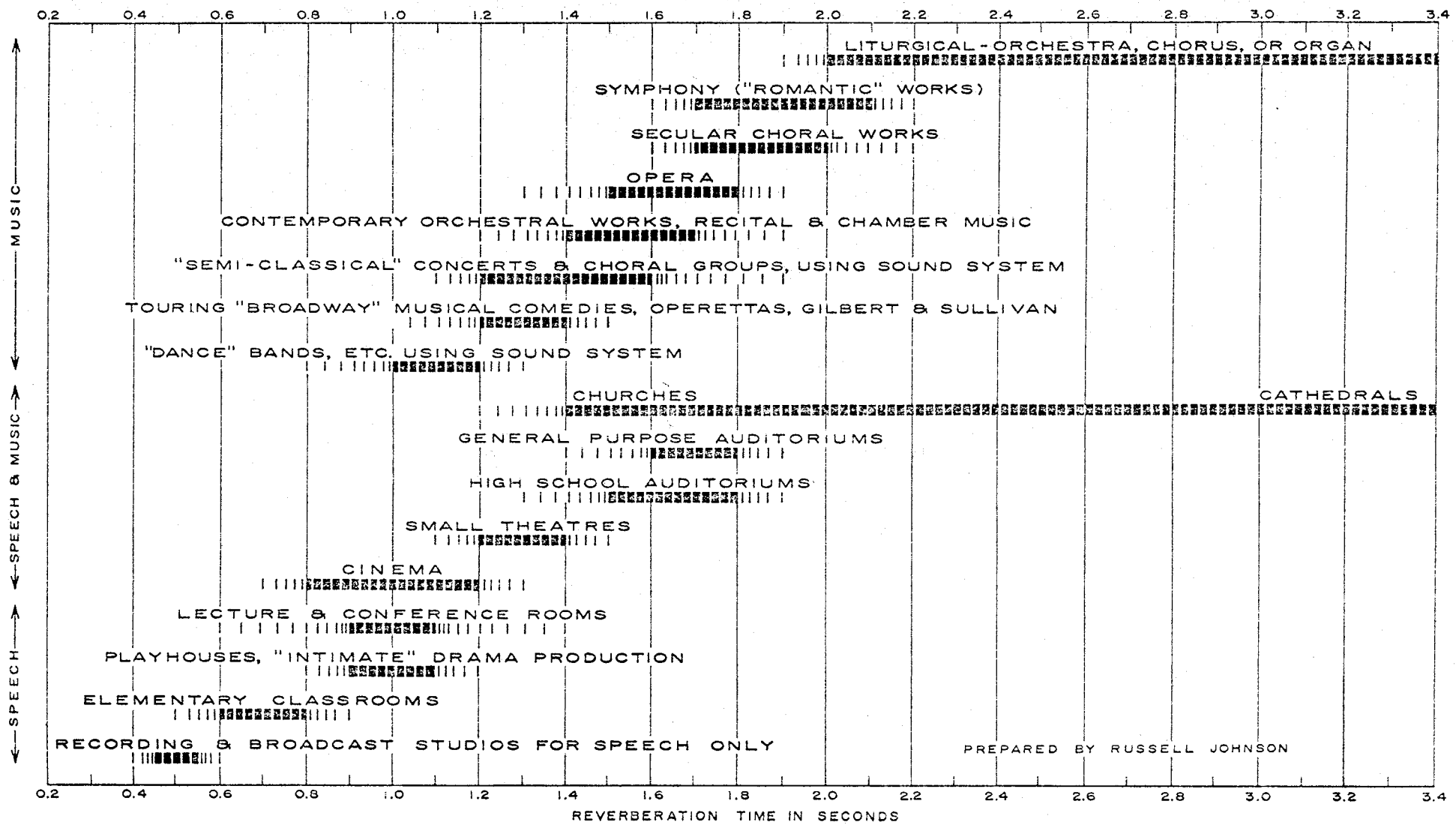
Actually, we don't set a design reverberation time goal for a new theatre, auditorium, concert hall, or church, without intensive discussions with the users and owners, to bring out all their feelings concerning the kind of space they want.

Now for brief answers to your specific questions: (Ed's Note: We asked Dave to write up some material that we felt would be of special interest to Newsletter readers.)

1. The reverberation time of high-volume spaces should be higher than low-volume spaces, because the sound quality should complement the visual quality. In Russ Johnson's chart, cathedrals (and this includes churches that look like cathedrals) should have reverberation times of three seconds (occupied) or over, while smaller churches can have reverberation times as low as two seconds (with a strong liturgical music program) or even lower, 1.4 seconds, if the emphasis is on speech. A smaller concert hall may have a reverberation time of 1.8 seconds, while a larger one probably should be around 2.0 or 2.1. Fan-shaped halls usually require rear-wall treatment and unfortunately have lower reverberation times; but there are exceptions, like the excellent Tanglewood Music Shed. Also, churches with A-frame construction (short side walls and highly-peaked roofs) often look deceptively high and often sound drier than a visual inspection would suggest. Otherwise, referring to Russ's chart can be helpful in establishing reverberation time goals for many spaces.

2. We use the Sabine equation for all large churches, concert halls, theatres, and auditoriums; and we find our predictions realized in the field. Most of the sound absorption in such spaces results from the audience, and we use Table VI, page seventeen of L. L. Beranek's "Audience and Chair Absorption in Large Halls II", JASA Vol. 45, No. 1, pages 13-19 for audience, upholstered seats, plaster, and thin wood. These are all per-area coefficients. To this table, we add the information from the Acoustical Materials Association booklet (See Newsletter Vol. 3, no. 1, page 18 for address); and, since the proportion of applied materials in these large spaces is usually small, we do not worry about the differences between Norris-Eyring and Sabine coefficients in this application. We reserve the Fitzroy equations for odd rooms having the absorption in only plane or two parallel opposing planes, and rectangular or cubical construction. The only time we use per-unit sound absorption is when there will be just a few unit sound-absorbers or people in a room.

3. As noted in prelimiary discussion, we doubt that there are practical limits to the length of reverberation that can mate with a central sound system, if the sound system designer can work with the architect and/or owner in providing a central system with enough radiating area and resulting directivity.

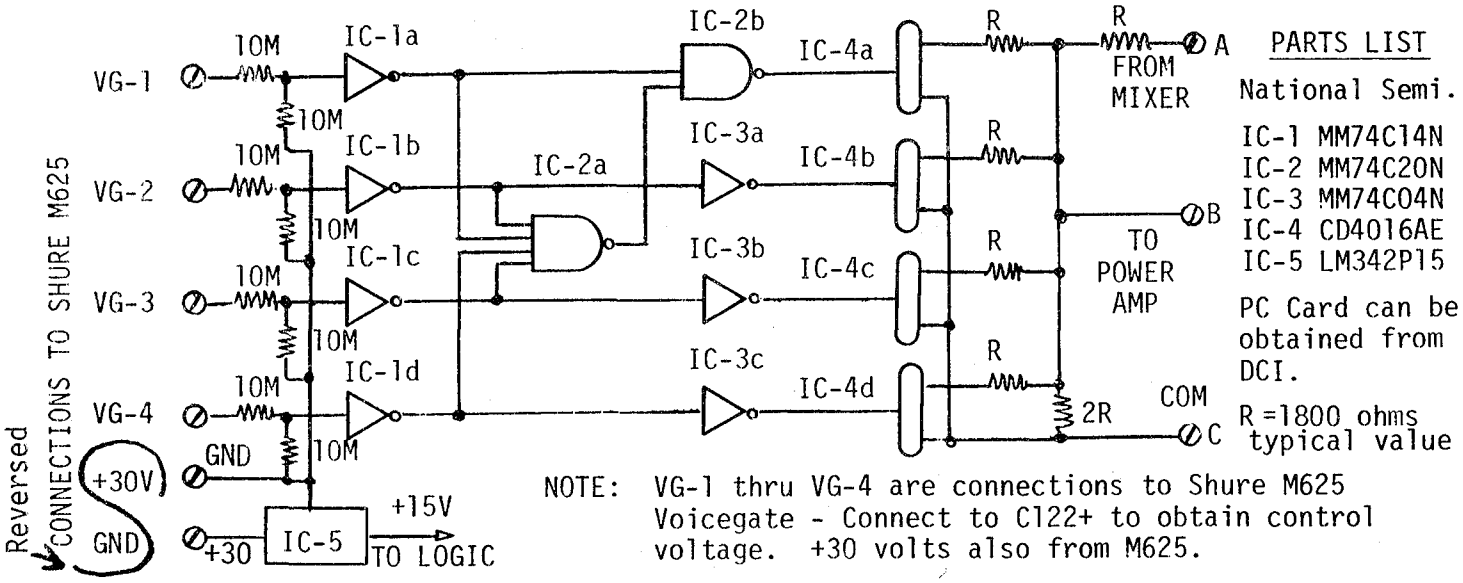


OPTIMUM REVERBERATION (500/1000 CPS) FOR AUDITORIUMS AND SIMILAR FACILITIES

NOMA - NUMBER OF OPEN MICROPHONES ATTENUATOR -- CORRECTION

From Phil Clark and David Torrey, Diversified Concepts, (Phil in Syracuse class, 1973, '74 and '75; Dave in 1974 and '75 Syracuse class)

We discovered an error in the original NOMA writeup (Newsletter Volume 2, no. 4, page 12). The +30V and GND connections are reversed. See drawing below.



Since the original publication of this note, we have been requested to construct 8 input and 20 input versions of this unit. Since the original board work was for 4 inputs, we had to stack either two or five boards modified to accomplish the task.

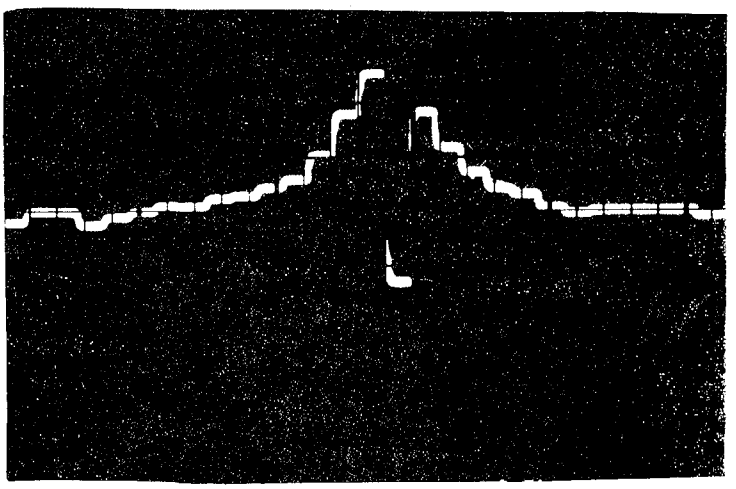
Completely assembled and tested boards figure out to cost as follows: NOMA-4 $60; NOMA-8 $100; NOMA-12 $140; NOMA-16 $180; and the NOMA-20 $220. Costs would drop. if we could make up more boards at a time, of course.

Diversified Concepts, Inc., 3920 New Seneca Turnpike, Marcellus, New York 13108

OCTAVE BOOST FILTER MEASURED

Bill Peterson brought into the DC class an octave boost-and-cut filter set. We often say in class that there are problems inherent in using a boost filter for sound reinforcement equalization. If the house curve shows a dip which proves to be a diaphragmatic absorption in the room, its easy to end up with 2 peaks in the sound system where previously you had a dip (and a dip is much easier to live with than a peak). If you are working with a real time analyzer, you can see it happening to you. Its when you are working "blind" that you can be fooled about what is happening to the house curve when you move a filter, especially in the boost position.

This photograph illustrates the problem. Using the GR 1/3-octave band pass equalizer we inserted a dip at 1,000 Hz, and boosted the octave equalizer at 1,000 Hz. Its easy to see what happened.



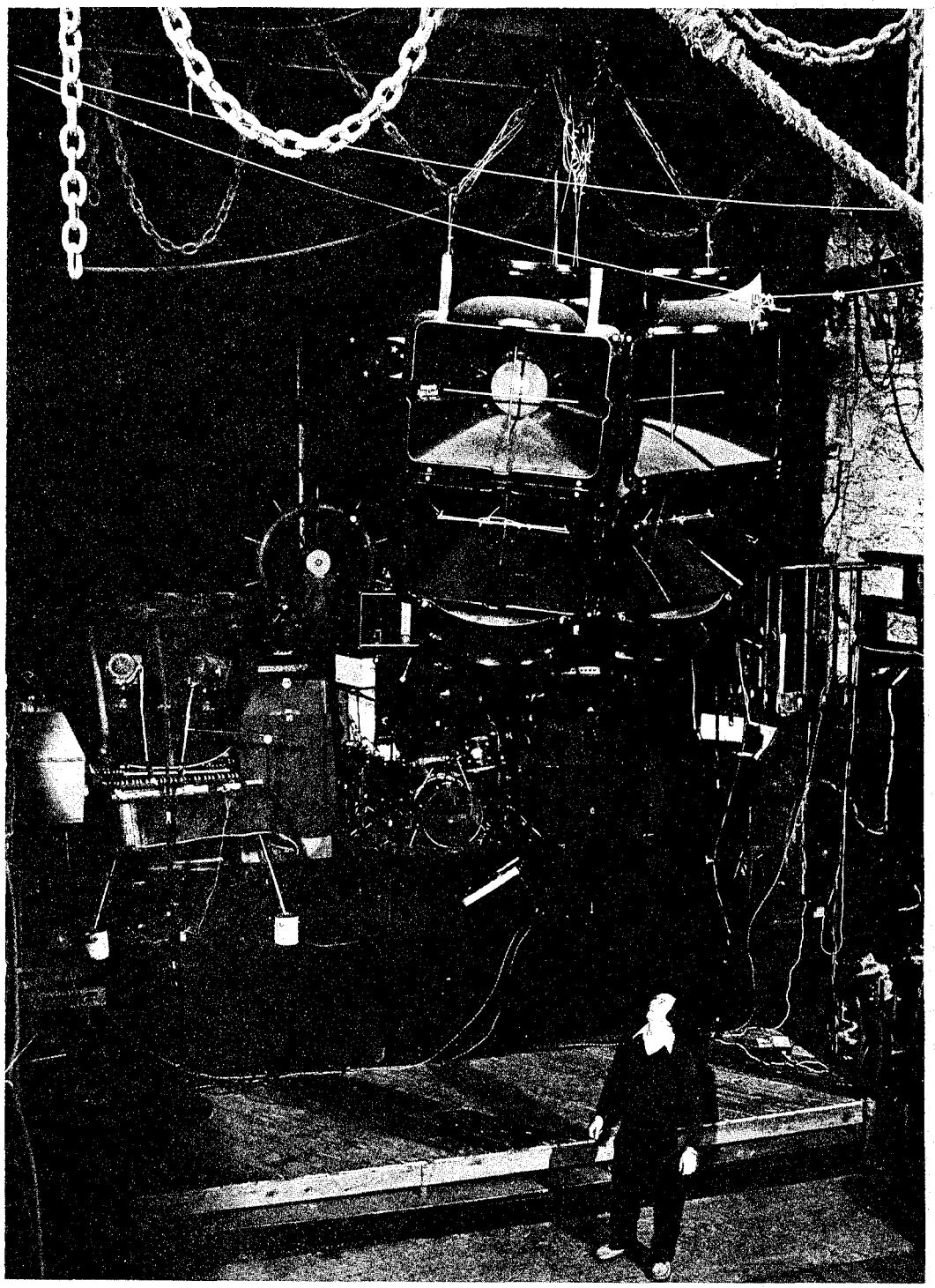
The first class that a 1/3 octave boost filter is brought in we will take a picture of the 1,000 Hz 1/3-octave filter on the GR real time in a cut position, and the 1,000 Hz filter on the 1/3-octave sound system equalizer in the boost position. We'll publish the picture.

DISCO ARRAY

That's Bill Peterson, Professional Sounds of Falls Church, 3-time D.C. graduate, standing under the horn array mounted to "antique" chains and ropes in a local Disco. Bill said the outstanding sound and coverage from the entire sound system was designed a la Syn-Aud-Con. It wasn't figured on the back of an old envelope or from stock left over from another job.

Bill was in class this year with 3 of his men. The reason that he said he didn't have more was because last year's graduate, Steve Axthelm, and another of his men were providing sound for Jan Eden tour.

Speaking of Disco sound systems, John Larssen of Philips in Stockholm, Atlanta 1975 class, says that 90 dB is maximum SPL in Disco systems there!



SYNERGETIC AUDIO CONCEPTS

From Andy Sobieralski, Gray Sound and Communications in Pittsburgh, 1973 Columbus class, 1974 Pittsburgh, and 1975 D.C. class.

I've been introduced recently to a clever device, called Rota-Lock, and have used them quite successfully and economically on several installations.

In many sound systems the biggest design problem is the speaker mounting. The photographs shown here illustrate a convenient and economical approach to the trickier installations you may encounter.

In each of the examples shown, a device called Rota-Lock, manufactured by Up-Right Scaffolds Company, 1013 Pardee Street, Berkeley, Calif. 94710, is used to fasten the horns. In examples 1 and 2, flat bar stock is welded to a short section of 2 inch standard schedule 40 pipe. Holes are drilled in the bar stock to coincide with the bolt holes in the driver/adapter. The entire assembly is fastened with hardened bolts. Figure 3 shows a mounting arrangement in a protective enclosure. Note in each case the elevation and azimuth is fully adjustable. If the locking bolt is only slightly tightened, orientation can be performed with one hand - a particular advantage when holding onto a speaker tower or hanging from an auditorium's grid work. Figure 1 shows a scheme for providing horn twist. Cut and reweld the bottom section of a vertical member at an angle. The twist angle may be adjusted from 0° to the angle of the pipe's lower section by rotating the vertical pipe. The vertical pipe is also supported by a Rota-Lock.

The possibilities are limitless. Consider the ease of construction of a fully adjustable, stacked and splayed array for instance. The manufacturer's literature has many application examples including storage racks, antenna mounting, theatrical rigging, etc., plus load bearing limits for standard sized pipe.

Figure 1

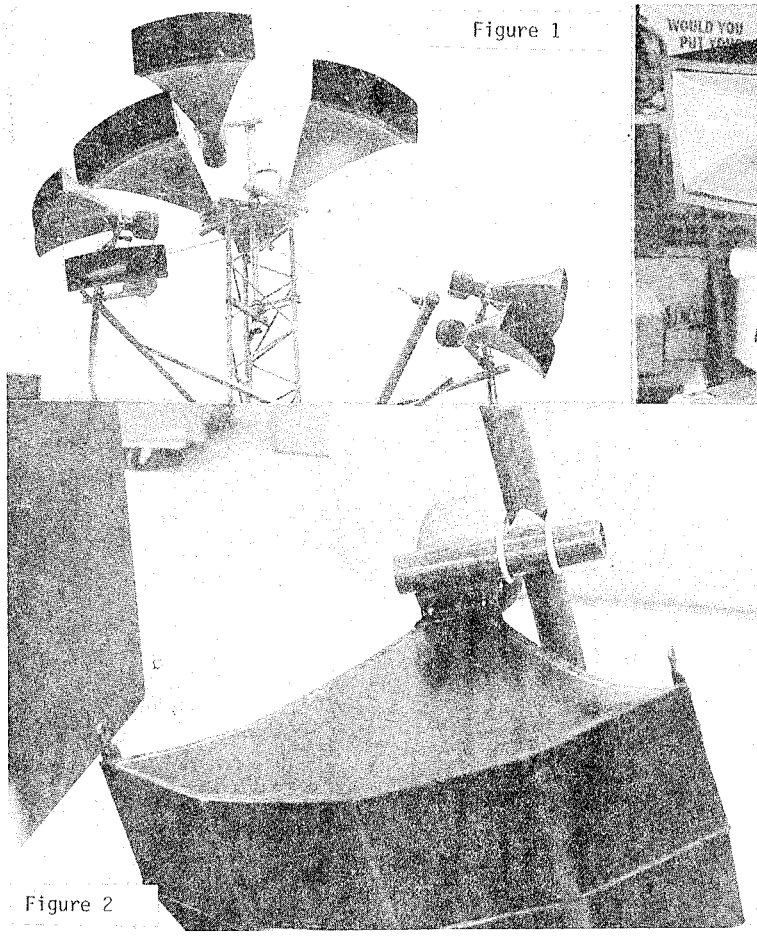


Figure 2

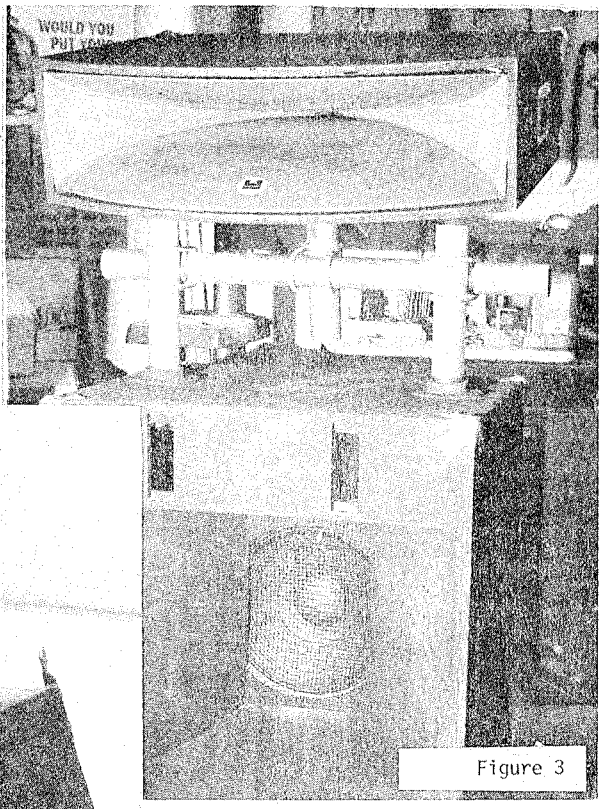


Figure 3

REGENERATIVE RESPONSE SPECIFICATION

Herb Chaudiere wrote the following specification clause for Regenerative Response equalization: (Robin Towne Assoc., Seattle class 1974)

The sound system equalization shall be adjusted using the Real Time Regenerative Response method.

Instrumentation required is a 1/3 octave band real time analyzer with associated measurement microphone and a pink noise generator.

The pink noise generator shall be fed into an appropriate input of the sound system.

The sound system microphone gain shall be increased to a point just below sustained feedback. The pink noise signal shall then be increased to a point, beyond which the system will go into sustained feedback.

The measurement microphone shall be placed at a typical listening position and the house curve observed on the real time analyzer.

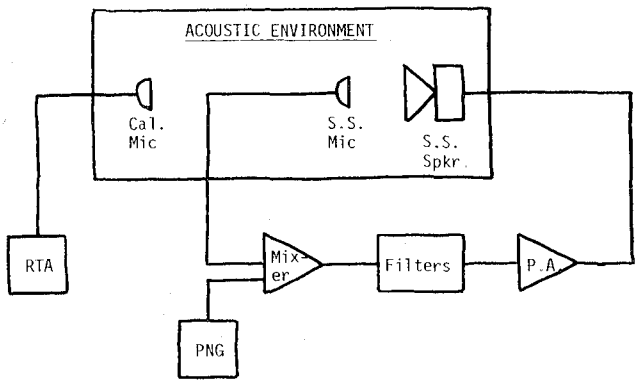
The system equalizer shall be adjusted to reduce those frequencies that have increased in amplitude relative to the overall curve as the system microphone gain and/or the pink noise signal were increased.

Those frequencies that go into sustained regeneration shall be equalized first, followed by those that merely "swell" as gain or pink noise level are increased.

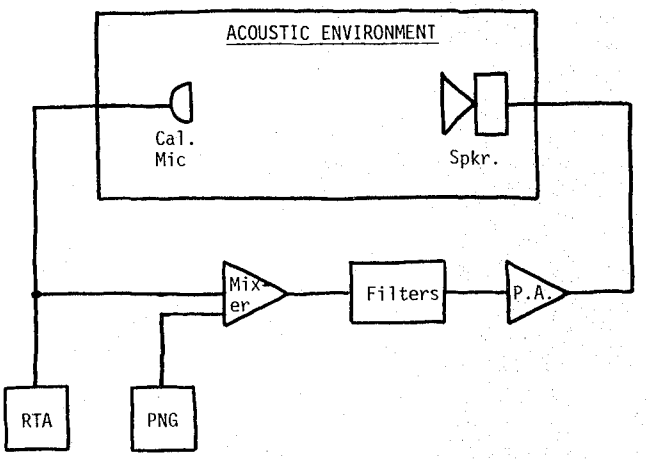
I would like to add a couple of comments: The sound system microphone gain is adjusted so that approximately +2 dB more noise causes feedback or +2 dB more microphone gain causes feedback. When raising the noise input just a slight amount causes regeneration, the sound system microphone gain is about right. Occasionally you will want to pull down high bass portions right at the last that stay up in amplitude but never feedback.

SCHEMATIC FOR REGENERATIVE RESPONSE

Through an oversight, the schematic for Regenerative Response Equalization was left out of *Sound System Engineering*, though text is complete. Syn-Aud-Con graduates since September 1975 will want to add the schematics (reproduced below) to pages 157 or 158 of the textbook.



Real-time regenerative response equalization, sound reinforcement technique.



Real-time regenerative response equalization, sound playback technique.

PRINTOUT FROM A TIME SHARE COMPUTER

Fred Lebow, Lebow Labs, 1975 Boston class, believes that too many sound contractors are "scared off" from using Time Share Computers and are missing out. So he says that as soon as he gets time he is going to write a Tech Topic for Syn-Aud-Con graduates to show them how easy it is - and not all that expensive.

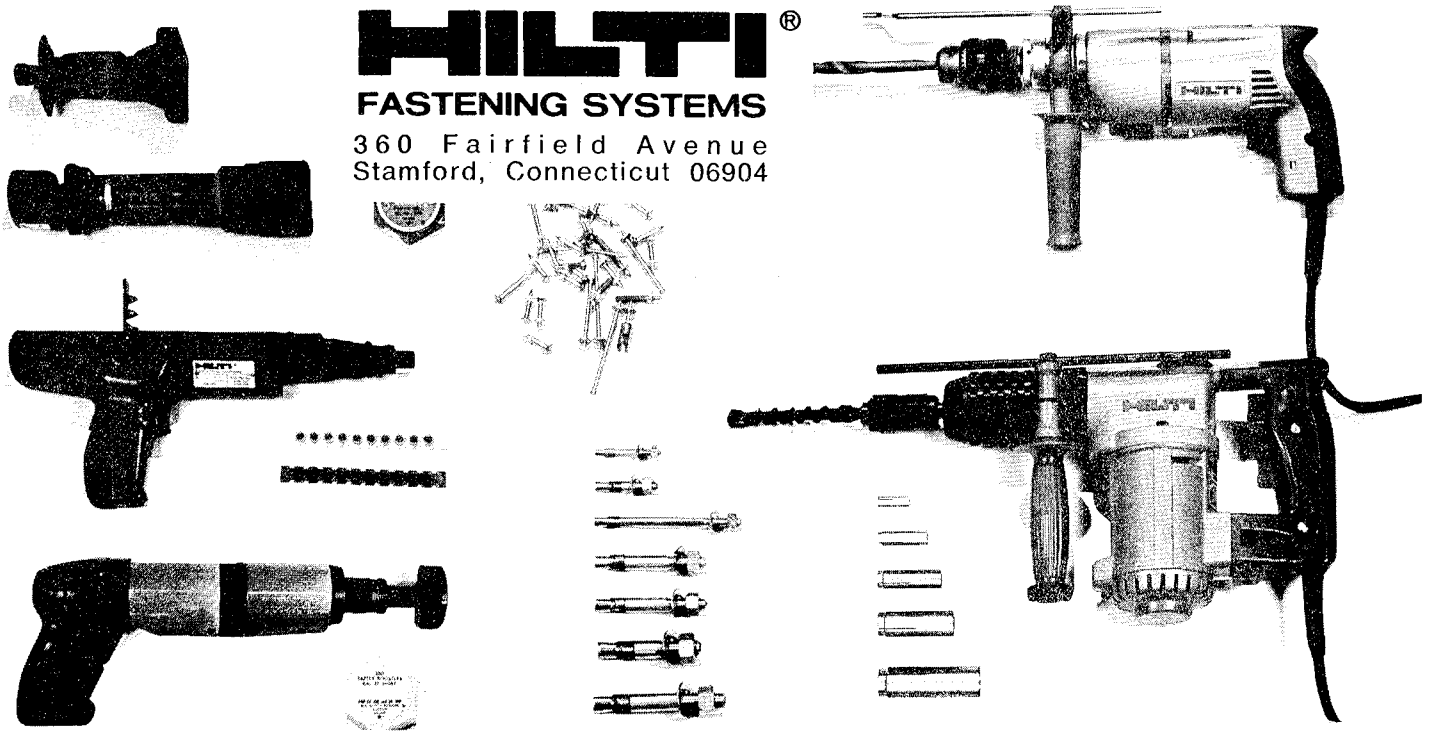
That's Fred Lebow on the right, holding up well over 12 feet of printout of their program instructions to their own time share computer terminal.

This program is used regularly by Lebow Labs to verify, check, or simply design from the beginning the jobs that they have under consideration.

Lebow Labs has 6 Syn-Aud-Con graduates on their staff.

DRILLING AND ANCHORING EQUIPMENT

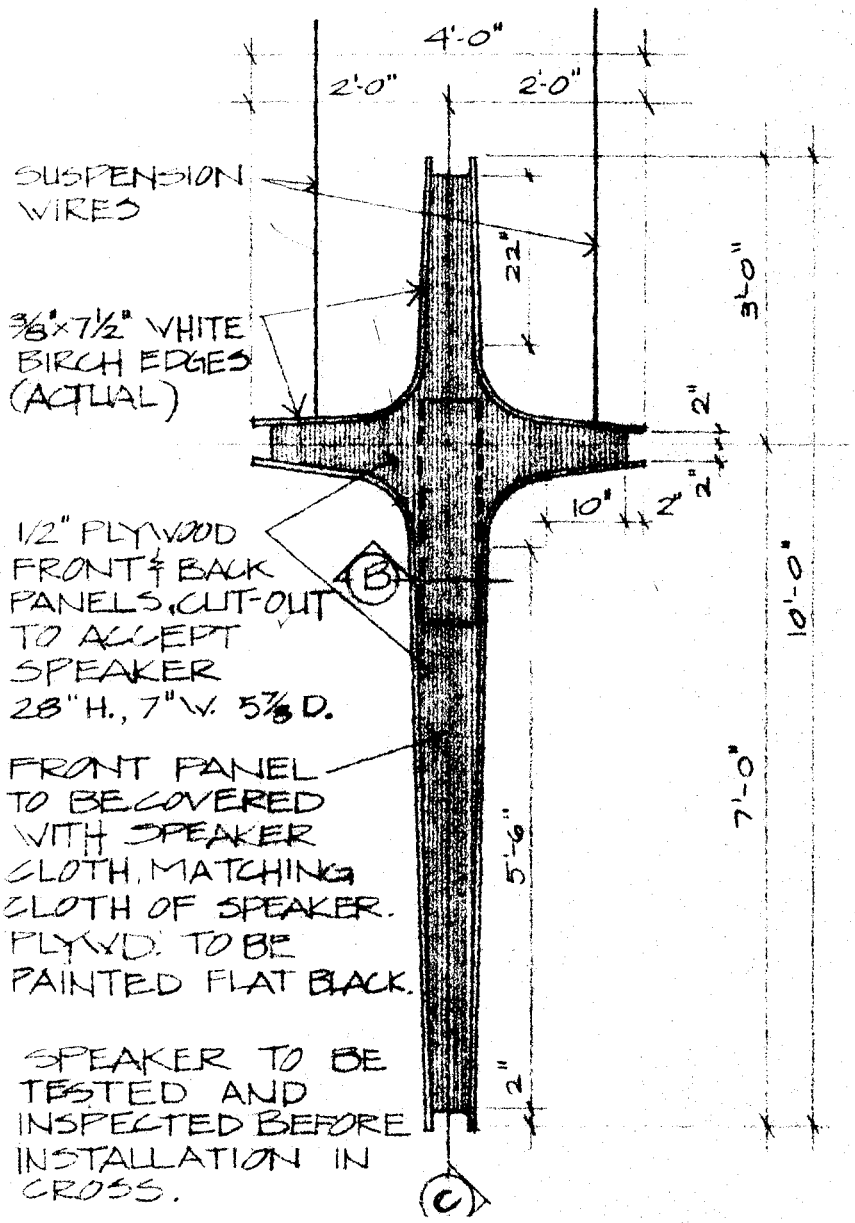
Fred Lebow also sent us information on a firm that specializes in drilling and anchoring equipment to steel, concrete, etc. If you write Hilti for literature, be sure to ask for their Plant Maintenance brochure in addition to product sheets.



SPEAKER SYSTEM MOUNTED IN CROSS

Ken Patterson, Soundplex, Kansas City class 1973 and 1975, gave us an architectural drawing of a speaker system mounted in the cross of a small church in the Kansas City area (reproduced here in part).

When the architect told Ken, "I won't have that ugly thing in my church," Ken proposed a clever answer that the architect admired enough to re-design the cross to accept the speaker system.



REVISED CROSS DETAILS

SCALE: ½" = 1'-0"

"WHAT I WOULD LIKE TO SEE"

Ken Patterson writes: "What I would like to see is a brief and simple new article similar to the BBN 'Sound Systems' article that Altec made available as a reprint several years ago. Only this time cover:

1. Two preferred types of sound systems
2. Bad or ineffective microphone techniques

Plus, have this article endorsed by numerous nationally recognized sound consultants. This verification would be a very powerful sales tool for the sound contractor proposing a high quality sound reinforcement system."

Is there a Syn-Aud-Con graduate that will take on this project? Such an article can, most likely, be placed in an architectural magazine, as was the BBN article written by Bob Newman. As Ken says, we need a new article.

SPEAKER HOISTS & WINCHES

One day Ron Steinberg, Interstate Electronics, 1973, '74, & '75 Chicago graduate, called to ask for a good source of hoists and winches. In the next day's mail, we received the following from Ken O'Toole, Audio Video Corp in Delmar, New York - 1975 Boston class.

12-29-75

Memo from KEN O'TOOLE

Con -
Here's a good
source for speaker
hoists, winches, etc.
low cost & reliable.
Thought you'd like
to know -
Ken

AUDIO - VIDEO CORPORATION
55 Delaware Avenue
Area Code (518) 439-7611 Delmar, N. Y. 12054

Equipment Patented and
Manufactured by
Sasgen Derrick Company
3101-29 Grand Ave
Chicago, Illinois 60622
Phone 312-638-0800

Gas, Electric and Hand Powered
Contractors' Material Elevators
and Hoisting Equipment
Swing Stage Scaffold Winches
and Truck Derricks

SYN-AUD-CON TRAINING SPEC

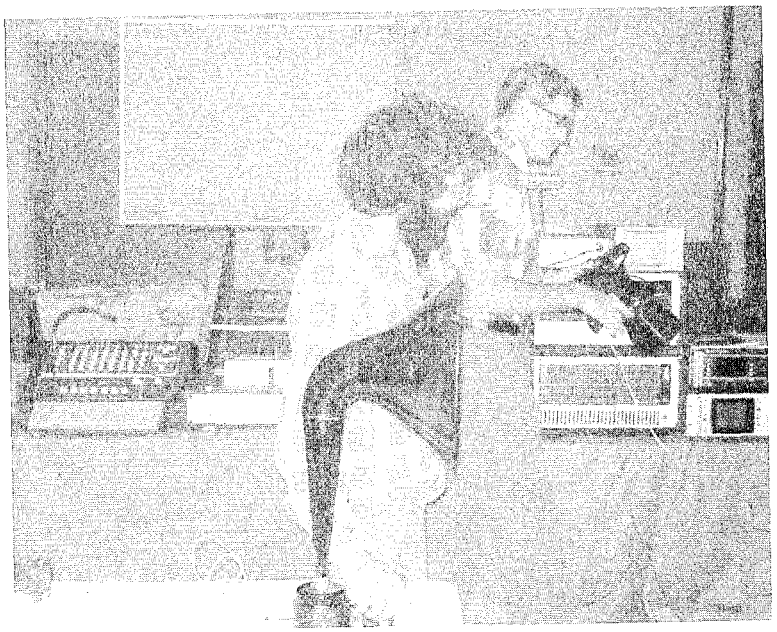
More and more specifications are being written that require evidence by bidders of special training in sound system design. Ken O'Toole sent in the following spec:

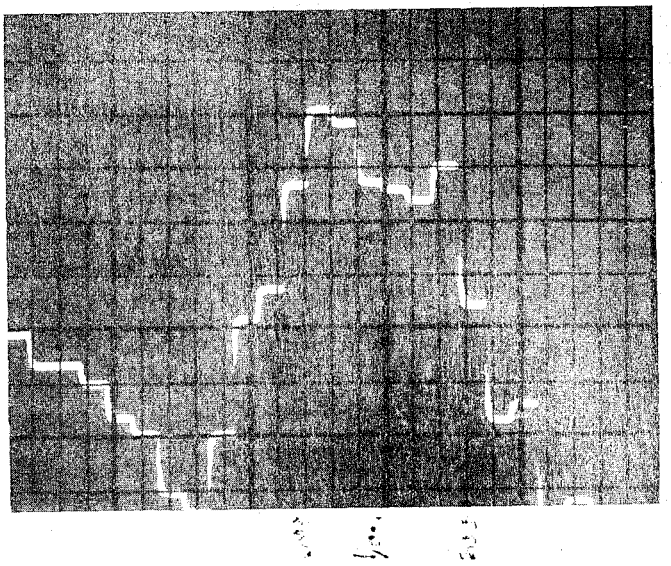
7. All bidders shall show evidence that they have in their employ, personnel who have attended sound engineering courses equal to Altec Acousta-Voice seminars or Syn-Aud-Con seminars.

And Dave Klepper of KMK Associates, New York, says he has a similar clause in his specifications.

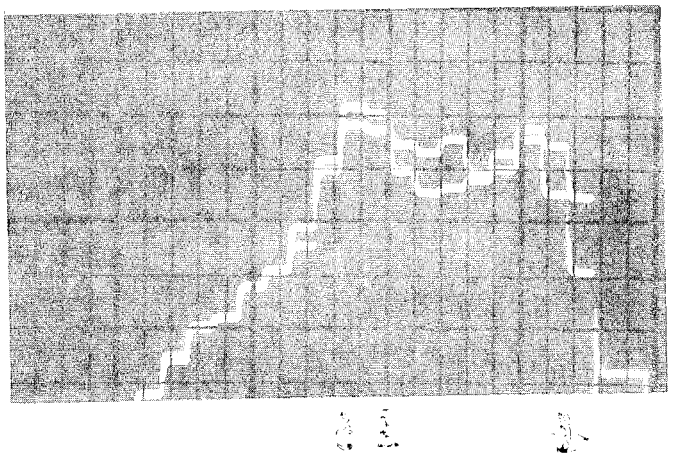
FARRELL BECKER'S ANTIQUE JEWEL

Farrell Becker of the 1975 DC class brought in an antique prize that he bought for $25 at a garage sale: A Magnavox horn with an electro-magnetic driver!





Farrell and the Magnavox horn



The Magnavox horn has a frequency response of about 500 to 2,000 Hz; not a bad match for a couple of obviously defective lavalier mikes we tested in one of our classes this year.

MASH NOTE

From Rick Garner, Moline, Ill. (1975 Boston class)

> One thing you might find interesting is that on my trip home from Boston, I shared a bus seat with Peggy Fletcher, granddaughter of Harvey Fletcher! It was quite a coincidence. I showed her her grandfather's name in my text book and Lab Manual. She was amazed to say the least.

Many people make personal sacrifices to get to a Syn-Aud-Con class, especially young people. Rick traveled all nite from Sioux Falls, S.D. where he provided the sound for a rock concert, to get to the Boston class. When sacrifices are made it particularly pleasures me to receive Rick's letter: "I appreciate being a Syn-Aud-Con graduate. I feel it is probably the most rewarding experience I've had to date."

Three-time graduate Harvey Mills, Pro Audio/Atlanta, is the first to attend the class in a wheel chair. Seems he hurt his leg and had to get around on crutches. Slipped on a wet floor and broke his other leg. Syd Stegall, President of Pro Audio/Atlanta and 3-time graduate and Office Manager, Pat Brandon, were in class to push his chair about -- though Harvey doesn't need a lot of push.

UREI 200 PLOTTING SYSTEM

Juergen Wahl has, along with the unusually creative and productive team at UREI, brought forth an outstanding precision level recorder with self-contained electronics for sine wave response testing. We asked Juergen to write up a short description of the new Frequency Plotting System (below) and he says that more detailed technical specifications are available to anyone upon request. You will be hearing more about this new instrument when UREI can spare one for Syn-Aud-Con class use.

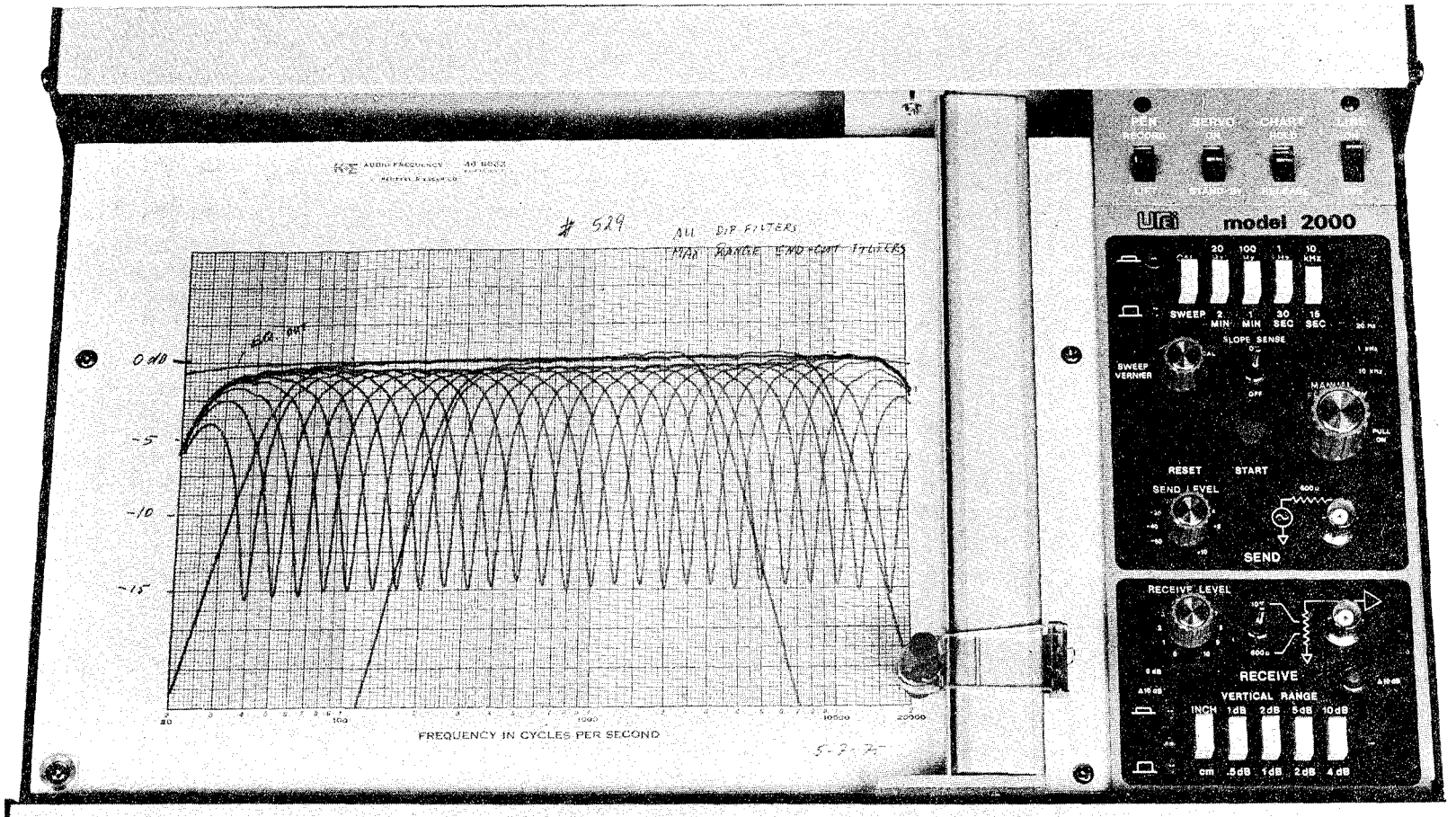
A few years ago UREI introduced the SONIPULSE, a test instrument to be used by sound contractors and other professionals in the field of audio applications.

The success of SONIPULSE and additional demands from those who worked with it in the field have encouraged us to add a new measurement instrument to our product line:

The Model 200, Automatic Response Plotting System

This system is the result of a cooperative effort by UREI and Hewlett-Packard Co. A basic H.P. X-Y plotter is modified by UREI to accept our audio analysis plug-in modules.

The first available module (in what will become a series) is an automatic sweep frequency generator and receiver, Model 2000, using state-of-the-art circuitry to achieve accuracy, resolution and dollar value previously unobtainable.



UREI 200 Plotting System, continued

The 200 system with 2000 plug-in module produces hard copy frequency response plots with 0.05 dB resolution and more than 60 dB dynamic range. Standard 3 cycle semi-log paper, K&E audio paper, and DIN-standard paper are easily accommodated. Vertical scaling can be changed from centimeters to inches by a front panel selector switch.

Light emitting diodes indicate scaling units and system mode. Frequency may be manually adjusted with the plotter engaged to allow quick "dry runs" before committing to paper.

An important feature of the Model 2000 plug-in is automatic Rate Sensing* and control, which insures accurate tracing of steep amplitude excursions commonly encountered when measuring room acoustics with sine waves. This circuitry automatically slows the sweep rate when rapid amplitude changes are encountered, resuming normal sweep rate following such excursions. In this way, unsuspected sharp dips or peaks in response are never missed or minimized. *(Patent Pending).

The possible applications for this system are numerous: Room acoustics analysis, sine wave loudspeaker and microphone response tests, permanent records of EQ settings, equalizer and filter measurements, studio maintenance records, in short, frequency vs. amplitude plotting of any audio device or system. This self contained instrument fulfills our extreme requirements of reliability, dependability, accuracy and versatility. Included are features which check the calibration of sensitivity as well as frequency. The modular design philosophy extends the future use of the Model 200 main frame to measurements of other audio acoustical and electrical parameters.

The suggested retail price of the 200 system including the 2000 module is well within the reach of any manufacturer, contractor, laboratory or studio, at a modest $2250.00.

SPIRAL MEMBRANE LOUDSPEAKER ENCLOSURE

Our Washington, D.C. class had the unusual experience of witnessing a unique new "spiral membrane loudspeaker enclosure" demonstrated and discussed by its inventor, Julius A. Kaiser of Kensington, Md. Mr. Kaiser's paper was published in the August 1975 edition of the JASA. When we read the paper, we wrote Mr. Kaiser asking him if he would demonstrate the speaker enclosure to our DC class.

The spiral membrane loudspeaker enclosure has one startling feature that fulfills a requirement called for in a paper I gave at the 51st AES convention in LA: Higher Q off-axis than is available on-axis. This means that the long needed ideal parameter overhead distribution loudspeaker may now be possible. Such a loudspeaker would allow extremely smooth coverage over a far wider angle than conventional units. By providing higher Q off-axis (where the D_2 distance is greater than the on-axis D_2 distance) it is possible to maintain high intelligibility over wide areas below an overhead mounted loudspeaker.

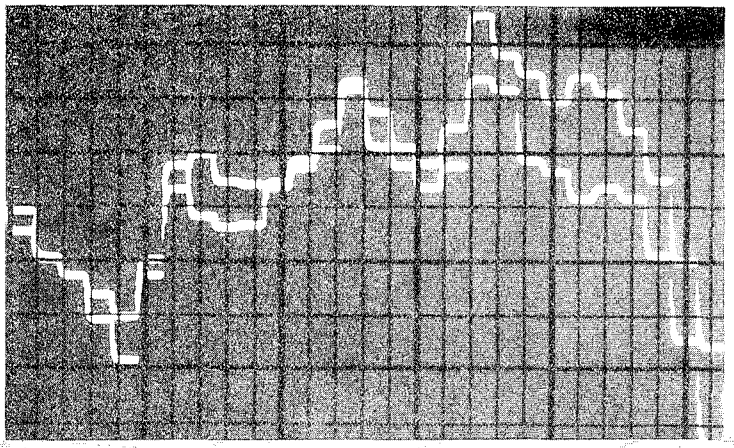
The handmade prototype (made of poster board, a CTS speaker, and a thin plastic membrane) performed according to theory and at low frequencies (the spiral does not operate at high frequencies in a Q controlling sense in this prototype) it demonstrated remarkable off-axis clarity compared to that expected from any conventional loudspeaker.

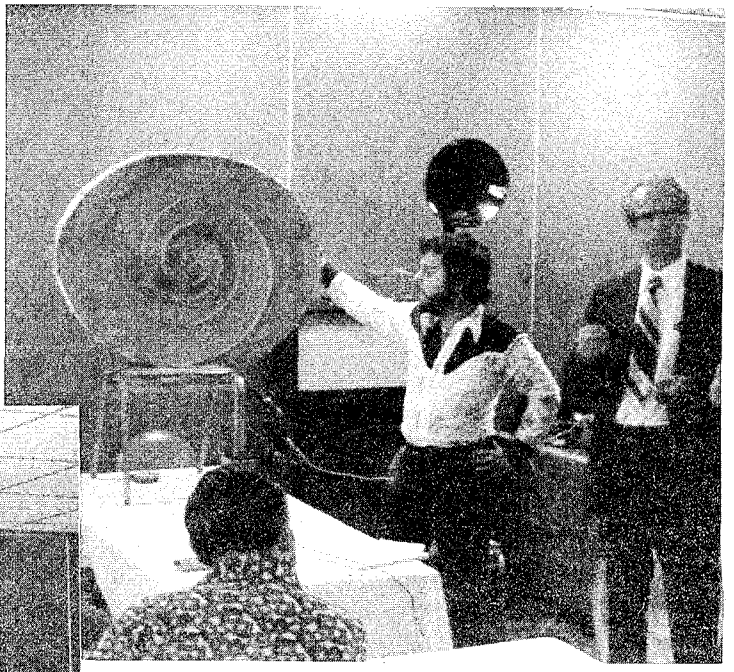
Spiral Membrane....continued

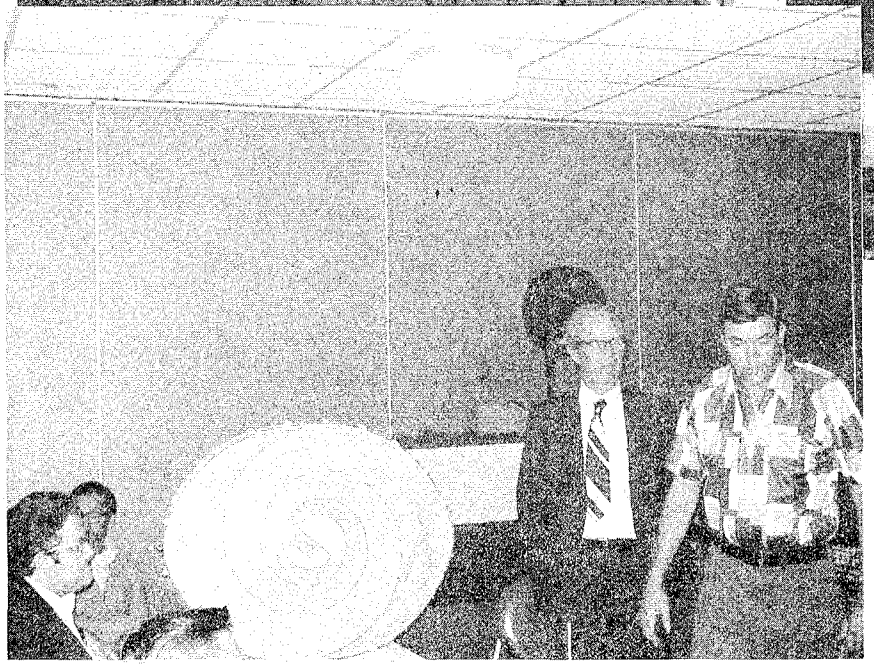
We asked Mr. Kaiser for background information which would give us some feeling about what led to the development of the loudspeaker enclosure. Mr. Kaiser wrote:

> As for my background, I have been working in various Government labs in the Washington, D.C. area for the past 27 years; 10 years at the Naval Research Lab., 4 years at the Harry Diamond Labs (Army) and the most recent 13 years at the Goddard Space Flight Center. My specialty for more than 20 of those years has been in microwave antennas, holding 11 patents relating to the electromagnetic spiral. Also, in May 1960 I published a paper in the IRE PGAP on the electromagnetic spiral. It contains many of the same thoughts, and words, that appeared more recently in JASA.
>
> Having developed the principles of the electromagnetic spiral, it was an easy step to the acoustical spiral. This is not to suggest that my attempts to make an acoustical antenna met with immediate success - my attic has several models that could never have worked. In retrospect, however, the problems with acoustical radiators are in many ways similar to those of electromagnetic radiators, and as things turn out, the acoustical spiral has almost identical properties to those of the electromagnetic spiral, e.g., broad bandwidth, broad and constant beamwidth, constant input impedance, and polarized sound waves. The one important identity that led me to the acoustical spiral, however, is the anti-phase condition existing at the input which needs to be made in-phase before efficient radiation can occur.

Syn-Aud-Con will continue to watch with great interest the continued development of this unique device and its innovative developer.

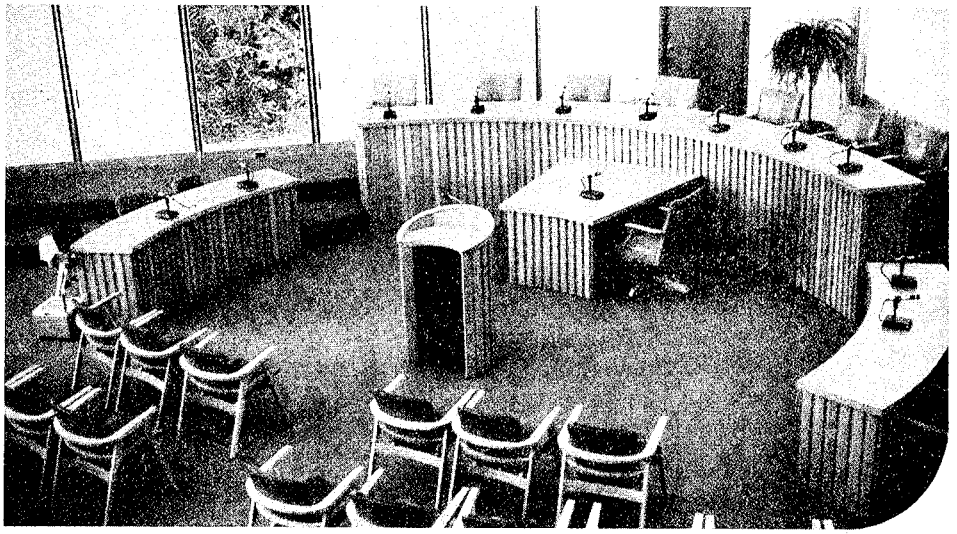


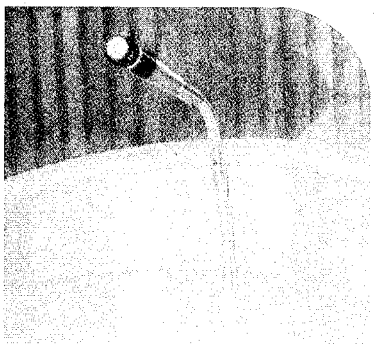


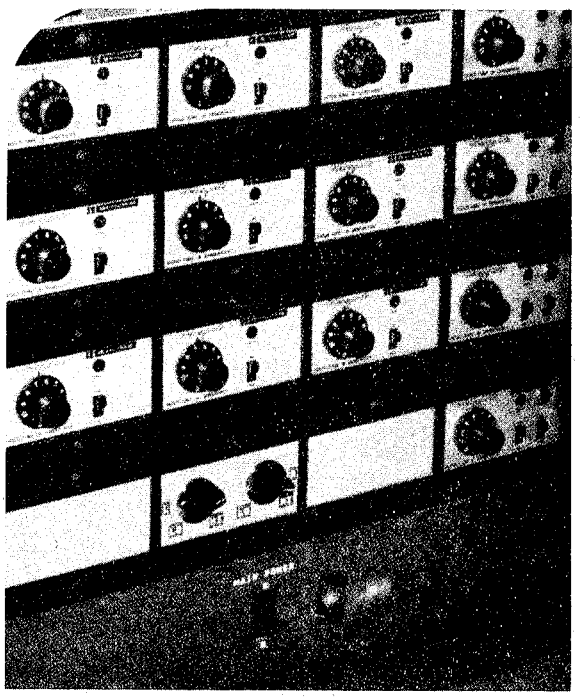


SHURE VOICEGATES ANSWER THE (ROLL) CALL...

Reprinted from SOUND SCOPE, December 1975 with permission from Shure Brothers. Don Gilbeau is a graduate of the San Francisco 1973 class.







IN MARTINEZ, CALIF...

One good thing usually leads to another—as Don Gilbeau of Stockton, California knows.

As the manager of the Audio, Video and Intercommunications Division of Delta Industrial Communications and Engineering, he's found that one recent installation of Shure M625 Voicegates and Shure microphones has helped him make additional sales of similar voice-activated sound systems in his area.

The "showcase" installation is in the Martinez (California) City Hall. As part of a top-to-bottom refurbishing, the building's interior and exterior were given a complete decorative renewal. And, to update the sound system, Delta was given the assignment to add easy-to-operate, professional performing sound equipment to the City Hall's main meeting room. This assignment led to the installation of 13 Shure Model M625 Voicegates, 12 Shure Model 545SD Microphones and one Model 544-G18 Microphone in the room's new sound system.

"This system gives the City Hall's main chambers all the operational features and top-performance needed to conduct their meetings —without requiring a sound system operator," says sound engineer Gilbeau. "Approximately eight to 10 dB 'headroom' has been achieved by keeping the number of open microphones reduced through the use of these 13 Voicegate units and one-third octave equalization. The system operates smoothly and effectively without chopping off the first syllable of a speaker's comments as in other voice-operated systems. The city manager has expressed his satisfaction with the system—and we have used this installation to convince other multiple microphone users to invest in similar systems."

Through the use of Shure Model M625 Voicegates with each of the 13 Shure microphones in the main council chambers of the Martinez City Hall (top left), all microphones in the system can be "on" and ready for voice activation—without ambient noise pickup, without feedback danger, and without a sound engineer to monitor and control microphone gain. The microphones—12 Shure Model 545SD's (one of which is shown far left, center) and one Model 544-G18 (far left, below)—feed the rack-mounted Voicegates (left) located in the back of the council chambers in a tamper-proof, lockable cabinet.

THE GREAT EQUALIZER BY SHURE

Shure Brothers has a new microphone, the PE 5 EQ Equalizer Microphone with four filter switches which provides 6 dB dip at 190, 560, 1650 and 4900 Hz. We received the literature during the last class of the year at DisneyWorld in Orlando. We will have one in our 1976 classes to demonstrate. Its the first equalizer microphone.

SYNERGETIC AUDIO CONCEPTS

RECEPTACLE CIRCUIT TESTER

General Electric has a product that is the "sound man's dream": A Receptacle Circuit Tester, TRC-2.

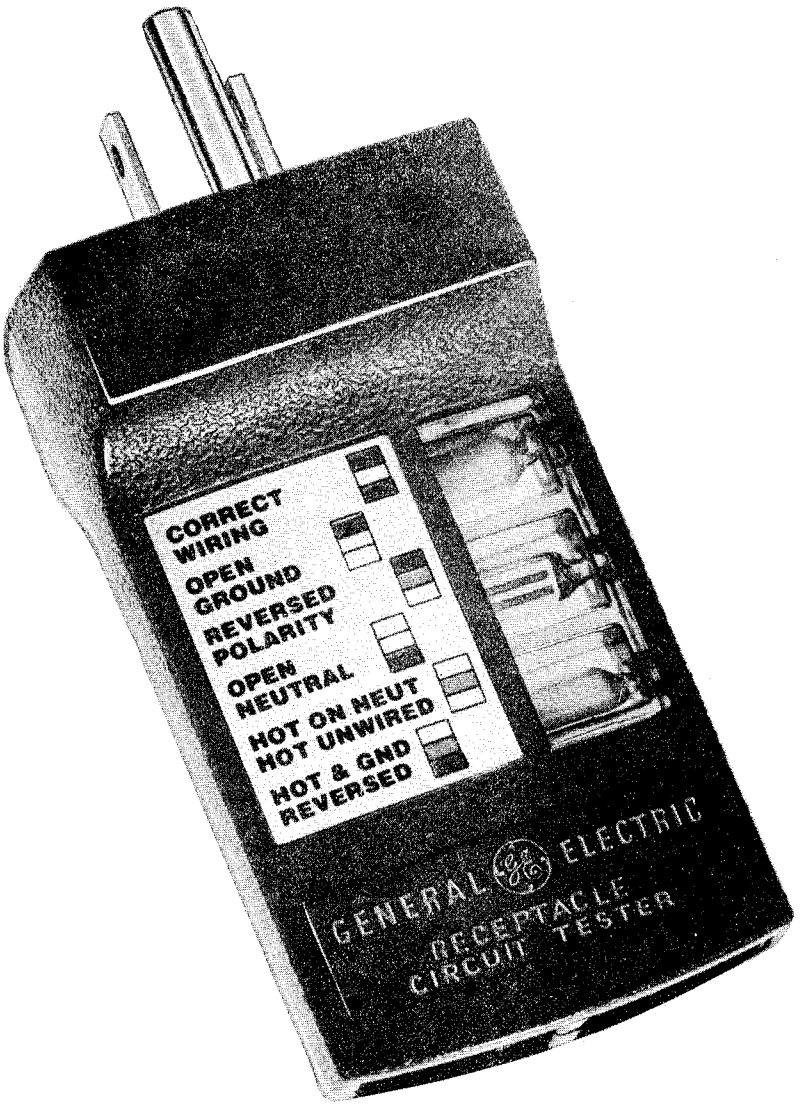
Its completeness points out to many sound men that they have not kept up with what the electrician is up to these days.

We bought, and have found remarkably useful the Model TRC-2 shown in the illustration.

This unit includes the "test buttons" (built in the end opposite the connector) for checking out ground fault circuit interrupter (GFCI) functions.

We paid $26 for the unit. Write General Electric Wiring Device Department, Providence, Rhode Island 02940 for the GE Sales Office near you. There is about one per state, and after locating the office, it takes some persistance to get them to sell you the unit.

The next Newsletter will look into some interesting GFCI devices now becoming available.



NEW SYN-AUD-CON SPONSORS

Syn-Aud-Con is very pleased to have two new sponsors of Syn-Aud-Con classes: West Penn Wire Corp. and David Clark Co., Inc.

This support from industry is unique to Syn-Aud-Con and it is a support that we are deeply grateful for, as it allows us to give our graduates far more than one can normally expect from a 3-day seminar.

WEST PENN WIRE is a manufacturer of audio cable exclusively and offers the Syn-Aud-Con graduate a source of audio cable from a manufacturer genuinely interested in working closely with professional audio engineers. Many of our graduates reporting having switched to West Penn Wire in the last couple of years and one, a leading acoustical consultant in the Midwest, states that he has had completely satisfactory results with West Penn cables in a wide variety of jobs.

DAVID CLARK CO., INC. is perhaps best known for their hearing protectors. (They make the hearing protectors that I have used personally for over five years.) David Clark Co. also is involved in the manufacture of space suit material for the government. Of greatest interest to Syn-Aud-Con graduates is their work in the development of headset intercom systems for professional audio and entertainment systems.

We are looking forward to full involvement with these manufacturers as the year proceeds. Both have indicated an eagerness to work with Syn-Aud-Con and Syn-Aud-Con graduates. We hope you will become better acquainted with the products of these supporters of professional audio education.

WEST PENN WIRE CORP.
P. O. Box 762 Oakland Ave
Washington, Pa. 15301
(412) 222-7060

Your Contact:
Don Hastings
President and Sales Manager

DAVID CLARK CO. INC.
360 Franklin St.
P. O. Box 155
Worcester, Mass. 01613
(617) 756-6216

Your Contact:
Robert J. Murphy
General Sales Manager

CURRENT SYN-AUD-CON SPONSORS

United Recording Electronics Industries
General Radio Company
Shure Brothers, Inc.
Sunn Musical Equipment Company
Sescom, Inc.
Emilar Corporation
West Penn Wire Corp.
David Clark Co. Inc.

Newsletter Volume 3, no. 1, page 5, "Who to Contact at a Syn-Aud-Con Sponsor" lists all our current sponsors except for our new sponsors with their address, phone humber and your contacts.

THE PRINT SAVER

Occasionally we get literature in the mail about a product that looks like it would use-to Syn-Aud-Con graduates but we haven't tried it nor do we know anyone who has. The Print Saver is such a product. Made by Tubes Unlimited, Inc. P O Box 25, Limestone, Tenn. 37681. The Print Saver is made to "carry rolls of plans to the field, on a plane, in your car, anywhere without getting dog eared and dirty." 36" or longer, removable caps at both ends, transparent smoke grey color. Approximately $25.

RELIABILITY OF OUR DEMO EQUIPMENT

I would like to comment on the versatility of some of the modern sound equipment we have been using in the class this year. Last summer in anticipation of working out a demonstration of playback system equalization, we asked John Phelan of Shure Brothers for his recommendation as to turntable, arm and cartridge. A few months later a Panasonics Technics direct drive turntable arrived with the Shure SME tone arm and their latest super track cartridge. I make no claims to being well versed regarding the fantastic variety of such devices available today but I can say that it made what I thought was very professional equipment sound like something out of the acoustic phonograph days by comparison.

The particular combination I am now using is absolutely without audible rumble, wow, or flutter. It will track my most distorted mono records of Maria Callas at high level and has shown itself capable of travelling fully assembled thousands of miles in the back of our truck by simply dropping the whole assembly into a large cardboard box. I have hooked up this new phono front end to my Marantz solid state preamp (selected by Saul Marantz for me just before he sold out his company - I was Saul Marantz's first rep in New England.)

This preamp in turn drives two Shure 105As (the same ones used in class for testing, speech amplification, etc. I have found these remarkably adaptable units perfectly acceptable playback units for home, studio or auditorium.)

These two power amplifiers are attached to the two Emilar loudspeaker systems used in class all year. The Emilar system produces the least listener fatigue of any system I have listened to. (One criticism we have had in class this past year since using the Emilar system is that our equalization demonstrations are not as dramatic as they were before. For this reason, in the last class of the year we hooked up the old speaker system for the equalization demonstration. We found that we had a rougher response to start, we were able to equalize to perfectly flat; however, the quality of sound had a disturbing harshness, perhaps the "horn" sound that many critical musicians speak of. Obviously if one horn has it and another doesn't, it is not an inherent fault of horns but a fault in that particular design.) The result is a temporary home listening system with performance far beyond the typical home playback system and immediately convertible to a multitude of commercial uses. We hope to include during the 1976 classes an evening demonstration of equalizing this playback system for optimum performance using the UREI 529 filter sets.

One final note regarding the 1975 classes. Irv Brown, Syn-Aud-Con's representative for New York City loaned us a Sescom lavalier microphone (under $30) This is an extremely light weight electret type microphone which we have found easy to use; it equalizes well - requires little as it is remarkable smooth and of extended range - and has stood up well to the usual droppings, etc., that go on when I step on the microphone cord inadvertently, etc.

Its a real commentary on the reliability of modern well made professional sound equipment today that Syn-Aud-Con completed their 1975 schedule without a single equipment failure.

ANNUAL AES GET-TOGETHER FOR SYN AUD CON GRADUATES

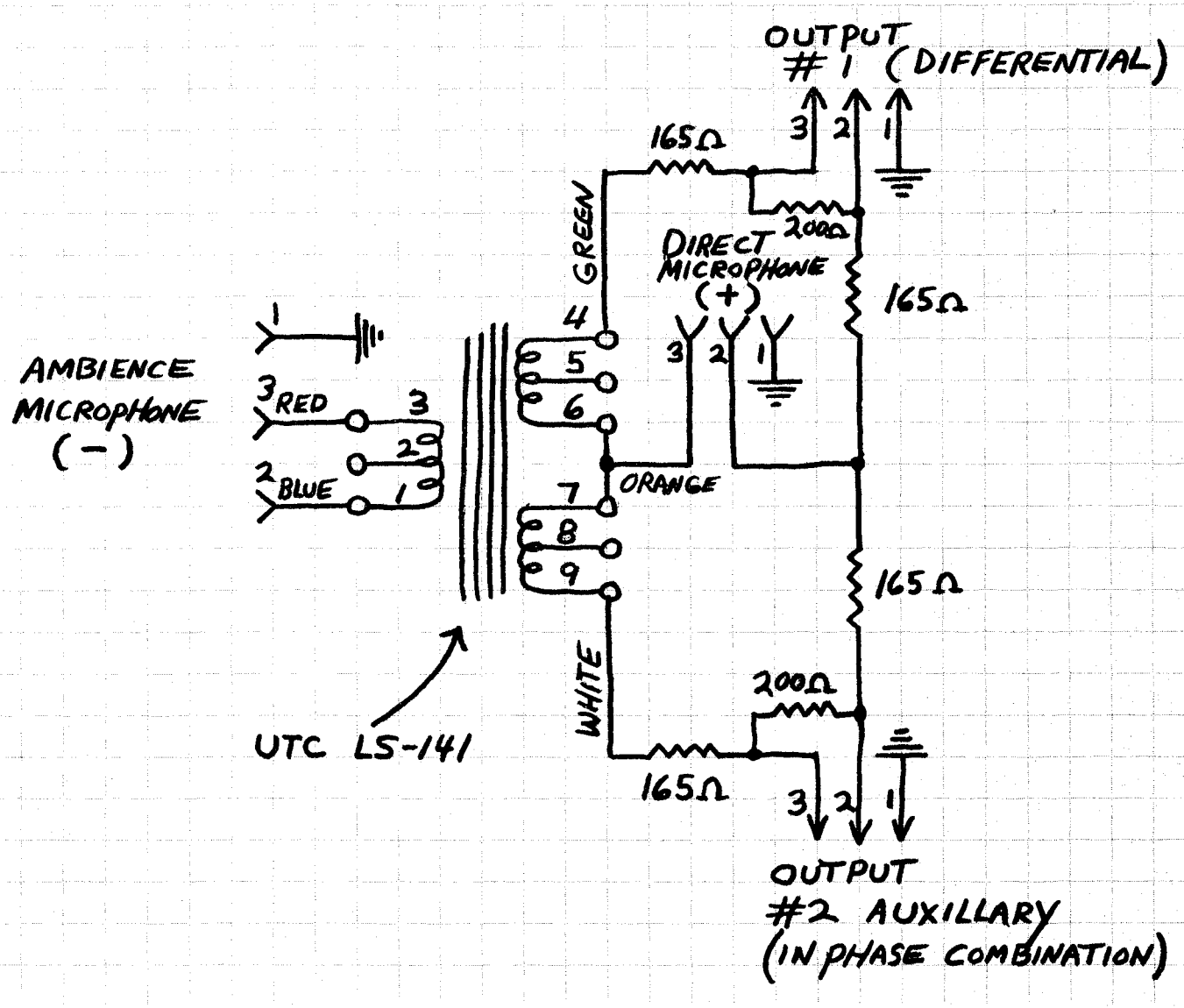
Last year approximately 100 Syn-Aud-Con graduates stopped in at Syn-Aud-Con's hospitality suite for the celebration of our first annual AES get-together at the Los Angeles AES Convention.

Our graduates, various audio industry pioneers, and sponsoring industry personnel had a chance to meet each other, share ideas, and just plain relax and enjoy each other.

As we did last year, we will again invite key audio pioneers to share the Open House with us. We will, however, try to hold the Get-together earlier in the Convention, perhaps Wednesday night (the second night of the Convention). We won't be able to set the night until we see the Convention program. Stop by our Exhibit Booth, # 58, for the time and place.

We look forward to sharing the evening with you and hope that you plan to attend the West Coast AES Convention in May (May 4-7) to be with us on Get-together night.

GRATEFUL DEAD HYBRID BOX (BY ALEMBIC)



EULER'S THEOREM - ADDITIONS AND CORRECTIONS

From Nelson Morgan, Sound Genesis (San Francisco 1975).

Just a short note concerning an article in the Volume 3, No. 1 Newsletter, page 15, about the Naperian constant e. While the mention of Euler's relation was informative, it does not explicity define e. The constant is explicity defined as follows:

$$e = \lim_{h \to \infty} \left(1+\frac{1}{h}\right)^h$$

At the bottom of the same page, you say $e^{i\Pi} = -1 + 1 = 0$, which should read:

$$e^{i\Pi} + 1 = -1 + 1 = 0$$

(Ed's note: I can take credit for most of the mistakes in the Newsletter. This one belongs to the typist.)

SYN-AUD-CON ORDER FORM

We have prepared a new order form for Syn-Aud-Con books and supplies (attached). We have a couple of new items: We are making *SOUND SYSTEM ENGINEERING* available to Syn-Aud-Con graduates by mail. Since September 1975 it has been given to every member attending class. But if you want extra copies or want to buy a copy before attending an Update class, it is available.

In addition to using *Sound System Engineering* as the textbook in class, we provide a Lab Manual - a 2" post binder, with materials and info not in the textbook. Graduates have most of the material in the Lab Manual. We are making the post binder available because graduates have a lot of material that they would like to have in matching Syn-Aud-Con binders.

We have dropped the Equalization paper because it has become too costly to have printed (our cost on printing alone is about $1). Unless we have some determined prodding on the subject, we will not re-stock.

We have a new Sound System Design Worksheet which is given to each member attending class. If you want to order extra copies you may. This Worksheet replaces SAC 102.

The graduate list includes everyone who has given us permission - 1973-1975.

ACOUSTICAL TESTS AND MEASUREMENTS is out of print.

The Sound System Slide Rule was redesigned last year and is slightly different and easier to use. The new rule is sponsored by NEWCOM '75.

SOUND QUOTES

From Concert News: "The Who has also taken special interest in making sure that the audiences can enjoy the full spectrum of the performance. Arrangements have been made with Showco, to custom design the sound and lighting systems for the tour. The total sound system's power will be hung from the ceiling to avoid any viewing obstacles."

From Time Magazine, " 'Walking,' a costly piece of featherbedding pushed through by the union more than 20 years ago, requires the number of musicians to be scaled to a theater's seating capacity. Thus, in a house with more than 1,300 seats, a musical scored for only five musicians must still have a full orchestra of 25 plus a conductor. The extra 20 simply walk away with a check. Local 802 Leader Max Arons explains with Carrollian logic: 'We have to protect the public from being cheated. A couple of instruments can make a lot of noise today, but the public is paying for an orchestra and they should get it."

From Concert News: "There were illusive moments when the music seemed to surface, but the group's (Uriah Heep) talent was consistently drowned out. It seems that when Heep has discovered a new plateau for their music, they should conceive a stage presence to match the quality of their music. Beautiful instrumentals and meaningful lyrics can hardly be enjoyed or even shared when a group is bent on destroying what they have created through over amplification. It seems that they are lost in the same ole fantasy."

"NO COMMENT" QUOTES

From a B.E.S. ad: "Engineers are trying to figure out how 360° horizontal and vertical dispersion can be produced by a non-enclosure, non-baffled speaker."

From Modern Recording, Test Results by "Our measurements of frequency response of this speaker system (and of all speaker systems to be tested in future issues of Modern Recording) are made by applying third-octave bands of 'pink noise' at 24 spot frequencies, and recording the output of a precision-calibrated AKG condenser microphone positioned *at a distance 1 meter from the system.*" *(Italics mine)*

"No Comment" Quotes, continued

From Westlake Audio Guarantee: "Power: 116 dB SPL minimum, linear scale, with broadband point noise source from one monitor measured at the mixer's ear. The control room potential with four monitors is a minimum of *128 dB SPL (italics mine)*

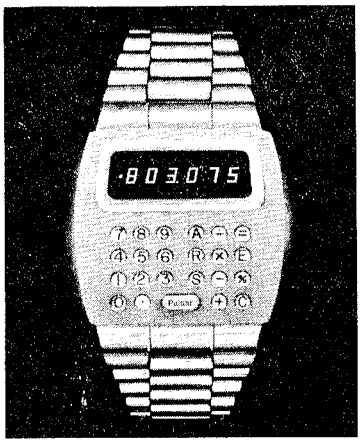
CALCULATORS

We have 25 of the HP 21s for class use now. Lowest price quoted to us to date: $88 by a local LA calculator store.

Calculators help. Herbert Murray, Manager of Sam Ash at 48th St. (1974 and '75 New York class) said that the 1st day of class in 1974 was chaotic and confusing. After class he bought a calculator and worked with it all year. In 1975, the first day was "a breeze" and really ready for the "meat" on the 2nd day of class.

WATCH/CALCULATORS

Watch/calculator



Time Computer Inc. has introduced a solid gold Pulsar watch-calculator combination with six-digit LED display. The calculator has five functions, plus memory, floating decimal, and display overflow. Priced at $3,950, it's designed around two C-MOS chips, one each for time and calculation. The watch uses four battery cells that should last for a year for 25 calculations and 25 time readouts a day.

$3,950 is all it takes.

WIRELESS MICROPHONES

"What the world needs is a good wireless microphone." If you use wireless microphones in your work or installations, would you send us your experiences -- espcially good experiences.

SCOPE CAMERAS

Real Time Analyzers' time has come. They have been on the market 9 years this Spring, and the industry is beginning to appreciate their value. One can learn more in a few days using a real time analyzer during the installation and equalization of a sound system than he can in months without one. If you want to keep records, Polaroid makes the Polaroid C-9 Camera with accessory hoods of various sizes. Cost is around $170 with hood. You can call Polaroid collect (617) 547-5176. Ask for J. E. Chapman, Industrial Marketing Manager. He will give you the name of a local industrial supplier.

SYN-AUD-CON 1976 SCHEDULE AND TUITON

In the late Spring, 1976, cost of Syn-Aud-Con tuition will be $350 for one participant from an organization; $325 for 2; and $300 for 3 or more. Syn-Aud-Con graduates will remain $175 for Update class.

Our tentative schedule: Seattle, February 17-19; San Francisco, February 25-27; Los Angeles, March 23-25; Dallas, April 6-8; Chicago, May 25-27; Columbus, June 8-10; St. Louis, September 14-16; New York, September 28-30; Boston, October 6-8; D.C., October 19-21; Nashville, November 9-11; Orlando, November 17-19.

BOOKS OF INTEREST

The arrival of the latest edition, the 6th, of *REFERENCE DATA FOR RADIO ENGINEERS*, The ITT engineering manual published by Howard W. Sams & Co., Inc. caused more than normal interest at Syn-Aud-Con. My first copy of this universal reference was a post World War II edition that I had latched onto as I began my audio career. Therefore, it is with a good deal of pleasure that I see my own work included in this latest 6th edition (See Electro Acoustics 37-12 through 37-22.) This massive reference work is more useful than ever with 48 packed chapters of accurate basic reference material. ($30)

THE HANDBOOK OF MULTICHANNEL RECORDING by F. Alton Everest recently published by Tab Books of Blue Ridge Summit, Pa. 17214 is an ideal basic textbook to make assignments out of to young technicians needing to study the funadmentals of large multitrack recording type consoles, as well as the typical peripheral equipment used with such units. Its an overview type book; not detailed and not technical and not really a "how to" but a good book and highly useful.

Mr. Everest has carefully identified his sources of material (his carefully documented references is worth the price of the book) and I was impressed that even where he had referenced a poor source he had astutely excerpted the one or two accurate statements from it.

The book left me with the feeling that while Mr. Everest may or may not know it all, what he chooses to write about is accurate, usable and easy to read. He leaves you with the feeling that he genuinely loves his subject and wants to share what he knows in a straightforward way. A very reasonable price of $10.95 in the hardback edition - its a worthwhile addition to any engineer who needs to keep up with today's recording techniques.

ADVANCED APPLICATIONS FOR POCKET CALCULATORS by Jack Gilbert published by Tab Books was of interest to me but not in the author's or publishers intent for the book. Mr. Gilbert proves effectively in this book that a well thought out, carefully planned, concisely written book on pocket calculators is obsolete as it leaves the author's pen. Carefully described techniques"for getting a silk purse out of a sow's ear" (doing logarithms on a standard calculator) turns the reader off as he realizes the standard unit shown costs more than a full scientific unit in today's newspaper ad. Mr. Gilbert's book is one of the better tries but you'll learn a lot more buying one of the HP's tutorial manuals for the 21, 35, 45, etc. By reading about the other contenders in the field you do come to the solid conviction that HP and TI have it "sewed up" if you intend to buy a scientific machine.

Mr. Gilbert did a good job but if you already own and use a scientific calculator, he tells you nothing your instruction manual hasn't already made clear. If you don't own a calculator, his attempts at avoiding prejudice might mislead you into buying something other than the ones manufacturered by two companies.

PLANNING AND EQUIPPING FACILITIES. We heard from John Odum, Jr., Bowling Green, Ky. (San Francisco 1975 class) asking for material on band and music rooms. We were able to supply some, but not all we wanted. In Atlanta 1975 class, Randy Bray, Ambassador Sound of Norfolk gave us *Music Buildings, Rooms and Equipment* which has been revised and is now called *PLANNING AND EQUIPPING FACILITIES*. It is an outstanding publication. $12. Send your money if you want to obtain a copy to: Music Educators National Conference, 1902 Association Drive, Reston, VA 22091. Request #32109948

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Ken Lind, Northeastern Communications Corp. (New Haven 1973 and Boston 1975) sent us information on a publication called *BYTE*. "*BYTE* has articles to get you in on the ground floor technically, covering hardware, soft ware, and applications. *BYTE* will be covering various user groups such as game players, computer music, computer art, small business uses etc." Sub. $12/year. *BYTE* Magazine, Peterborough, N.H. 03458 (the people who publish '*73*)

ARTICLES OF INTEREST

Since the last Newsletter there have been a number of technical articles of more than passing interest to Syn-Aud-Con graduates that have appeared in the various technical Journals.

1. *Sabine's Reverberation Time and Ergodic Auditoriums*, JASA Vol 58, No 3, September 1975, pages 643-655. William B. Joyce, Bell Labs.
   Joyce's article is a complex mathematical treatment of the fundamental physical laws underlying the dissipation of energy in any form. Hence, a caution that the general Syn-Aud-Con reader may find it difficult. The importance of the article is the proof that no existing reverberation formula is statistically reliable in spaces deader than 1.5 to 1.0 seconds and that in spaces more live than that the Sabine equation is the best choice. We are fortunate that as the room becomes acoustically difficult for the sound designer, the equations we rely upon to diagnose the room become quite accurate.
2. *Spectrum Analysis of the Recording Studio*, from Recording Engineer/Producer magazine, October, 1975 issue, pages 47-54. In my opinion, the best article written on real time analyzers to date. Written by Wayne Jones
3. *The Electrical Part of the Recording Studio - Understanding the Neutral* by Jerry Simon, October 1975 issue, pages 15-23, Recording Engineer/Producer magazine. A splendid article. Be sure to read. (Recording Engineer/Producer is one of the magazines listed in Newsletter Volume 2, Number 3, page 21 as being "mailed free to qualified recipients in the U.S." Sometimes you have to follow up a couple of times on such a request.) In any case, don't miss this article by Simon.
4. *Spiral Membrane Speaker Enclosure* by Juluis A. Kaiser, Jr., JASA Vol. 58, no. 2, August 1975, pages 446-450. See write up in this Newsletter, pages 18-19 of a demonstration of the spiral membrane speaker enclosure in our DC 1975 class.

CLASSIFIED

Occasionally we are asked to place an "ad" in the Newsletter by someone in the industry that needs to add an engineer to his staff. We do not do this; however, if someone has paid his own tuition into the class and he wishes for some reason to change his employment, we will place a Newsletter notice if someone asks us to; hence, the following "ads":

"I am eager and able to work in any of these areas: 1) design engineering or sales for manufacturer, 2) acoustical consultants, 3) sound system engineering: design, installation, operation, and 4) recording studio engineer/mixer."

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A good design engineer from the musical equipment industry is looking for an interesting assignment.

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If interested, drop us a note and we will put you in touch.