newsletter

SYNERGETIC AUDIO CONCEPTS

P.O. BOX 1134, TUSTIN, CALIFORNIA 92680

VOLUME 3, NUMBER 4
July, 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 both had two ideas

TABLE OF CONTENTS

VOLUME 3, NO. 4

From Don Davis: This Newsletter completes three full years of publication. Synergetic Audio Concepts came into being January 1, 1973. The first Syn-Aud-Con class was held May 10-13, 1973 at the Ambassador Hotel in Los Angeles. Our first Newsletter was published in September 1973 and consisted of 4 pages.

Now, well into our fourth year and approaching our 2,000th graduate (this doesn't count Updates), we can't help being awe-struck at the quantity and quality of Syn-Aud-Con graduates and impressed at the influence they are exerting in today's professional audio industry.

Our new Graduate Directory (due in July) reads like the Who's Who of professional audio.

Most exciting of all to Carolyn and me is the realization that our learning curve has climbed considerably as you shared your unique individual skills and insights with us in the classes and in our Newsletters and Tech Topics.

We are the busiest we have ever been in the exploration of new equalization techniques, measuring methods, and equipment tests while at the farm in S. Indiana. We hope to be able to announce by the first of the year our plans for the first graduate professional project in 1977. We wanted to hold the first workshop this year but we were not able to put everything together in time.

Syn-Aud-Con's future is exciting because of your participation in its past and your belief in its future.

SYN-AUD-CON GRADUATE DIRECTORY

The new graduate directory is available now and includes all Syn-Aud-Con classes through June, 1976. Graduates, including Update attendees, are listed alphabetically by state and country. Cost of the new directory is $3.00 and it may be ordered from the Tustin office.

SYN-AUD-CON SCHEDULE

SCHEDULE FOR THE BALANCE OF 1976:

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

Syn-Aud-Con seminar costs are now:

1 participant	$350.00
2 participants	325.00 each
3 or more	300.00 each

Graduate Update is still $175.00

SUMMER ADDRESS AND PHONE NUMBER

Our summer address and phone number (until mid-September) is Box 6, Norman, Indiana 47264. Phone 812/995-2582.

WHO ASKED FOR PNC CURVES AT AES?

Someone, during the AES Convention in Los Angeles in May, asked me for the following information. Somehow the "clear" button to my memory got pushed before I wrote your name down. In any case, here is the answer to your question: "Preferred Noise Criterion (PNC) Curves and Their Application to Rooms" by Leo L. Beranek, Warren E. Blazier, and J. Jacek Figwer, JASA Vol. 50, No. 5, 1971, pp 1223-1228 (Fig. 4 shows BBN curve).

HANDHELD REAL TIME ANALYZER

Yes! At the recent Spring AES Convention an octave-band (calculator size) real time analyzer was shown by Ivie Electronics of Orem, Utah. While this unit, so far as we could tell from a hasty inspection at their booth, does not have desirable integration times and seemed to lack precise calibration, we were delighted to realize that the concept had been presented to the marketplace.

It does serve as proof that a 1/3-octave handheld unit is conceivable and for the added benefits of greater resolution plus more accuracy and proper integration times, a very large market is ready to pay up to $1000 for the convenience such a unit could offer.

RICHARD C. HEYSER'S AES PAPERS

Richard C. Heyser discussed many of his, to say the least, advanced concepts to an enraptured audience at a Hollywood AES section meeting about a week before the West Coast AES Convention. He also gave a paper entitled "Holomorph Recording" at the Convention.

Holomorph recording, if you aren't familiar with the term, is one that has the general property that all of the programs are found at every part of it. Not only is the Holomorph immune to severe mutilation but *any piece* of a Holomorph may be used to reproduce all of the original programs impressed on it.

The more interesting of the two presentations was the section meeting because Dick was relaxed, uninhibited, and responding to what can be honestly described as a worshipful audience. Some of the better Heyserisms that resulted were:

"It pains me to put ten years of work into a single sentence."

Or, in predicting the future of the recording industry he decided that:

"We will ultimately settle on six channels...I can see the advertising now: SEXAPHONIC. Why have foreplay when you can have it all!"

The response of the Hollywood recording people indicated that quad is not only dead.... it stinketh.

And finally, Dick defined 10^{-12} Boo as one "Peek a Boo" (Pico-Boo)

As may be surmised from the above, Dick Heyser can be as entertaining as he can be profound.

LOW COST REAL TIME ANALYZER?

Many have written asking for details on the paper given by Lyman G. Miller, Jr. of Hewlett Packard Laboratories at the May AES Convention, entitled: "A Low Cost Real Time Audio Spectrum Analyzer." As it turned out, Mr. Miller gave the paper "on his own" and did not represent Hewlett Packard. The paper was aimed at the kit builder and was "low cost" if one were willing to invest "low cost" hours in the project for a very unsophisticated version of a real time analyzer. The paper was not preprinted.

At this time Communications Company's ARA 412 is still the lowest cost 1/3-octave real time analyzer on the market, selling for under $1500.

WHAT DO ALTEC AND IVIEWOOD HAVE IN COMMON?

Both Altec and Iviewood believe, if their current literature is to be taken seriously, that you can add output voltages as if they were coherent in a music system. Additionally, Altec confuses instantaneous peak power with what they call RMS power (we assume they mean average power) assuring us in a recent specification sheet that instantaneous peak power is RMS power. Perhaps they both need to read Syn-Aud-Con Tech Topic Volume 3, Number 4, "Watt's Watt in Biamplification" by Ed Lethert.

INSTITUTE FOR RESEARCH AND COORDINATION INTO ACOUSTICS AND MUSIC

We have often discussed in our Syn-Aud-Con seminars the role of the computer-synthesizer programmed in such a way that the artist "conducts" the piece rather than plays it. This concept put forward by Max V. Mathews, F. R. Moore and J. C. Risset in an important article in SCIENCE Magazine in January 1974 made clear to most of us that not only would the input methods grow more complex but that the acoustic output interface would of necessity provide greater versatility. Systems such as that used by the Grateful Dead called attention to some of the possibilities.

IRCAM, The Institute for Research and Coordination into Acoustics and Music will be headed by composer Pierre Boulez, former Music Director of the New York Philharmonic Orchestra.

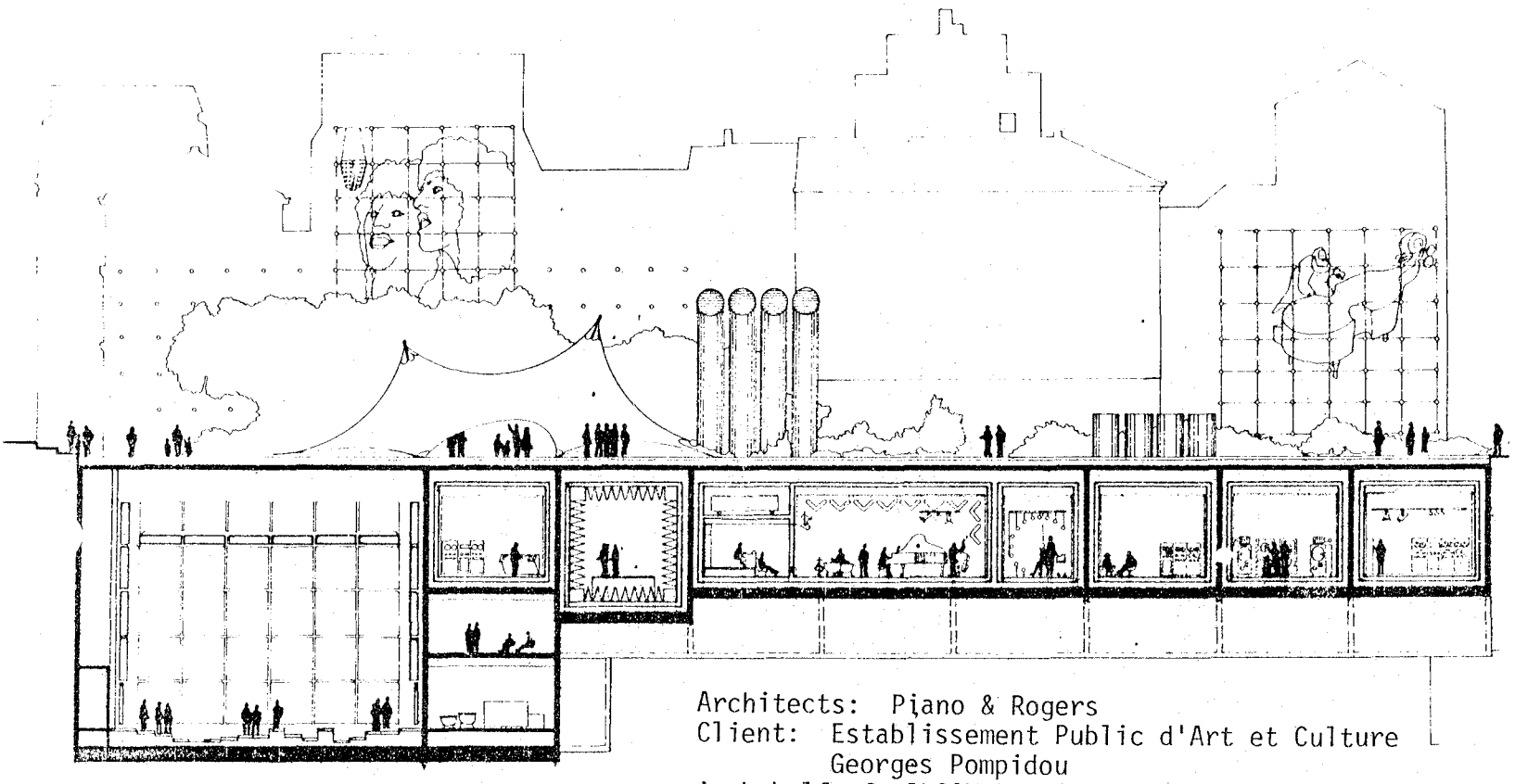
The facility, part of the Centre d'Arts in Paris is sponsored by the French government and designed by Piano and Rogers, architects, and winners of the Plateau Beauborug competition. Included in the staff is Max Mathews of Bell Telephone Laboratories to guide the acoustical research.

The acoustical consultant actually involved with the construction of the center is V.M.A. Peutz of Holland. In an article by the architects in a magazine called RIBAJ, February 1976, the following excepts are quoted as being, we believe, of interest to Syn-Aud-Con graduates:

> "Scientists who work in studios with musicians usually lack musical culture..which would enable them to focus their attentions into precise musical vision...Similarly, few musicians want, or are even able, to acquire a certain minimum technical knowledge. They consider the technicians as servants to supply their meal not only cooked but digested! But if the musician interested himself more seriously in scientific research, he could incorporate in the actual process of his composition the knowledge he had acquired...This interface between musicians and scientists is a vital element in the future role of the IRCAM.
>
> In IRCAM I suppose there are four departments, each one led by a personality. There is the computer department, under Jean Claude Risset, which is essentially oriented towards synthesized and analyzed processes in sound. There is the electro-acoustic department, under composer Luciano Berio which is oriented towards natural and acoustically modified sound and electronically modified sound; there is the instrument and voice department which is self-explanatory, but is also very much concerned with the development of new instruments and new techniques of playing. Vinco Globokar, the head of the department, is extremely strong as an extraordinary technician in unusual ways of playing - his friend Honneger plays one continuous note for 20 minutes. And there is the diagonal department, diagonal meaning spanning the whole range of general acoustics, a diagonal line through the whole system, if you like, which covers all the areas that the other departments, whose specializations are quite precise, don't pick up. That department also includes what we know in the building as the 'espace de projection', the public projection space, which is the public interface within IRCAM, which is probably in fact certainly, a unique room, which is no room like it in the world at the moment. It's a room with practically total acoustic and volumetric variability, that is to say, the ceiling can vary in height from roughly 3 metres to 13 metres, that means the volume of the room can change as a factor of 4:1, and also the acoustic qualities of the room--the reverberation time and the reflection and absorption characteristics and diffusion characteristics - can also vary from, for example, a reverberation time of about .8 of a second up to 4 or 5 seconds.
>
> This means that you have two enormously powerful research tools within which to

IRCAM, cont.

investigate the acoustic environment and which can be used in public situations, which is rare, in other words in studios and in scientific institutions of like character one can always go to extremes, but it is very, very rare that the public can be brought into a situation which is extreme in the field, if you like. In that sense, the 'space de projection' is an extremely exciting room, it's certainly a very expensive room compared to the traditionally finished studio but it also has immense performance advantages over practically any other room that we know at the moment.



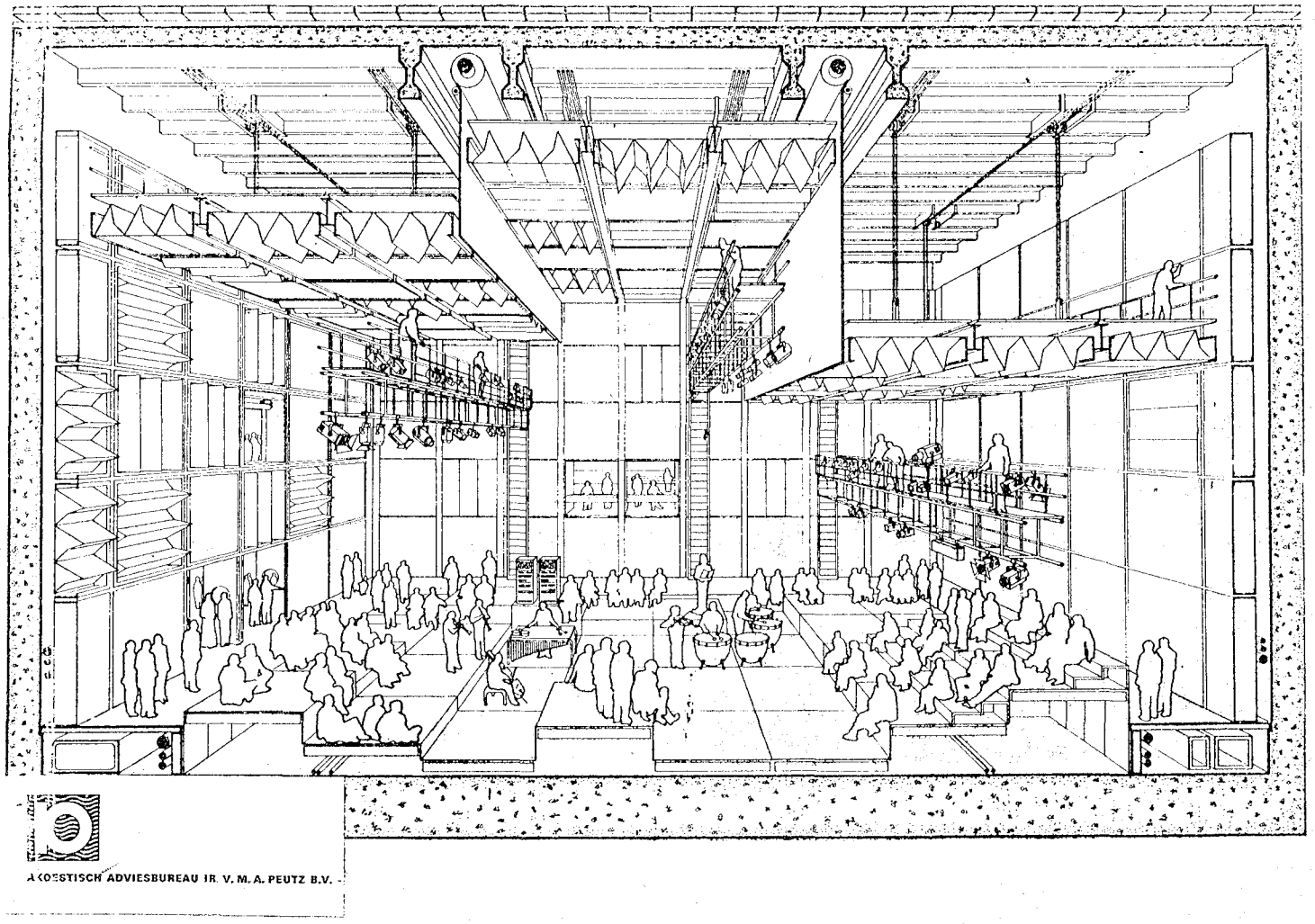
Architects: Piano & Rogers
Client: Establissement Public d'Art et Culture Georges Pompidou
in behalf of: IRCAM Institut de recherche et coordination Acoustique Musique

Directeru: Pierre Boulez

It's a great thing that he (President Bordaz) has the ability to believe in the quality of the consultants - his architects. That brings us around to another point which is that in our own team, in the architects' team, and the engineers' team, we also have remarkable people; we have an acoustician, and a scenographic consultant who are extraordinary in their own fields, they have high standing and international reputation independent of the work they are doing now. On the IRCAM team, the're all international from everywhere, they're really not only a French group, they're absolutely worldwide, really quite extraordinary. The acoustician, Victor Peutz, is Dutch.... Victor Peutz is an incredibly precise man, I believe he was a nuclear physicist before he became an acoustician. He opted out of nuclear physics for moral reasons, amazingly humble, an absolutely incredible man, phenomenally powerful intellectually and backed by an office which is very diverse, 20 or 30 people, each

IRCAM, cont.

with his own speciality. He admits to not knowing everything and that's his great strength, he says: 'I will ask my expert', although he is in fact a man of immense expertise. Victor Peutz, Manfred Schroeder and Max Mathews who is the scientific director of Bell Laboratories in New Jersey, have really been very concise and supported us in our acoustics work."



After reading these quotations and examining the illustrations, and realizing the scope and importance of this project, one can't help but ask oneself why this is happening in Europe rather than the U.S. The Grateful Dead experiment was financed by the group out of their own revenues. How can a trickle of our tax dollars used to feed the governmental and academic behemoths be diverted to nurture an American research project that can go on in its own uniquely American uncoordinated way until brought together occasionally to provide waymarks along the path? Obviously we need intellectual leadership capable of living with not only the artists and engineers but with the politicans and professors, able to coordinate and conciliate each diverse faction until paths of mutual communication have a chance to develop.

AMPEX ATR-100 IS A MINIMUM PHASE TAPE RECORDER

For the past two years, Syn-Aud-Con classes have heard us point out that the most glaring deficiencies in the studio monitoring chain have been non-minimum phase loudspeakers and *tape recorders*. The Ampex ATR-100 series has phase correction networks in the record circuit and are now minimum phase sources. Specifications on this new series were the talk of the May AES show. All we need now is for someone to either identify which monitor loudspeakers are essentially minimum phase response over the the greater part of their range or else develop a phase equalizer that allows us to compensate for those loudspeakers that exhibit large areas of non-minimum phase response.

ENHANCEMENT: AN ARTISTIC TOOL. TECH TOPICS VOL. 3, # 12

Comments on Reprint of *db* article on Rock Systems: It is a fundamental Syn-Aud-Con tenet that an audio professional needs to know the basics of our business and respect those pioneers who worked them out for us. It has been our experience that "accidental" discoveries are made by those equipped to recognize the difference between what theory has taught us to expect and what practice has actually delivered.

Innovation by its very nature violates the orthodox. Innovation most often is either a correction of, or an extension of, existing theory. While respecting (yes, even revering) what has been done as important, in a few cases, however, blocked mental bowels can't pass innovation and, upon trying, regurgitate orthodoxy. The more original and exciting the innovation, the more likely the symptoms among those having this affliction.

When this article was submitted to a technical society journal, the reviewer suffered immediate stoppage of such severity that we wondered if the ideas in the article were more innovative than even we had believed.

The concepts described were well-based, expensive experiments in the enhancement of *produced* sound under "live" musicians' control. As such, the experiment asks more questions than it answers. It is our belief that a correctly posed, provocative question far exceeds the value of orthodoxy's most thoroughly documented embalmed fact.

Thus, we hope that each of you will approach this Tech Topic with an open, searching mind that recognizes that twenty years from now the Ron Wickershams of this world will be as avidly quoted and referenced as the Olsons and Beraneks are today. The value of this article lies in the ideas it causes to form in your thought, not in the specific techniques that were necessary to the experiment. The article will be remembered for what it bred, not for what you read!

EMILAR

When we first tested the EMILAR drivers a little over a year ago and made an unequivocal endorsement of them, we little realized what a reception they would receive from the professional audio field.

EMILAR, just one short year later, is pretty universally recognized as the best available balance between extended response, low distortion, high power handling capability, and extreme ruggedness. We were delighted to hear from so many graduates at AES how pleased they were with the results of using EMILAR during the past year and the tremendous potential of the present year.

Research on new products is proceeding at a rapid pace at the EMILAR plant, as well as increased efforts to raise their production capacity to insure predictable deliveries to their professional users.

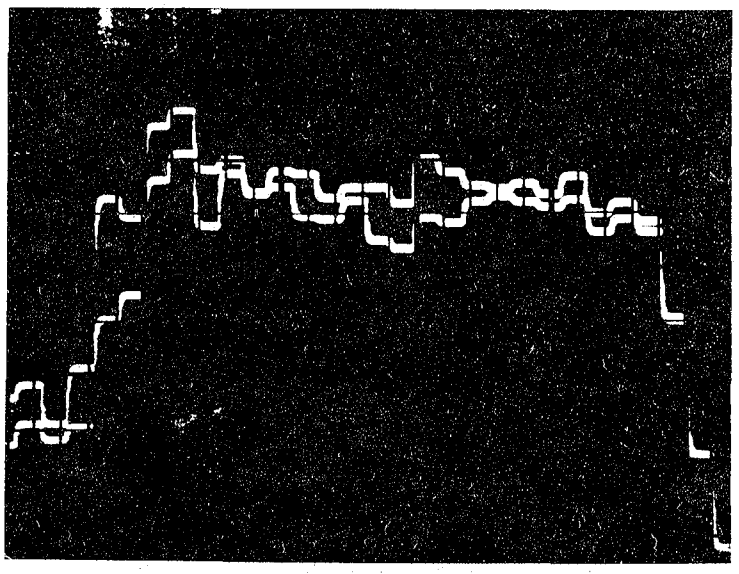
For those graduates who have just joined the Syn-Aud-Con "family", EMILAR is a product you need to experience to appreciate.

"GUARANTEED ACOUSTICAL DESIGN"

We wanted to document a straightforward, everyday occurrence because of the persistence of advertisements and beliefs to the contrary of what we put forth in Syn-Aud-Con classes.

One guarantee offered in the recording industry states that applying two broadband Pink Noise signals of equal power to two of their monitors yields an increase of +6dB acoustically and that the same signals to four of their monitor loudspeakers yields +12 dB. Now that the company has moved "east" they "guarantee" a 14 dB increase.

We connected our GR 1382 noise generator simultaneously to the input of two power amplifiers (Shure SR 105s). We adjusted the first monitor to read 90 dB-SPL on the GR 1923 precision sound level meter. We then photographed the "raw" response of the GR 1021 real time analyzer.



The lower trace is the acoustic response of one monitor speaker measured at the typical studio mixer's distance.

The upper trace is with both monitors on at the same time at unequal level (each read 90 dB-SPL at the SLM by itself.) The sound level meter went up 3 dB. Note that at one frequency band, 1250 Hz, an increase of +5 occurred, while at other individual frequency bands there was no increase. The broadband increase as read by the sound level meter set for "flat" response was exactly +3 dB.

Fig. 1

We then eliminated the room acoustics entirely by adjusting two electrical signals of Pink Noise from a single generator and recorded how they sum at the output terminals of the mixer.

Figure 2 shows the result. The output VI meter on the console (Shure 101) also went up 6 dB. This is the expected result. Because both electrical signals are from the same generator they are coherent, just as the acoustic result was the expected result because the two signals were not coherent because of room reflections.

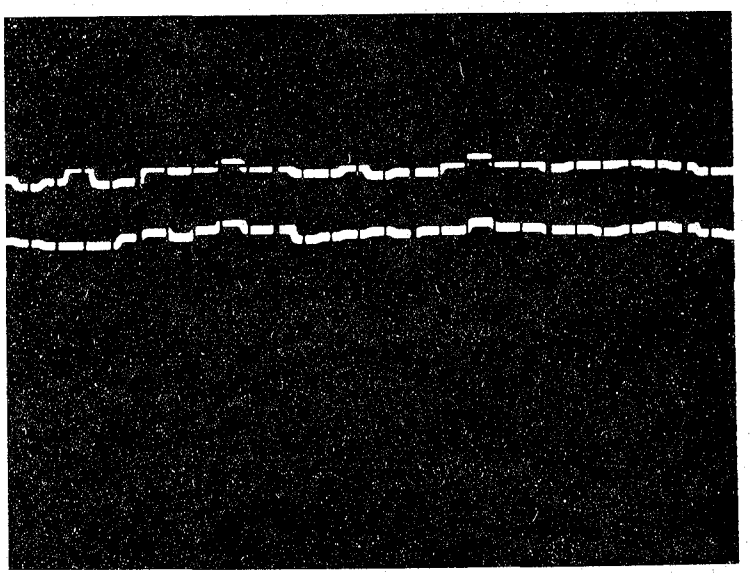


Fig. 2

Conclusions

Outdoors or in an anechoic chamber it is theoretically possible to find an exact spot between two loudspeakers where coherent addition of random noise signals (must be from a single

"Guaranteed Acoustical Design," cont.

generator) could be obtained acoustically. In an acoustic environment that has boundary surfaces with typical reflections, it is most unlikely that such addition will be observed.

If the guarantee in question is valid (that is, the studios are that dead) then it is our opinion that they are far too dead, as they are approaching an anechoic chamber's environment. This would mean that the mixer would hear a different addition of coherent sound than would the home listener when listening to the same piece of music.

This, then, opens up a fascinating area of research. We know that studios and control rooms can be made too "live." They also can be made to "dead." We believe that "too dead" can be defined as that point at which the sum of coherent signals exceeds acoustically +3 or 4 dB, as the room would obviously fail to provide sufficient mixing of the sound.

If anyone would like to undertake the project of experimenting to determine how "dead" a room would have to be to allow coherent addition of loudspeakers, we would be very interested, as would Syn-Aud-Con graduates.

SPECIAL CLASS FOR HOLLYWOOD SOUND SYSTEMS

On the weekend of April 24-25, 1976 a special Syn-Aud-Con seminar was sponsored by Hollywood Sound Systems (HSS) for most of their staff and many of their valued clients. Engineers from the three major network studios: NBC, CBS, and ABC; Andy Block from Wally Heider Recording; technical personnel from theme parks - Magic Mountain and Busch Gardens - attended the class. It was an intensive two day class weighted towards the specific problems broadcast and recording engineers experience.

The HSS class was our first such class for a sound contractor and a particularly interesting one because each member of the class was working out answers to real questions and problems. (David Faragher of HSS assembled a most useful impedance test box which allowed us to show the magnitude of the impedance on the screen of the real time analyzer. We use the box in all of our classes now.)

HSS have been highly successful in providing the reinforcement sound at the Academy Awards presentations and have just finished a successful reinforcement of sound in Boston Symphony Hall for the broadcasts of the famous "pops" concerts. Many at HSS have come from the entertainment field, giving them a special empathy with the artist. Companies such as HSS offer employees a remarkable variety of opportunities meeting the diversity of problems to be solved in the entertainment industry. Our special seminar was but one of the building blocks used by HSS to insure that their personnel have the best equipment both physically and mentally to apply to their specific jobs.

For all the people who ask us about women in our classes, Hollywood Sound Systems' owner, Della Barreras, brought with her the office manager, Debra King, and secretary, Cari Casteel. Mrs. Barreras said that the girls wanted to come so that they could understand the specifications they type and would be conversant with today's new techniques. And Susan Reisig, Technical Supervisor of Busch Gardens, was there. They didn't come to observe. They were heavily involved in the evening work sessions with their HP-21s and all the formulas.

It's not difficult to find someone at HHS who knows what he or she is talking about.

THE ILLUSION

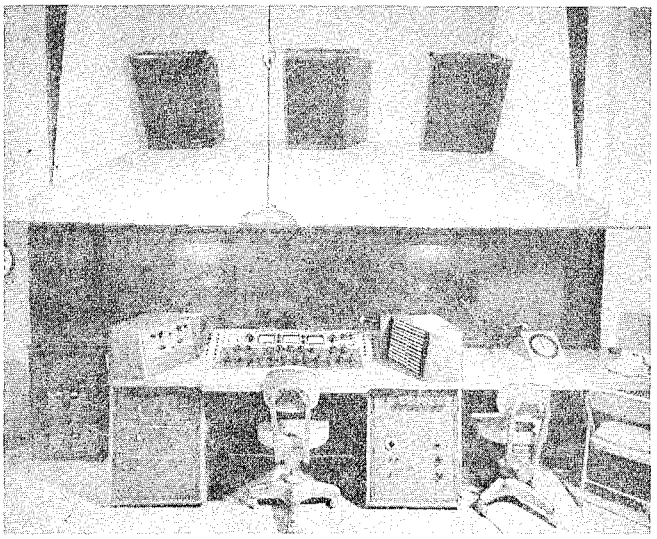
In every class we are asked where and how to buy the Illusion. The information is in Newsletter Vol. 2, #3, but the more recent graduates don't have all the older Newsletters in their Lab Manuals (there are too many of them now to stuff into a Lab Manual). You may purchase an Illusion for $25 plus $2 each for packing and shipping from Eling Industries, P. O. Box 6075, Santa Barbara, CA 93111. Phone 805/964-2931. This is half the price you would pay at a retail store -- if you can find one that carries it.

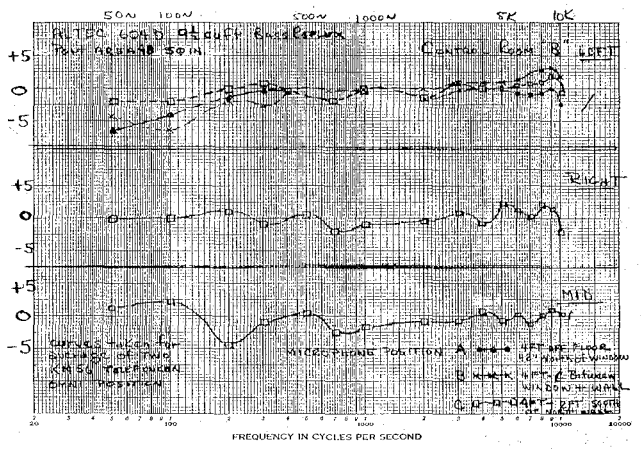
BILL PUTNAM: A PIONEER IN 'MONITOR' MEASUREMENTS

The Los Angeles 1976 class was privileged to have Milton T. Putnam, President of United Recording Corp. (owners of UREI) attending and actively involved in many interesting discussions.

It was a surprise to me to learn that Bill Putnam had used "selected bandwidths of random noise" to measure the acoustic response of studio monitors back in the 1950s and had written about it in one of his AES papers in 1959: "Recording Studio and Control Room Facilities in Advance Design". The paper was presented at the New York AES Convention in October 1959 and published in the JOURNAL in April 1960, Vol 8, #2.

Mr. Putnam loaned us some of the original slides from his talk that illustrates the monitoring setup and the resultant curves as determined by both noise and warble-tone measurements. We are not aware of any engineer using random noise for such studio measurements prior to these and believe that these photographs are of historical interest and importance.





I WISH I'D SAID THAT

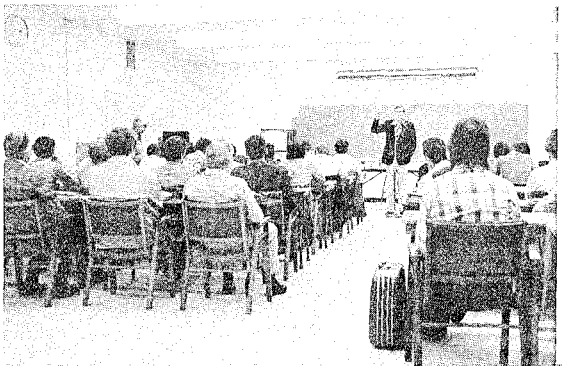
PHIL CLARK of Diversified Concepts in Syracuse (Syracuse class 1974 & 75) received a memo from the architect's engineer asking him to remove half the loudspeakers from a specification for a large 'Cafetorium' in a high school. Phil studied the drawings and sent back a memo, "if you will remove half the lights". This turned out to be the proper reply to the engineer's 'memo-design' method.

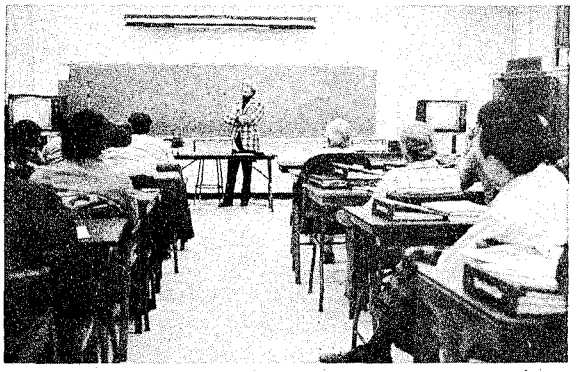
DICK HUGHES of Wilson, Klaes, Brucker and Worden of Buffalo (Syracuse 1975) had a good answer to an architect's engineer who asked him why he couldn't satisfy the sound system needs for a small auditorium with a single cone loudspeaker in the corner, and Dick replied, "The reason that I don't put one loudspeaker in the corner of the room is the same reason that you don't put a single light for the auditorium in that corner."

DIGITAL REMOTE ATTENUATOR

Syn-Aud-Con conducted a special class for more than 40 audio professionals in Edmonton, Canada in April 1976, sponsored by the University of Alberta Extension in Edmonton. The photographs show the very nice classroom facilities that were available to us for this class at the University.

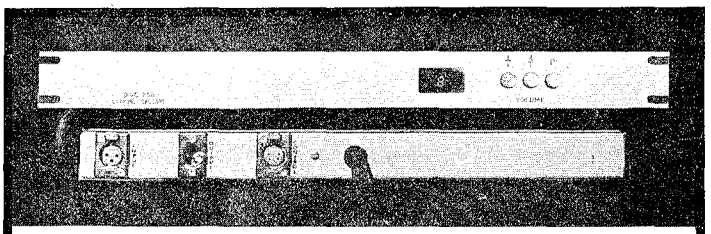
During the class, Earl Siegel and Pete Peters of Estron Industries in Calgary demonstrated one of their developments: a digital remote attenuator. We were very impressed with their demonstration, the fact that it was sturdily constructed and professionally assembled; therefore, we are publishing one of their data sheets. For further details, write directly to Estron Industries, Ltd., 1218 - 45th N.E., Calgary, Alta. T2E 2P1.





ESTRON **DGC 256**

DIGITAL REMOTE ATTENUATOR



DESCRIPTION

The Estron DGC256 is a dual channel attenuator controlled by circuitry capable of accepting binary or "time coded" data.

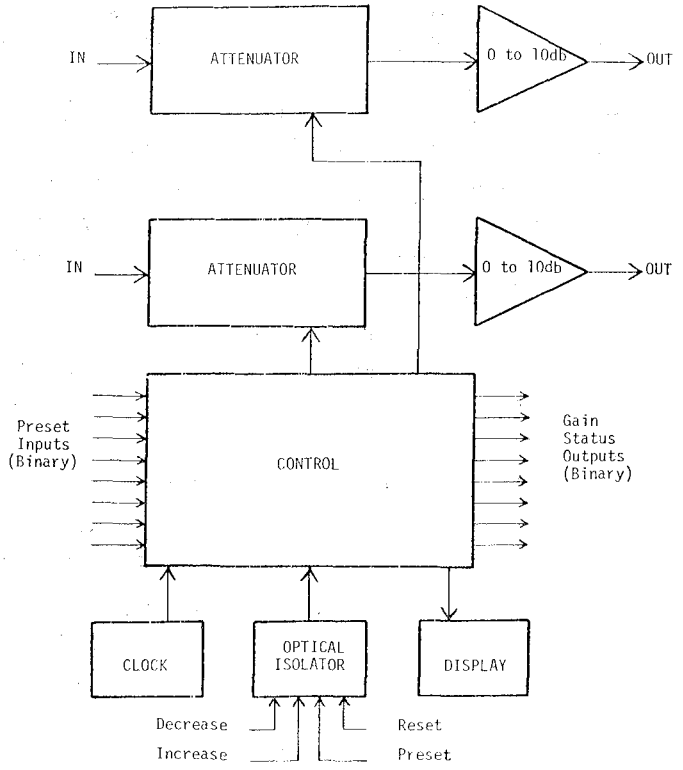
Every effort has been made to offer a reliable product that will enable the system designer to use existing and future inovations in digital logic to directly control the gain of an audio system. System design need no longer be limited to an operator in control of a mechanical "pot". Microprocessors, medium scale integrated circuits or mechanical logic can now be implemented to automatically tailor system gain to external parameters such as; ambient noise, feedback, program requirements or "idiot proofing" requirements.

While the DGC256 is sophisticated enough to be used as a computer interface the "simple" problems of remote gain can also be easily solved. Consider the case of a lecture hall where the lecturer can control system gain from the podium and at the same time gain can also be controlled from the equipment room and/or recording studio. All control locations remain active eliminating the need for special operating procedures in order to acquire "gain control".

The Estron DGC256 has been used as:

a) Basic multi station gain control
b) Wireless (Ultra Sonic) gain control
c) A telephone interface to drop system gain to background level during calls
d) Logarithmic DC amplifier
e) Automatic fader
f) Audio chopper

Thus far uses seem limited only by the designers imagination.



DGC 256 BLOCK DIAGRAM

SOUND ANALYSIS CHARTS FROM CODEX

The Codex Book Co., 74 Broadway, P. O. Box 366, Norwood, MA 02062, publishes the most useful series of charts for use with fractional octave devices.

Three of these charts cover approximately 99% of any professional audio man's needs for documentation of amplitude response curves, RT_{60}, ambient noise levels, and coverage patterns. (You can choose five positions in a room and plot the 1/3-octave or 1/1-octave response at each of them. The envelope of response curves thus formed gives an idea of the variation in coverage pattern.) Remember that for sounds with a broad spectrum response (such as Pink Noise through a sound system or typical ambient noise spectrum) they can be converted from one spectrum scale to another on a power basis. For example, if I have three adjacent 1/3-octave bands all at 90 dB-SPL, then their one octave level centered on the middle band would be

$$10 \log\left(10^{\left(\frac{90}{10}\right)} + 10^{\left(\frac{90}{10}\right)} + 10^{\left(\frac{90}{10}\right)}\right) = 94.8$$

And a single frequency spectrum equivalent level if the center band were at 1000 Hz would be 90 – 10 log 230 Hz* = 66.4 dB-SPL

*1/3-octave filters have a bandwidth of 23% of the center frequency.

The three charts we have found most useful are:

1. Sound analysis at preferred octaves, #31464. The bottom horizontal scale is calibrated in Hertz from 31.5 to 16,000 in octave bands. The upper horizontal scale's calibration shows the band limits for the preferred center frequencies. The left-hand vertical scale is calibrated in octave band - SPL in dB. (This scale can be crossed out when desired and the right-hand vertical scale can be calibrated in 1/10 second intervals for RT_{60}.

2. Sound analysis by 1/3-octave bands, #31462. The bottom horizontal scale is calibrated from 31.5 to 16,000 in 1/3-octave bands. The upper horizontal scale is calibrated in Band numbers (Band #1 centers on 1.25 Hz, Band #2 centers on 1.6 Hz, etc.) from Band #15 to Band #42. The left-hand vertical scale is in dB and the right-hand vertical scale is suitable for RT_{60}, etc.

3. Wide Range Sound Analysis, #31466. Bottom horizontal scale numbers from 1 to 25,000 in decades (1/3-octave intervals). Top horizontal scale in decade numbers allows band numbers to be assigned according to use of bottom scale. Vertical scales in decades.

Each of these 8½ x 11 charts can be ordered in lots of 50 sheets for $3.30 or 25 sheets for $2.05. They are "see through," allowing overlays of plots and match the dimensions of standard level recorder charts for easy comparison.

The use of such charts professionally plotted enhances the data you present to your customers and demands their respect.

TESTING THE SOUND SYSTEM

ROBERT BOYD of Canadian Electronics Ltd., Calgary Alberta (Edmonton class 1976) tested out the equalized sound system during class with:

> Theophilus Thistle, the successful thistle sifter,
> while sifting a sieveful of unsifted thistles, thrust
> three thousand thistles through the thick of his thumb.

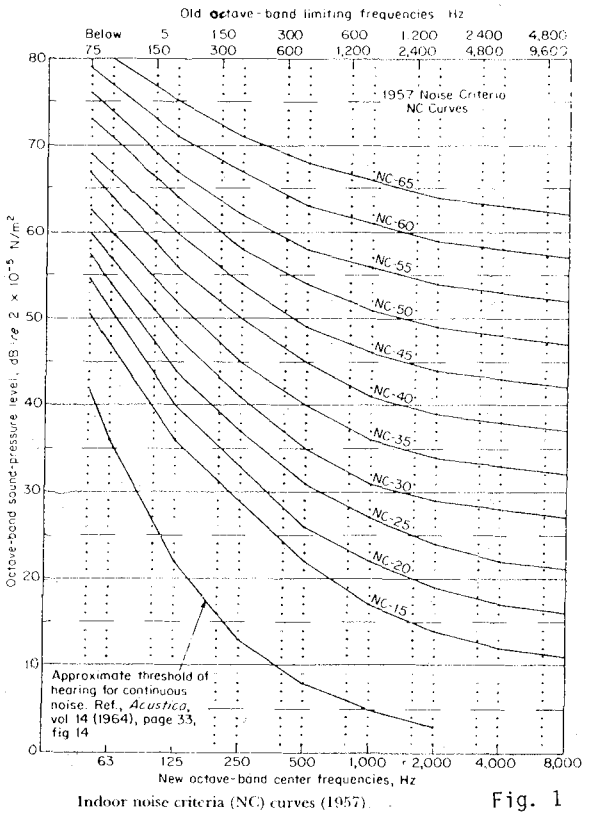
Try it. It tests more than the sound system.

PREFERRED NOISE CRITERIA (PNC) CURVES

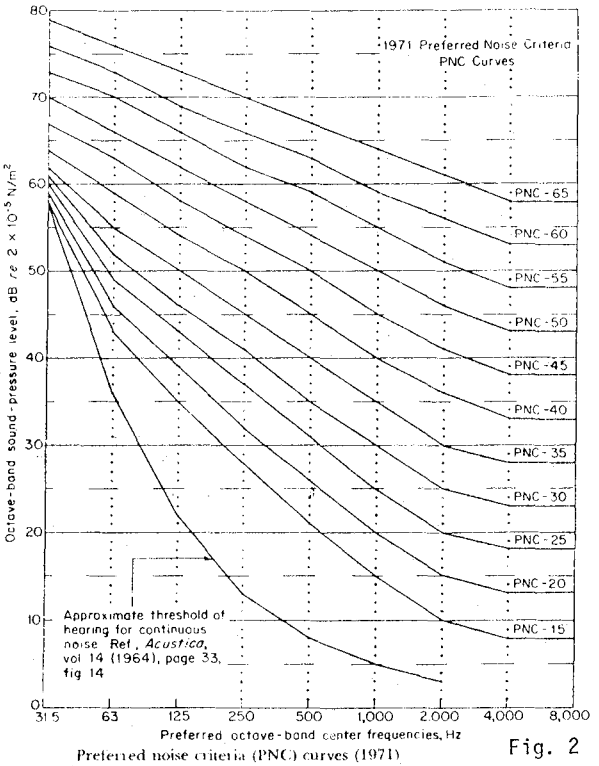
LENNOX BLIZZARD, Subject Supervisor at George Brown College in Toronto, (Columbus 1976 class) pointed out that our NC Curves in *SOUND SYSTEM ENGINEERING*, page 169, Fig. 9-9, use the older octave band limits rather than the newer octave center frequencies. Fig. 1 shows the standard NC curves in terms of both band limits and center frequencies (band limits at top of chart, center frequencies at bottom of chart - 1957 chart).

A newer proposal, not as yet internationally accepted, is the 1971 Preferred Noise Criteria Curves (PNC). See Fig. 2.

For sound system 'protective clauses' in specifications we normally recommend using the old chart. In sound masking work where you are seeing correlation between NC criteria and the degree of acceptable masking level, the PNC curves are the most useful.



Indoor noise criteria (NC) curves (1957). Fig. 1



Preferred noise criteria (PNC) curves (1971) Fig. 2

SYN-AUD-CON "COOKBOOK"

TOM WALTON, who heads up the Guitar Works in Santa Cruz, CA (San Francisco 1976) like many businesses that serve the musical sound market, is moving into professional audio.

Tom mentioned that, being new in the sound contracting work, he spends an inordinate amount of time looking for mounting hardware and suppliers of special equipment. He asked if Syn-Aud-Con could put together a "directory" to help the new company in professional audio, and wondered if there would be Syn-Aud-Con graduates that would be willing to write special Tech Topics on hardware, mounting techniques, (and we have had several valuable "contributions" along these lines in past Newsletters).

To help us start our directory, Tom sent in a list of suppliers of special hardware and fittings. We would be very pleased if anyone and/or all would send in hardware and installation information so that we could put together an installation and practices manual which would be available to all Syn-Aud-Con graduates at a small printing charge. It would be sort of a Syn-Aud-Con "cookbook" with each contribution identified.

SOUND MASKING -- IDEAS AND APPLICATIONS

ROSEMARY CROSS of Executone Limited in Toronto (Edmonton class 1976) holds the title "Sound System Marketing" with her company and she has made sound masking projects her speciality. She has shared some of her insights with us. One reading of Rosemary's article shows why she has been successful in her speciality.

She writes: New ideas for the use of electronic sound masking systems are constantly being developed. Recent innovations in the use of dual-generator or 'stereo' systems (notably by R. K. HERBERT of Ostergaard Associates) (New York class 1974) have brought the state of the art to a new high and for a well designed open-office 'landscape' masking is a basic necessity.

Other applications however are also proving to be of interest. A system has been installed in a high school guidance area...a series of interview rooms around a central office with a waiting area where pamphlets and books on careers are available. The surroundings are basic, there is no acoustic treatment, the ceiling is suspended but not highly rated, room walls are thin and there is no carpet or screening. The object is to achieve some privacy during interviews for students, parents and the guidance staff - and that object is attained. The same system is used to reduce distractions in the school office - a general-use area with counter, clerical staff desks and private offices for the Principal and Vice Principal. Here a hard tile ceiling meant that the only access to the plenum was through the light fixtures, but a satisfactory speaker distribution was possible. Individual volume controls in each area were very important in achieving a balanced sound in both these applications.

This basic idea shows that *masking is a useful acoustical material*. (Italics mine) It can be used in traditional office areas where building materials have not provided enough privacy between offices. Where partitions are not slab to slab or are not dense enough, - or where ductwork creates acoustical anomalies - masking can often be used less expensively than structural changes. Legal and other offices can be assured of confidential privacy even when doors are left open. (It's not always possible to get up and shut the door when a telephone call requires privacy.) Corridors and secretarial areas need no longer act as sounding boards. Here, also, individual controls can allow the more flexible use of the system by the executive.

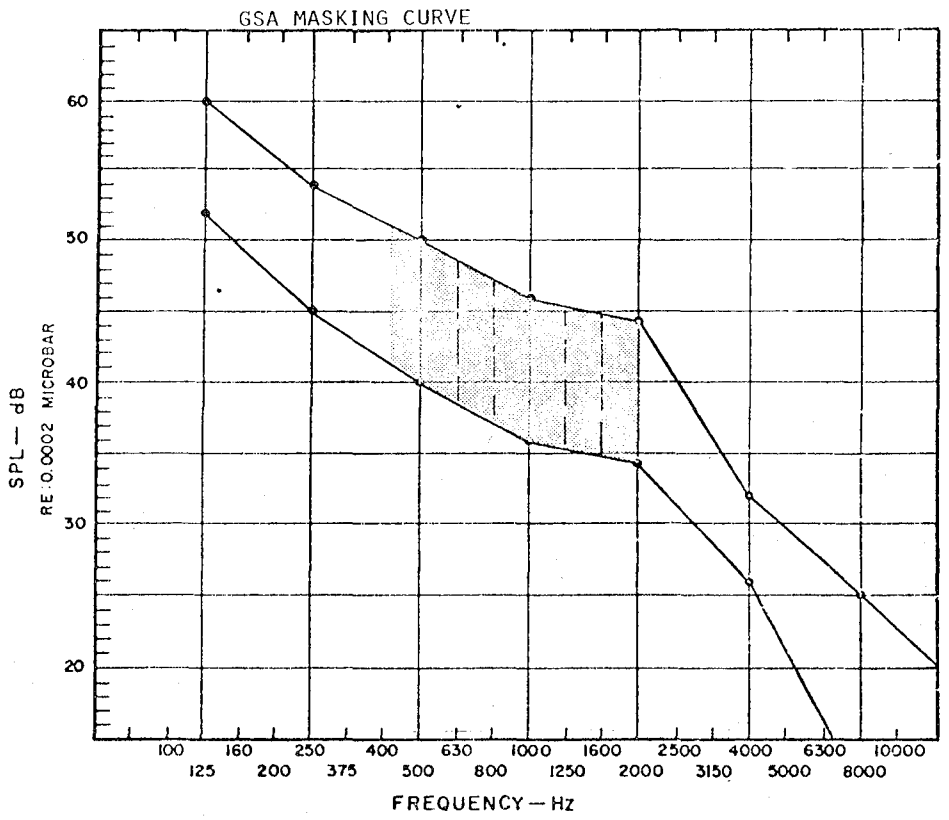
Privacy problems can occur anywhere. One Masking System user, Imperial Oil in Halifax, complained that conversations from one executive office (not masked) could be overheard in the adjoining washroom. A masking speaker was added in washrooms and the problem was solved. A further washroom comment - masking in washrooms, cloakrooms and corridors is set at a level 3 dBA higher than in the open office area by Robin Towne Associates' specifications. The effect is mainly psychological but makes the office area sound level pleasantly acceptable.

Masking has also been used successfully to reduce distraction in draughting/office areas of an architectural and engineering consulting company. Even without screens, carpet or other acoustical additions, a low-level sound masking system gives considerable speech privacy. A similar condition exists in a Hydro Generating Station site office where only screens have been added as a concession to acoustics and masking is a more practical addition than carpets, drapes, wall or ceiling treatment.

These masking systems are obviously outside the norm and the largest application will no doubt remain "office landscape". Masking itself however is a useful tool and its range of application has certainly not yet been exhausted.

(continued next page)

Sound Masking -- Ideas and Applications, Cont.



MOTION PICTURE THEATER SOUND

TED UZZLE of Cinephone Co., Architectural and Engineering Services for the Cinema, Boston, Mass (Boston class 1975) has conducted an irregular correspondence with us that has been rife with valuable physical and metaphysical comments. Typical of his depth of research and ability to think about and recognize the correlation between the old and new are his comments below:

"Let me give you an example of what we are dealing with. Here's a tiny chunk of audio history. When *The Jazz Singer*, the first talkie, played in Boston, it played in a theater twenty-two feet wide, and three balconies tall. Think about that. Think about the vertical vs horizontal coverage angles. Think about the portion of the interior surface area made up by those side walls.

Before talkies, there were cogent reasons for building such theatres. Urban property had parallel sides, steep neighbors, and cost more than construction materials or labor. You reduced image distortion by keeping the patrons as nearly as possible on the horizontal axis of projection, and stacking them closely below and even above the vertical axis. Present-day theatre designers deprecate a steep projection angle, forgetting that the plane of the Earth's horizon means nothing in a dark theatre; only the relative angle between projection and viewing axes.

Look again at the SMPTE Progress Committee report on Soviet Motion picture work and see if those bizarre loudspeakers don't make some kind of sense. Thirty years ago an architect named Ben Schlanger worked out rigorously the sight lines for the theatre, inventing a few new designs in the process. He decried the industry's failure to establish a coherent concept of the sound film, which lament Rettinger and others are justified in echoing. The debate between Fox's mixed stereo sound and MGM's PerspectaSound is being exactly repeated in the quadraphonic hi-fi melange today. The cinema acoustician's equivalent of Ben Schlanger has yet to come along."

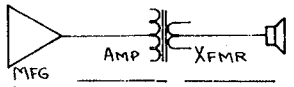
SOUND SYSTEM DESIGN WORKSHEET FROM NORTHSTAR SOUND

TOM McCARTHY of North Star Sound Inc., Minneapolis, Minn. (Minneapolis class 1973,74 & 75

Q CALC
SPEAKER ANALYSIS

NORTH STAR SOUND INC
1408 - FIRST AVENUE SO
MINNEAPOLIS MINN 55403

SPEAKER TYPE _____ DATE _____
USED IN _____ MEAS. BY _____
V
S
NEAR FT.
FAR FT.
N (of N+1)
TEMP C° F°
WET TEMP
HUMID
PRES.



MFG
MODEL
PWR OUT
V or Z

FREQ HZ	SITE DATA N. AMB.	RT60	NEAR SPL	FAR SPL	V SPK.	E SPK	Q CALC R	De	Q	Q N+1	SPK ANALYSIS PWR IN	SENS	% EFF.	NOTES
PINK														
31														
63														
125														
250														
500														
1K														
2K														
4K														
8K														
16K														
MEAN														
MANUFACTURER'S RATED														

NOTE: SKETCH IN ELECTRICAL MEAS. POINTS AND ALL EQUIPMENT IN AMP→SPEAKER CHAIN. SHOW APPROPRIATE CIRCUIT VALUES. DESCRIBE ROOM, SPEAKER MOUNTING/POSITIONING AND MEASUREMENT MICROPHONE LOCATIONS.

ACOUSTIC ANALYSIS

NORTH STAR SOUND INC
1406 - FIRST AVENUE SO
MINNEAPOLIS MINN 55403

NAME _____ DATE _____
ADDRESS
JOB NAME
ADDRESS
USE
SUBMIT TO _____ TITLE _____ PHONE
AT _____ BY
NOTES

BASIC SHAPE _____ NO. PEOPLE
BASIC DIMENSIONS: CEIL. HEIGHT _____ WIDTH _____ LENGTH
UNUSUAL FEATURES
PLANS REQ'D _____ AVAILABLE _____ SENT _____ ON HAND

	QUAN.	RUN 1	RUN 2	RUN 3	RUN 4
V, FT³					
S, FT²					
RT60 sec					
ᾱ					
Sᾱ, FT²					
R, FT²					
N AMB.					
DP-DN					
SYST. De					
SYST. DL					
SYST. AL-C					
SYST. dB@2'					
Qeak Sel					
Da					
Dc					
DL					
EAD					
Di					
Ds					
NOM					
PAG					
NAG					
PAK SPL Ds					
L SENS					
PWR REQ					
PWR AVAIL					

RUN 1
RUN 2
RUN 3
RUN 4

FURNISHINGS
CEILING
FLOOR
SIDE WALL
SIDE WALL
BACK WALL
FRONT WALL

DISPERSION ANGLE: HORIZ. _____ VERT.
IS POSSIBLE WITH Q? _____ PRACTICAL?

SILENCING UNUSED PREAMP INPUTS

CHARLES TOWNSEND with the State of Florida, Department of General Services (Orlando class 1973) sent in a method of silencing unused preamp inputs to avoid excessive front end noise in the system.

"The Clairex CLM 8500 is chosen as the closest off-the-shelf equivalent having a dark resistance of about 10 meg.

This system lends itself well to long distance control since one is only controlling the LED power (40 mA) and not the audio input or output circuit directly. A regulated power supply is recommended since varying loads could produce voltage drops and changes in the brilliance of the LEDs and eventually the gain of the system."

CORRECTIONS FOR AUDIO BURST KEYER TECH TOPIC

Page 3 of Tech Topic Volume 3, # 9, by SAM ADAMS, paragraphs 5 and 7 refer to 1,000 Hertz. Please change to 1,000.0 Hertz. The eighth paragraph should have been 1.0 Hertz instead of 10 Hertz.

A MODIFIED METHOD FROM MEL
(MEASURING RT_{60})

Mel Sprinkle, Acoustical Consultant in D.C., (New York class 1975) read Tom McCarthy's method for obtaining the RT_{60} or time of reverberation from graphic level recorder charts (April 1976 Newsletter). Tom's method was to measure the angle and calculate RT_{60}.

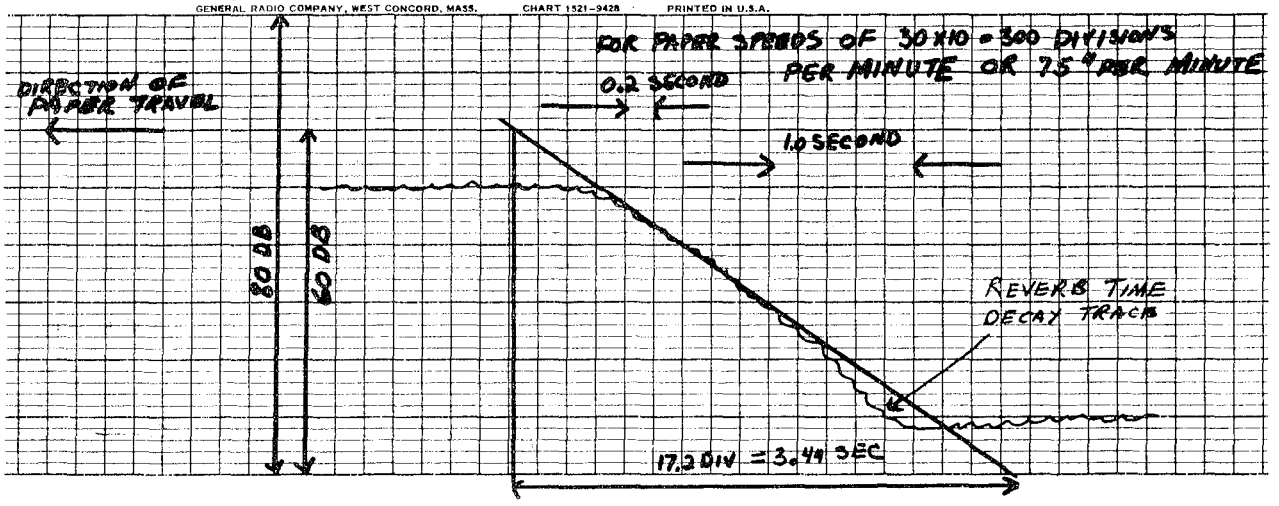
Mel writes: We have developed a method using the General Radio 1521 graphic level recorder which we believe gives the answer more rapidly and more accurately, since it is in our opinion far easier to measure distance with a measuring scale than angles with a protractor.

We use the General Radio chart paper #1521-9428 and equip the recorder with the 80 dB pot. For the benefit of those not having a graphic recorder, this converts the paper width to a linear decibel scale with a value of 80 dB. We set the paper speed to the fastest value which is 30x10, or 300 divisions per minute. Since the small divisions are ½" apart, a paper speed of 300 quarter inches per minute is the same as 75 inches per minute or 1.25 inches per second or five small division per second. Each small division represents, therefore, 0.20 second or 200 milliseconds.

Our method is to produce the decay traces on the paper and then pass the paper over our drafting table. The bottom edge of the lined area is then aligned with the straightedge and fastened to the drafting table surface with drafting tape. Our table can accomodate five or eight decays. A triangle is then placed along the decay to get the average slope and a line is then drawn along the slope, and extrapolated from the chart edge to 60 dB. Using the triangle and straightedge, let fall a perpendicular from the 60 dB level to the bottom of the chart. The number of small chart divisions is rapidly and accurately measured by an "engineer's" type scale using the 1/40 values. Each large division on the 1/40 scale is exactly ¼" and 1/10 values can be easily read. Thus we use the 1/40 engineer's scale to measure the distance along the bottom of the chart and multiply the number of divisions by 0.200 to get the reverberation time.

We have found this method to be simple and accurate. It can be learned and performed by draftsmen (pardon - draftspersons!) or even relatively unskilled workers.

Those having Bruel & Kjaer pen recorders do not need this method because B&K sell a special reverberation time protractor which is very handy. Those having GR pen recorders but with only the 40 dB pot cannot use this method. They have to use the tangent method but we have developed a simpler method for this case. But that's another story. (To be continued.)

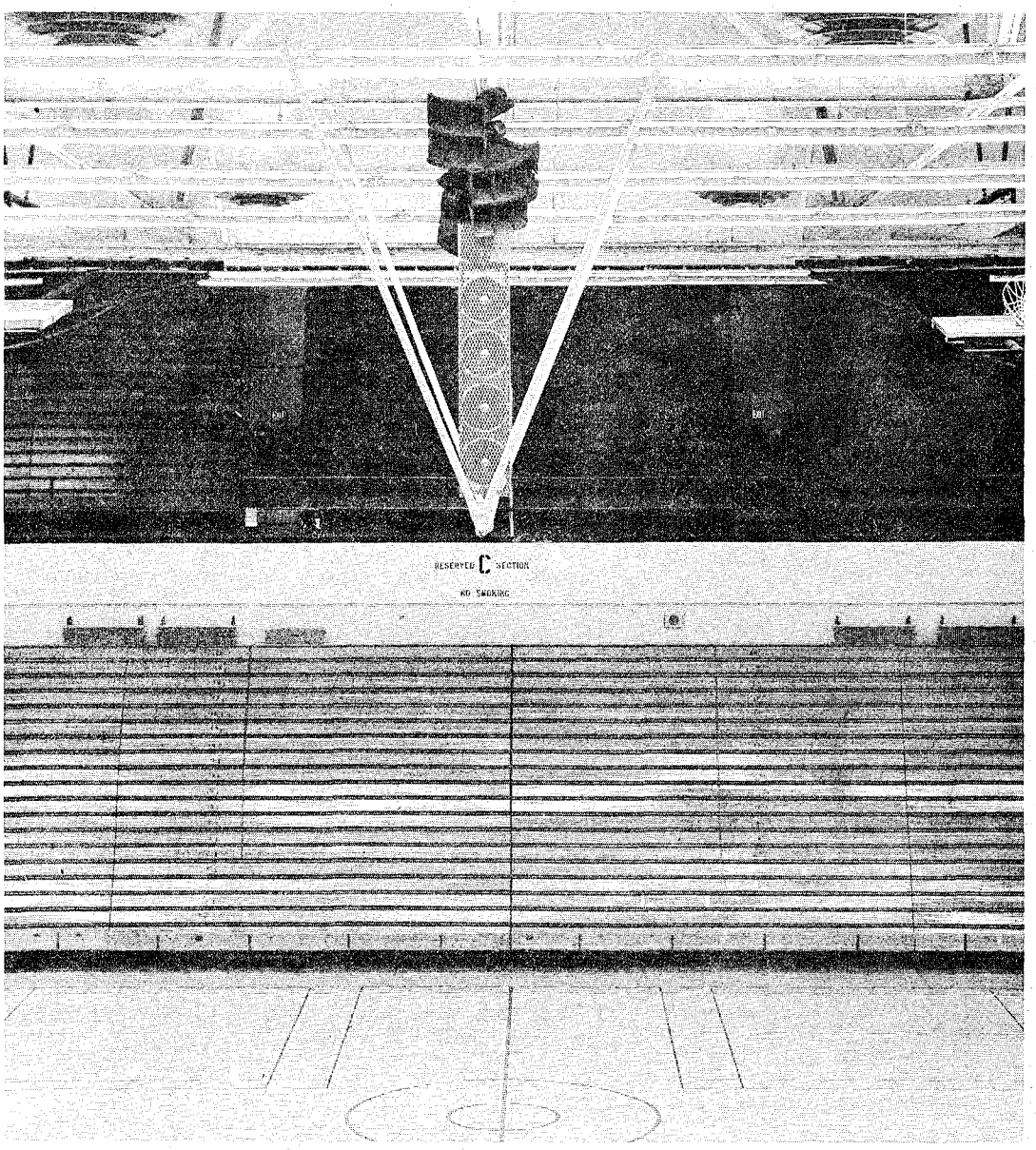


GYMNASIUM SOUND SYSTEM USING FOUR UNENCLOSED WOOFERS

STEVE BARNES, (Los Angeles 1973) and co-worker with Vic Hall of the RT_{60} meter and the ARA 412 RTA fame at Communications Company, San Diego, CA was good enough to dig out of his files an ideal use of four *unenclosed* 15" woofers in a gymnasium. Bleachers were installed down the side walls (no end wall seats). The bipolar (figure 8) pattern obtained from these low frequency loudspeakers developed a coverage pattern that would have been impossible to duplicate with a conventionally enclosed system.

Note the really precise manner in which standard sectoral horns are raised in Q to compensate for the n+1 factor necessary to handle such wide horizontal coverage angles with uniformity. To our best knowledge, this is the first such array installed in a gymnasium and was installed back in 1971.

Listeners say that there is a distinct coverage area of excellent evenly distributed sound throughout the seats which can then be walked out of into the uncovered areas, such as the floor or end zones which have remarkable sonic isolation by comparison.



TOPAZ - SOLUTION TO POWER PROBLEMS

RICHARD JOHNSON of Lawrence Berkeley Lab(San Francisco class 1976) suggested that we get the catalog from Topaz. Topaz offers as standard products: uninterruptible power systems, ultra isolation transformers, DC to DC converters, AC to DC converters, AC line regulators, DC to AC inverters.

Topaz's catalog on 'Ultra Isolation Transformers' is exceptionally useful, containing examples of difficulties that can be encountered and their solution. Any engineer dealing with entertainers, hospitals, or any communication equipment likely to go overseas needs the kind of information Topaz has readily available, in addition to their full line of products.

Write Topaz, 3855 Ruffin Road, San Diego, CA 92123

USING THE PEUTZ MAXIMUM D_2 EQUATION

On occasion, graduates find themselves dealing with extremely difficult rooms. JOHN BURGOYNE, JR. of Manila, Philippines (Chicago class 1973) came up with the following auditorium figures.

$V = 412{,}006 \text{ ft.}^3$

$S = 40{,}253 \text{ ft.}^2$

$RT_{60} = 7.88$ secs at 2000 Hz

$D_2 = 144.5$ '

$R = 2{,}645 \text{ ft.}^2$

Among many other problems (such as excessive ambient noise, etc.), John needed to know how many speaker systems would be needed to reach 144.5', having found by means of the Peutz equations that the minimum Q for 15% AL_{CONS} in order to penetrate 144.5' would be 134.5. Having access to the EV HR4020 type horns, John needed to know how many to use.

The usual solutions are to increase absorption in the room, thereby lowering RT_{60}, or decrease D_2, but remembering to account for the increase in N+1 this usually requires.

Since the EV HR4020 has a Q = 50 at 2000 Hz and the required Q = 134.5, we can see that we need to roughly cut the D_2 to 1/3 the original value. Doing this we find:

$$\text{min Q per horn for an } AL_{CONS} \text{ of } 15\% = \frac{641.81(D_2)^2(RT_{60})^2\ (N+1)}{15V} =$$

$$\frac{641.81\left[\frac{144.5}{3}\right]^2(7.88)^2(3)}{15(412{,}006)} = 44.88$$

This means that three such horns could safely be turned on at the same time and still provide 15%AL_{CONS} at 48 feet. $\left[\frac{144.5}{3}\right]$ = 48 feet

John is going to report back the results.

POPULAR ELECTRONICS ARTICLE BY RALPH HODGES

Ralph Hodges, Syn-Aud-Con graduate of the New York 1975 class, has written a very enlightened article in POPULAR ELECTRONICS, May 1976) that allows a serious high fidelity fan or electronic experimenter to feel some of the excitement of participation in "The World of Sound Contracting". Ralph is assistant technical editor of HI FI STEREO REVIEW and our New York class was his first in-depth study of sound system design. One reading of the article indicates the impressive amount that Ralph absorbed and assimilated during the class.

We plan to reprint the article and use it as part of the Syn-Aud-Con mailing package to prospective attendees.

USING THE MOIR POWER LEVEL DEVICE TO OBTAIN Q

James Moir, the well-known English author and acoustic consultant, has developed a simple, direct method of measuring L_p (dB-PWL). He has calibrated an acoustic source in acoustic watts and uses it to raise the L_p (dB-SPL) observed at a given test point from a loudspeaker being tested by 3.01 dB.

USE OF THE DEVICE IN A FREE FIELD

Moir's proposal intended the use of the device in normal semi-reverberant spaces. Several difficulties arise in such usage, such as being able to accurately obtain the room constant R, the placement of the device, etc.

Most manufacturers in the United States quote four foot sensitivities obtained by providing the loudspeaker with an electrical input of *one watt at its rated impedance*. Such measurements are normally taken, however, at distances of ten to fifteen feet in order to avoid near field anomolies.

By replacing the test loudspeaker, which has generated the sensitivity level (L_s), with the power level device and adjusting the power level device until it produces the same L_p at the original measuring microphone as the test loudspeaker did, we obtain the condition where $L_s = L_p$. Since the $L_p = L_p$ at 0.282 meter for a Q = 1, any L_p above L_p at 0.282 meter has to be due to the Q of the test loudspeaker.

$$Q = 10^{\left(\frac{L_s - L_p + 20 \log \left(\frac{\text{measuring dist.}}{0.282\text{m}}\right) + 0.2\ \text{dB}}{10}\right)}$$

An Example

A commercially available driver mounted on a sectoral horn measured

$$L_s = 104 \text{ dB-SPL at 10 feet}$$

Substituting the power level device in place of the test loudspeaker and raising its power until its $L_p = L_s$ at the measuring microphone, we find that its acoustic output is 0.21 watts

$$L_p = 10 \log \left(\frac{0.21 \text{ watt}}{10^{-12} \text{ watt}}\right) = 113.2 \text{ dB-PWL}$$

then:

$$Q = 10^{\left(\frac{104 - 113.2 + 20 \log \left(\frac{3.05^*}{0.282}\right) + 0.2\ \text{dB}}{10}\right)} = 14.7$$

**10 feet = 3.05 meters*

Since one watt was used as an electrical input to obtain L_s, then the percentage of efficiency is the acoustic output times 100

$$0.21 \text{ acoustic watts} \times 100 = 21\% \text{ effic.}$$

SUMMARY

Mr. Moir's device is now under product development by Brüel and Kjaer and should appear in the market place within the year. Since L_s can be obtained for any angle both on-axis or relative Q's may be obtained. Loudspeaker efficiencies are obtained with ease. Since any test distance may be employed outdoors, tests of extremely large arrays can provide true far field measurements. Most importantly, this method will relieve the loudspeaker manufacturer of tedious mathematical integration of reams of data and allow him to quickly and accurately provide an essential parameter needed by the practicing audio engineer.

- - - - -

TECH TOPIC VOLUME 3, NUMBER 11
SOUND SYSTEM DESIGN WORKSHEET

Syn-Aud-Con classes now receive the completely redesigned SOUND SYSTEM DESIGN WORKSHEET. Glen Ballou and Mel Sprinkle cornered us in New York at the Fall AES convention and pointed out that certain changes in the original version would make it both easier and more accurate to use.

These suggestions have been incorporated in this new version of the SOUND SYSTEM DESIGN WORKSHEET. It uses the Sabine formula throughout a consistent set of equations.

If you wish to order extra copies for your Sound System design, we make them available for 50¢ each.

DAMPING FACTOR OF AMPLIFIERS

$$\text{d.f.} = \frac{Z_L}{Z_A}$$

Where: d.f. is the damping factor

Z_L is the impedance of the loudspeaker

Z_A is the internal impedance of the amplifier

Since the above equation fails to account for the DC voice coil resistance we can write a further equation for the *true* damping factor.

$$\text{d.f.} = \frac{Z_L}{Z_A + Z_{DC}}$$

Reference: Audio Cyclopedia, second edition, Page 1120, 20:103

Example

Loudspeaker Impedance = 8Ω (DC voice coil resistance - 4Ω)

Power amplifier internal impedance = 0.25Ω

$\text{d.f.} = \frac{8}{0.25} = 32$ True $\text{d.f.} = \frac{8}{0.25 + 4} = 1.88$

ROUGHLY APPROXIMATING V FROM S OR FROM V

In rooms with reasonably regular dimensions, it is possible to roughly obtain either the volume, V, or the boundary surface, S, when either of these two parameters are available.

Finding S When V is Known

$$S \text{ in } ft^2 = 6.25V^{2/3}$$

For example, for a room with a volume of 500,000 ft^3 the total boundary surface area would have to approach

$$S \text{ in } ft^2 = 6.25(500{,}000^{2/3}) = 39{,}372 \text{ } ft^2 \text{ or roughly } 40{,}000 \text{ } ft^2$$

Finding V When S is Known

$$V \text{ in } ft^3 = e^{\left(\frac{3 \ln\left(\frac{S}{6.25}\right)}{2}\right)}$$

If we had a room with a surface area that was 42,500 ft^2, then

$$V \text{ in } ft^2 = e^{\left(\frac{3\ln\left(\frac{42{,}500}{6.25}\right)}{2}\right)} = 560{,}742 \text{ } ft^3$$

These useful approximations appear in L.L. Beranek's book, *Acoustics*, page 426.

Or, it should be between 500,000 and 600,000 ft^3

A TYPICAL TALKER'S ACOUSTIC OUTPUT

Dr. Harvey Fletcher of Bell Telephone Laboratories, in his classic book, *SPEECH AND HEARING IN COMMUNICATIONS* assigns a Q = 2 to 2.5 near the 2,000 Hz octave band for the "typical" talker. (Page 76) He further states that this same typical talker has a level at 1 meter of 65.4 dB-SPL. Using these assumptions we can calculate the "typical" acoustic power radiated by the talker. (This talker was 22% of a group tested with the extremes at 54 dB-SPL, 7%, to 75 dB-SPL, 4%)

Calculating Acoustic Power

The first step is to convert the dB-SPL reading into a dB-PWL reading, remembering that the dB-SPL = dB-PWL at 0.282 meters and that the formula for acoustic watts is

$$\text{Acoustic watts} = 10^{\left(\frac{\text{dB-PWL}}{10}\right)} \times 10^{-12} \text{ watts}$$

We can then convert our dB-SPL readings back to 0.282 meter and adjust for the effect of Q in raising the reading.

$$\text{dB-PWL} = \text{dB-SPL} + 20 \log \frac{1 \text{ meter}}{0.282 \text{ meter}} - 10 \log Q$$

Or, in this specific case:

$$\text{dB-PWL} = 65.4 + 20 \log \frac{1}{0.282} - 10 \log 2 = 73.38$$

and,

$$10^{\left(\frac{73.38}{10}\right)} \times 10^{-12} = 22 \text{ microwatts}$$

Thus, our "typical talker produces:

$$65.4 + 20 \log \frac{3.281^*}{2} = 69.7^{**} \text{ dB-SPL at 2'}$$

(*1 meter = 3.281 feet)
(**normally rounded to 70 dB-SPL)

These same relationships can also be written as

$$\text{Acoustic watts} = \left(10^{\left(\frac{\text{dB-SPL} - 0.5 \text{ dB}}{10}\right)}\right)\left(\frac{4\pi(D_x)^2}{Q\ 10^{13}}\right)$$

Where D_x is the distance from the sound source in feet instead of meters

The use of the old reference 10^{-13} is admissible here as we are not calculating dB-PWL as such but continuing on to an answer in acoustic watts

$$\text{Acoustic watts} = \left(10^{\left(\frac{70.0 - 0.5}{10}\right)}\right)\left(\frac{4\pi(2)^2}{2 \times 10^{13}}\right) = 22 \text{ Micro watts}$$

HP-65 USERS CLUB AND THE NEW SR-52 CLUB

The HP-65 Club is made up of members who have a deep involvement in computer-calculators, especially the HP 65 but not limited to the 65. When the SR-52 came out the 65 NOTES contained many programs for the 52. Now they have made the following announcement: The following pages will serve to terminate the HP-65 Users Club support of the SR-52 calculator. The HP-65 User's Club cannot continue to support other machines because of the many differences that exist....Before year end, Rockwell and Commodore are expected to announce 'high end' machines which would further dilute the Club's efforts."

There will be a new club, SR-52 Users Club, 9459 Taylorville Rd., Dayton, Ohio 45424. Write R.C. Vanderburgh for a year's subscription. Tentative cost $6.00

If you want to subscribe to the HP-65 Users Club (and most HP calculator owners will appreciate the HP 65 NOTES, even if they don't own an HP-65), write Richard Nelson, 2541 W. Camden Place, Santa Ana, CA 92704

BOOKS OF INTEREST

FROM TINFOIL TO STEREO by Oliver Read and Walter L. Welch. Howard W. Sams, $19.95 hardbound; $9.95 softbound.

The valuable book, *FROM TINFOIL TO STEREO*, by Oliver Read and Walter L. Welch has been re-issued after having been out of print for many years. To quote from the Forward:

> *Sixteen years after its first appearance, the reprinting of FROM TINFOIL TO STEREO with but modest revisions and additions and by the original publisher besides, is something of a literary oddity, especially since, in that interval, the manuscript had been returned to its authors, apparently with the thought that reprinting would probably never be warranted. How differently things turned out! For most of that intervening period, the book was entirely unavailable from the publisher in its original binding and dust sleeves, while the going price for used copies steadily escalated, year by year, to $60 and in one known case to $200. Libraries have found it impossible to keep copies in good condition because of intensive use, and many copies simply disappeared!"*

I purchased my copy from the estate of a close associate years ago. Far from a dry history of a phonograph, this remarkable book traces the seminal ideas that spawned talking motion pictures, radio, television, and indeed, the scientific foundations of the communications industry as a whole, back to the time and place where it was only a gleam in an intuitive inventor's eye.

The book is worth many times its low price of $19.95 for its discussions of Maxfield and Harrison's Theory of matched impedance, complete with Hanna's criticisms and the influence of Webster, Lord Rayleigh, et al. As a clue-book to original source material, it is unexcelled.

The engineers responsible for making the motion picture talk were also key to the development of professional sound. There is detailed historical treatment of this period: *....The GE-RCA interest, Rockefeller backed, founded Radio-Keith-Orpheum, comprised of RCA, American Pathe, and the Keith-Albee-Orpheum theater chain, for the purposes of producing sound pictures. The Warner Brothers-E.R.P.I.-Western Electric-AT&T aggregation was a Morgan financed operation. The financial importance of those alignments may be appreciated by considering that from a state of virtual insolvency in 1925, Warner's assets had expanded to $16,000,000 by the close of 1928 and by the end of another year to $230,000,000.*

The industry went on to become essentially depression proof, especially for the sound system engineers. Western Electric-E.R.P.I. had income from theater installations in 1929 of $37,000,000.

Out of E.R.P.I. came the Altec and JBL companies.

In this accurate, detailed book are the clues to the history of what amounted to a "space race" of its era but between private industries rather than governments. When the 1920 and 1930 dollars are translated into today's equivalent, the magnitude of the efforts can be fully appreciated.

The slaughter of sacred cows looks like a buffalo hunt in the unrestrained days of the 1870s. How the industry abandoned the vertical cut for the lateral and how today technology is back to the vertical is a fascinating and instructive tale that weaves as a thread through the tapestry the authors have woven.

Since those who don't know history are reputably doomed to repeat it, the lessons this exceptional book offers are painless compared to taking the lumps of experience. As "professional managers" increasingly seize audio companies and slowly manage them out of existence, the story of how these companies came to be and what they have been is as exciting a story as the logical projections of what can and will happen as audio once again attracts entrepreneurial engineer-managers into the coming digital revolution and steps around the unadaptable "bottom line" management cliques into a new professional sound.

BOOKS OF INTEREST

KEN STOLTENBERG, Electronic Engineering Services, Rochester, Minn. (Minneapolis class 1973 and 1975) wrote us about the General Electric *TRANSIENT VOLTAGE SUPPRESSION MANUAL*. Ken said that they have been installing transient suppressors on power lines and phone lines on remote transmitters and noticed a reduced failure rate, particularly those they could attribute to electrical storms. And he mentioned that it should be of particular interest to those who take equipment on road shows and run into all kinds of situations.

We ordered a copy from General Electric, Semiconductor Products Department, Electronics Park, Syracuse, New York 13201; priced at $2.50. It is an invaluable reference.

Appendix A, "Surge Voltages in Residential and Industrial Power Circuits" by Martzloff and Hahn is worth the price alone. Voltages as high as 2500 volts for periods of one cycle can occur in home wiring from the operation of an oil burner (damped oscillation with a frequency of 0.25 megahertz).

This well thought-out manual presents, in an orderly manner, an analysis of what the problem is, how it occurred, and typical approaches to worthwhile solutions.

****

In the April issue of the Newsletter, Volume 3, Number 3, page 27: Books of Interest, we mentioned the useful book, *ELECTRONIC FACILITY BONDING, GROUNDING AND SHIELDING REVIEW*, and failed to note the address of the National Technical Information Service of the United States Department of Commerce. 5285 Port Royal Rd., Springfield, VA 22151.

ARTICLES OF INTEREST

From BUSINESS WEEK, March 8, 1976: "Organized R&D projects of the kind that are covered in company budgets account for about 40% of the total increase in productivity. .. Industry earns an average 30% rate of return per year on its R&D spending - about *twice* the return that companies get from their capital investments."

These two facts mentioned in the article on R&D in BUSINESS WEEK points up the Achilles heel of a majority of audio manufacturers.

Interestingly enough, even among the acknowledged experts on the subject, there is a great debate regarding where invention and innovation comes from: Is it organized efforts of large groups or lone thinkers in their garages and basements?

In the audio business both types of research have been influential. Certainly in the early days, Bell Labs and RCA made major contributions by supplying the environment that encouraged rapid development of earlier individual concepts. Concurrently, inventors such as Shure, Kahn, Klipsch, McIntosh, Bozak, etc., started companies out of their own research efforts. Today, because many of the larger audio companies spend *no* money on real R&D (Shure being the notable exception among the larger firms) our industry offers unique opportunities to the gifted individual inventor.

Many Syn-Aud-Con graduates exhibit a decided inventive flair which with cultivation can become a consistent productive capability. One of the first steps is to keep a detailed notebook of ideas of interest to you. As we often suggest to the classes, your Syn-Aud-Con Manual, kept up to date with articles you have found interesting from all other sources such as AES, SMPTE, Audio Magazine, dB, etc., can be your basic idea notebook. Then, when you first encounter an unmet technical need, a new relationship between two old ideas, or any of the multitude of typical technical accidents, you'll not only recognize their potential but you'll know exactly where to look for reference material, needed techniques and who tried it before but didn't have your tools to solve it.

Because so few in our industry support such work in their own operations, better ideas have a larger than usual chance to obtain a hearing. Invention without really clever creative marketing can and does kill the best of new ideas. The hardest fact the inventor has to face is that he rarely is the proper man to market the idea. That will be the subject of another article in the future.

ARTICLES OF INTEREST

The March 1976 issue of the SMPTE JOURNAL contains an article entitled "Acoustic Response Measurements and Standards for Motion-Picture Theaters" by Erik Rasmussen (pages 164-169).

This article reveals devastatingly what can happen when international committees get together to decide technical matters. A method of measuring acoustic amplitude response in octave bands at various listener positions is proposed in a manner that allows the grossest of defects to remain hidden while the measuring engineer gains the false impression of having done something.

It is important that those engineers capable of contributing valuable work on the serious problem of Motion Picture acoustic response in theaters read this article and become acquainted with the lack of basic knowledge currently rampant in the field. It becomes obvious in the article that the only reason 1/1-octave plots were adopted was because of the availability of such equipment to the prime movers of the project.

These same engineers regard the technicians most likely to do the actual work as some form of sub-mentality that needs special guidance and limiting concepts. The dB averaging method proposed in this day of omnipresent electronic calculators is insulting and inefficient. The failure of these same engineers to realize that in the United States alone over 1,000 1/3-octave real time analyzers are in the hands of "technicians" is appalling.

Worst of all, however, is the underlying implication that a suitable answer can be reached by the methods proposed. Total failure to recognize that the international motion picture industry badly needs the proposals of Dr. John Hilliard for a new look at a standard loudspeaker system before any fruitful work can be done in the adjustment of such systems is a fundamental error.

Dr. Hilliard's proposal included a highly refined, advanced theater loudspeaker system capable of maintaining more uniform Q, better audience coverage, and amenable to wide frequency response adjustment via equalization while maintaining low acoustic distortion.

Until the Academy of Motion Picture Arts and Sciences recognizes that it has failed to use sufficiently well equipped representatives at these international meetings such difficulties will continue.

Conclusion: Motion picture progress in terms of utilizing present acoustic technology is in worse shape than most of us realized. Blunders such as these lead to proliferation of private solutions and make eventual standardization a much more difficult task.

****

An unusually comprehensive article on the efforts of contemporary acoustic consultants was written by Sharon Lee Ryder in the November 1975 issue of PROGRESSIVE ARCHITECTURE. It mentions many current American acousticians involved in a concert hall project in conjunction with his present pet project. However, when discussing the 'piece de resistance' of the article -- the Institute of Research and Coordinaation into Acoustics and Music, headed by Pierre Boulez, and now under construction in Paris, Ms Ryder fails to credit the largest acoustic firm in Europe (and perhaps the world), V.M.A. Peutz, who served as the acoustical consultant for this most demanding project.

All major projects currently in process are discussed and key design ideas are outlined. It is available as a reprint from Reinhold Publishing Co., Inc., publishers of PROGRESSIVE ARCHITECTURE.

ARTICLES OF INTEREST

In the January 1976 SMPTE JOURNAL (Volume 85, pp 6-9) there appears an article entitled, *AUDIO, THE STEPCHILD OF TELEVISION BROADCASTING.* This misleading title belongs to an excellent article on the V.I. meter and its uses, especially those special applications pertinent to broadcasting. The author, Hans Schmid, has several pet terms. He prefers such as "VU meter lag" in place of 10 dB headroom and "Clip level margin" instead of the 6 dB amplifier margin broadcasters add to the basic headroom.

Mr. Schmid further points out that if the program level is +8 VU, then the amplifier must be capable of an additional 10 dB VU meter lag + 6 dB clip level margin, + 6 dB impedance stabilizing pad = +8 +22 = +30 dBm *power* level at the output terminals of the console.

Included in the article are excellent photographs of a recording oscilloscope's record of the VU meter lag.

This article is worth having in your manual and we have written for permission to reprint.

***

THE GREAT SOUND OF AMERICAN TELEVISION. Almost every audio publication has had a recent article on television sound. STUDIO SOUND AND BROADCAST ENGINEERING from England (a publication that is "available without charge to those qualified in the industry" See Newsletter Volume 2, Number 3, or Page 16 from "Best of Past Newsletters for a list of audio publications free to "those qualified") has an article in the May 1976 issue, *THE GREAT SOUND OF AMERICAN TELEVISION*, by Gordon Skene.

To quote, "America (as well as the rest of the world I am told) has been increasingly concerned with the quality of the image, the transmission of the picture, be it from down the street, or live via the Moon. But one thing has remained constant, with very few exceptions, and this is the generally poor quality of the transmitted sound... much of this problem comes from the lack of concern on the part of the networks. The situation with television audio is much the same with motion pictures; more time is spent on the visual and the last detail looked at is invariably the audio.

"American network television sound is archaic, and it's archaic for a reason; the consumer public is not interested in the sound when they buy a 19" Sony Triniron television, they're interested in the devastating color." And they go on to say that the networks are not doing anything about audio because the public is not complaining. The telephone company is not making any startling changes because the public is not complaining. "No one complains, and the problem goes nowhere."

The number of articles appearing at this time indicates that a sleeping giant is rubbing his sleepy eyes.

CLASSIFIED

WANTED: Used real time analyzer. Jim Hawkins, Electro Acoustic Systems, Arnoldsville, GA 30619

FOR SALE: Real Time Analyzer. Communications Co. ARA 411 with scope attachment. Like new condition. Contact Jerry Miller, K-T Electronics, 3306 Lime Ave., Long Beach, CA 90807. Tel 213/424-0979