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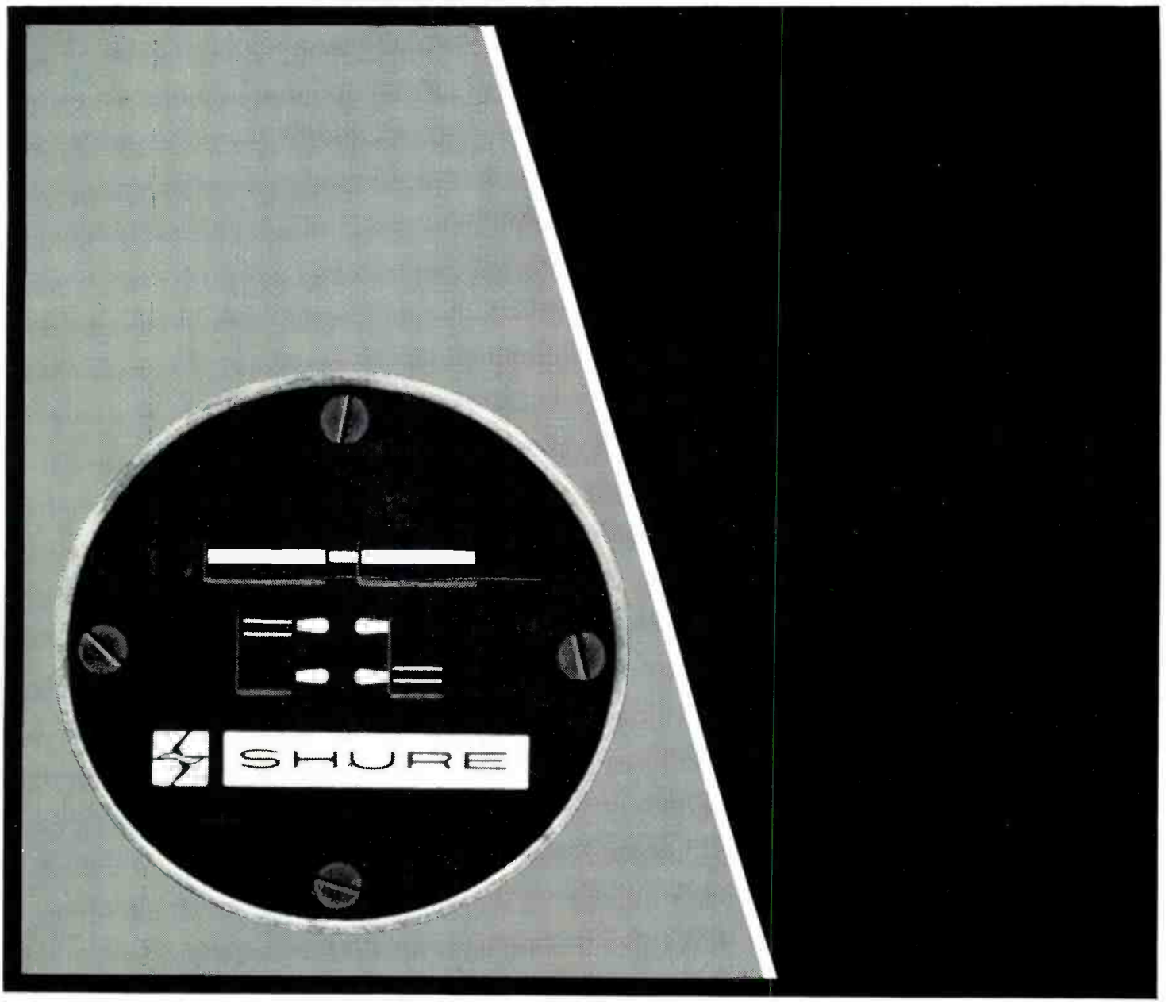

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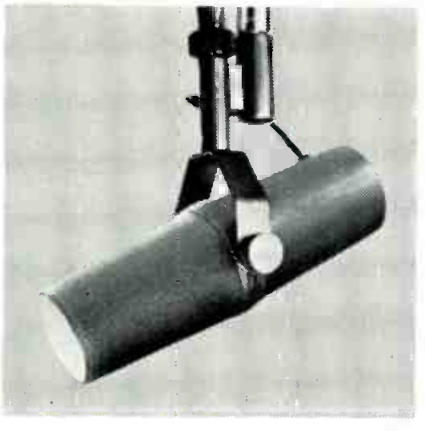

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ABOUT THE COVER

• This lovely setting, so nicely captured by John Woram's camera hides a modern and busy studio complex. Read about Caribou Ranch beginning on page 26.

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letters

The Editor:

In **db**, Volume 3, Number 11, p. 26, November 1969, there is an interesting article on the history of microphones entitled: JUST STEP UP TO THE MICROPHONE written by Robert Hawkins.

The following two paragraphs are taken from the article by Hawkins.

In the early thirties, a move toward real quality was made with the introduction of the velocity or ribbon microphone, so-called because the sound waves vibrate a narrow corrugated duraluminum ribbon suspended betwene the poles of a strong magnet, setting up small electric currents which are then amplified. The ribbon mic is highly sensitive on both broad sides of its face but scarcely at all

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on the edges, and has a frequency range from 30 to 15,000 Hz. Used almost always indoors due to its extreme sensitivity, it immediately was universally acclaimed for both dramatic and orchestral use.

In a short time, Western Electric introduced a cardioid directional microphone which was really a combination of two mics, the ribbon and the dynamic, with an adjustment so each type could be used independently. It contained two ribbons: one free-moving and one baffled acoustically with a sound-absorbing material. This was the first instrument to combine not less than three pickup characteristics in a single unit. By switching, its pattern could range from non-directional to unidirectional to cardioid. RCA followed with their variation of the cardioid 3-way adjustable, the 77-B, which had the characteristics of a velocity mike with the advantages of directionalism. Each of these are fairly flat up to 10,000 Hz.

The second paragraph is in error for the reasons which follow: The RCA 77A Unidirectional Microphone was the first commercial microphhone with a cardioid directional pattern. The microphone was commercialized in 1934, at least five years before the Western Electric Unidirectional Microphone with a cardioid directional pattern was commercialized.

I presented a paper on the RCA Unidirectional Microphone at the meeting of the Acoustical Society of America in Cleveland, Ohio on December 1, 1932. The abstract of the paper is published in the *Journal of the Acoustical Society of America*, Volume 3, Number 3, p. 315, 1932. This abstract states that the directional pattern is given by the cardioid, $R = R_0 (1 + \cos\theta)$, where R is the normalized response, R_0 is the response of the pressure and velocity sections and θ is the angle the direction of the impinging makes with axis of the microphone.

Marshall and Harry presented a paper on the Western Electric unidirectional microphone at the Meeting of the Acoustical Society of America in New York, N.Y., on May 16, 1939. The abstract of the paper is published in the *Journal of the Acoustical Society of America*, Volume 11, Number 1, p. 164, 1939.

U. S. Patent No. 1,892,645 was issued on the RCA Unidirectional Microphone to Harry F. Olson and J. Weinberger on Dec. 27, 1932.

To summarize: The RCA Unidirectional Microphone with a cardioid directional pattern preceded the Western Electric Unidirectional Microphone in development, publication and commercialization by several years. RCA pioneered in the development and commercialization of the unidirectional microphone with a cardioid directional pattern which has now become the universal directional microphone in use today.

Harry F. Olson
RCA Laboratories
Princeton, N. J.

The Editor:

With regard to my article A SIMPLE HIGH QUALITY MIC PREAMP, printed in the July issue, here are a few corrections to minor errors and omissions, which may serve to clarify some of the questions raised in trying to build a similar unit.

Table 1. Frequency response: ±1 dB, 30-20,000 Hz; ±2 dB, 20-25,000 Hz. Equivalent input noise; −123 dBm, full bandwidth, unweighted (0.3 μV).
Input overload: −23 dBm at midband; lower at frequency extremes.

Figure 1. (C1, C2) 25 mFd 15 V tantalum capacitor (Sprague TE-1157.1); larger size, higher voltage required if greater power supply voltage applied.

(T1) 200/800 Ω transformer and shield (UTC 0-25 connected for 150 Ω input and 600 Ω output, and 0-17 shield). (T2) 30 k/200 Ω transformer (UTC 0-10 connected for 30 kΩ input and 200 Ω output).

I hope this information is of assistance. I also wonder if anyone has achieved comparable preamp performance (primarily in the 0.3 μV input noise specification) with integrated circuits. My recent experience with the RCA CA3048 and the Fairchild μA739 indicated the possibility of coming close.

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John M. Woram

THE SYNC TRACK

● *"I am just getting started in recording and am equipped with a four track and a two track recorder, a mixer and some microphones. The equipment is all quite good 'semi-pro' quality; however, my recordings don't sound professional because I have no compressors.*

"I cannot use a compressor after the mixer because it would bring up the noise floor; therefore compression must take place before the mixer. To date, I have only found one compressor that will compress mic level signals (M62V Level-Loc by Shure). If I had to get high quality mic preamps and line compressors for each microphone, it would cost me a fortune. Therefore, would you recommend the use of a compressor such as the Level-Loc, or do you see another solution?" (excerpt from a letter recently received.)

Before looking for solutions, let's back up a little bit. Compressors are wonderful devices, but they don't *professionalize* a program. If a so-so signal is applied to the input, the output will be compressed, and that's about all you should expect. That *professional* sound originates elsewhere, although the compressor may certainly help somewhat from time to time. But don't look at the compressor—or for that matter any other piece of gear—as anything more than a tool, to be used as needed, hopefully in a professional manner. It has no intrinsic professionalism of its own. This must be supplied by the operator. In fact, the effect of a compressor used professionally may be all but undetectable.

The point is—it's misleading to consider any specific piece of equipment as the key to success. I guess this is just a continuation of the music-vs.-technology debate. But it is important to understand—right at the beginning—the role of the equipment. A compressor, properly used, may assist you in creating a professional recording. However, it will not transform an indifferent recording into a good one just by being plugged in.

Moving right along—it's important to understand what a compressor is actually doing. It might help to think of the compressor as a variable gain amplifier. When low level signals are applied, the compressor does not react and the output signal is the same as the input. However, once the input level exceeds a certain point, the gain of this "amplifier" goes down; therefore a further increase of say 10 dB at the input may give only a 5 dB increase at the output. But, when the input signal is once again lowered, the gain of the compressor returns to normal. As this happens, the low-volume signal components rise to their normal (un-compressed) level. And of course, so does the residual noise, hiss, leakage, and what-not. In severe settings, this gain restoration becomes audibly objectionable, since it creates a "pumping" or "breathing" sound as the noise level goes up and down.

If only one microphone, or track, is being compressed, a lot of the pumping may be masked by the program content from the other microphones, or tracks, which are not being compressed. In fact, several compressed signals may be combined, after individual compression, and each signal will help mask the pumping noises of the other signals and in turn be masked by them. However, when the total program is fed to a single compressor, its effects will be comparatively easy to detect since there is nothing else going on to mask the pumping sound. Treating the total signal is usually referred to as "program limiting" and generally a more sophisticated compressor is required.

(For a more thorough discussion of the differences between *limiting* and *compressing,* see the October and November 1970 SYNC TRACK. For now, the two words may be used interchangeably).

Anyway, since one signal may require more limiting than another, and some will need none at all, it is important to be able to insert a limiter (or compressor) somewhere in the individual signal path before it is mixed with other signals. In a studio console, there is usually a patch point somewhere after the mic preamp to accomplish this. Generally, the patch point appears after the signal has been amplified to about line level, since this seems to be the operating

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level favored by most professional limiters.

However, in the absence of any patching facilities, the engineer must either choose the mixer output or the mic lines as his insertion point. Generally, mic lines are best left untouched, since at these low operating levels, some limiters won't function at all, or the output from the limiter will be too loud, too noisy, or both. However, the Shure Level Loc was designed for mic level operation, so it should function properly—which brings us at last to the reader's inquiry. If the Level Loc gives good results, look no further. There are certainly more sophisticated devices around, with price tags to match, and many of them won't function as well as the Level Loc, given the necessary limitations of the reader's set-up.

However, if more flexibility is definitely required, perhaps it would be possible to modify the mixer so that a compressor could be inserted somewhere after the first stage of amplification. Of course, this requires a little knowledge of circuitry, and a mixer that may be re-worked without falling apart.

It might be more practical to buy an inexpensive second mixer, such as the Shure M67, and feed the microphones to be compressed into it. Then, the high level output could feed a professional quality compressor, with the output of the compressor feeding a line level input on the original mixer. There it could be mixed with those other mics that did not require compression.

Of course, there comes a point at which such "outboard rigging" can get to be more trouble than it's worth. The flexibility gained with each additional signal path available does not long remain proportional to the number of external devices plugged in. Any set-up that gets significantly more complex than the one just described should be examined very carefully before the fact. It might actually be more economical to invest in the gear that will give you the flexibility you really need, rather than trying to create it out of a collection of less expensive components.

A final point to consider is that when program limiting is the center image, shifting that may be apparent when one side of a stereo program requires compression. Consider what happens when say, the right track of a stereo program is compressed. Every time the compressor reduces the gain of the right track, center located images will apparently shift momentarily towards the left, since the amount of center information located on the left track remains unaffected by the compressor. Therefore, a stereo adapter is required, along with an additional compressor for the left track. Simply stated, the adapter is an interconnection between the two compressors. With the connection in place, any limiting action in one unit will cause the same amount of gain reduction in the other. Therefore, the total program will be compressed, rather than just one side, and soloists will remain centered.

On another matter, the writer inquired, *"What is the proper procedure for miking an upright piano?"* He noted that he was using an AKG D-224 microphone, but that the piano sounded very distant.

Fortunately, there is no *proper* way to place microphones. If there were, someone would have published a book of mic placements long ago and all recordings would sound pretty much the same. I should digress here for a minute to point out that Lou Burrough's new book, *Microphones: Design and Application*, has little to say about where specifically to place a microphone to record a particular sound. He does tell you what to guard against in setting up for a recording, but the actual placement depends upon your taste, knowledge, and the personality of the microphone in use, along with a consideration of what else is going on in the room at the same time.

Getting back to the question, about all that can be passed along here are some very general statements. The D-224 is one of the finest cardioid dynamic microphones around. The response is quite flat, and off-axis response is excellent. If the piano sounds distant, the first thing that comes to mind is to move in closer. Perhaps the room is on the live side, and a lot of off-axis reverberant sound is being picked up. Of course, if the microphone is too close, it may not be able to pick up the total piano sound. In this case, perhaps an omnidirectional mic might do better.

Then, where is the microphone? In front of the piano? above it? in the rear? etc. Try a different location. Piano mics have been seen in very unlikely places, and it may be worth while to do a little experimenting here.

I presume this is sufficiently vague so that it will seem that I have answered the question without actually having done so.

Seriously though, there are no stock answers to microphone placement questions, other than to respect Lou Burrough's advice to continually experiment while keeping the basics of mic technique in mind. ■

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Norman H. Crowhurst

THEORY AND PRACTICE

● Many years ago, I heard a cute pair of definitions that distinguish an engineer from a salesman. An engineer is a man who learns more and more about less and less until he finishes up knowing everything about nothing. A salesman is a man who learns less and less about more and more until he finishes up knowing nothing about everything.

That comparison makes a good point about two noticeably different trends in people: the engineer specializes, the salesman diversifies, to put each occupational tendency in one word. Another way of stating substantially the same distinction between the two types, wheher or not they should be rigidly identified with these specific occupations, is that some people are interested in things, while others are interested in people.

Such definitions imply a sort of absolute distinction. If we accept them that way, then nobody is either a perfect engineer or a perfect salesman, using those designations pro tem. Every man is a bit of each, although his actual occupation may be neither of those designated!

In this connection, the thing that has interested me has been that the kind of people who read this magazine, and who respond to this column, seem to bridge these extremes, about 50/50. They are, by their having selected the vocation, engineering, but mostly in communications, balanced type of individuals.

Pursuing this viewpoint, it would be correct to say that either extreme makes a somewhat unbalanced personality. People who balance the two divergent properties have, to some extent at least, "got themselves together." They have integrity; they are able to get to the truth of a matter.

Such a line of thought starts me, inevitably, thinking about individuals I have known and about activities in which I have engaged. And I get to thinking about honesty and integrity. And from that, to thinking about how people get the way they are.

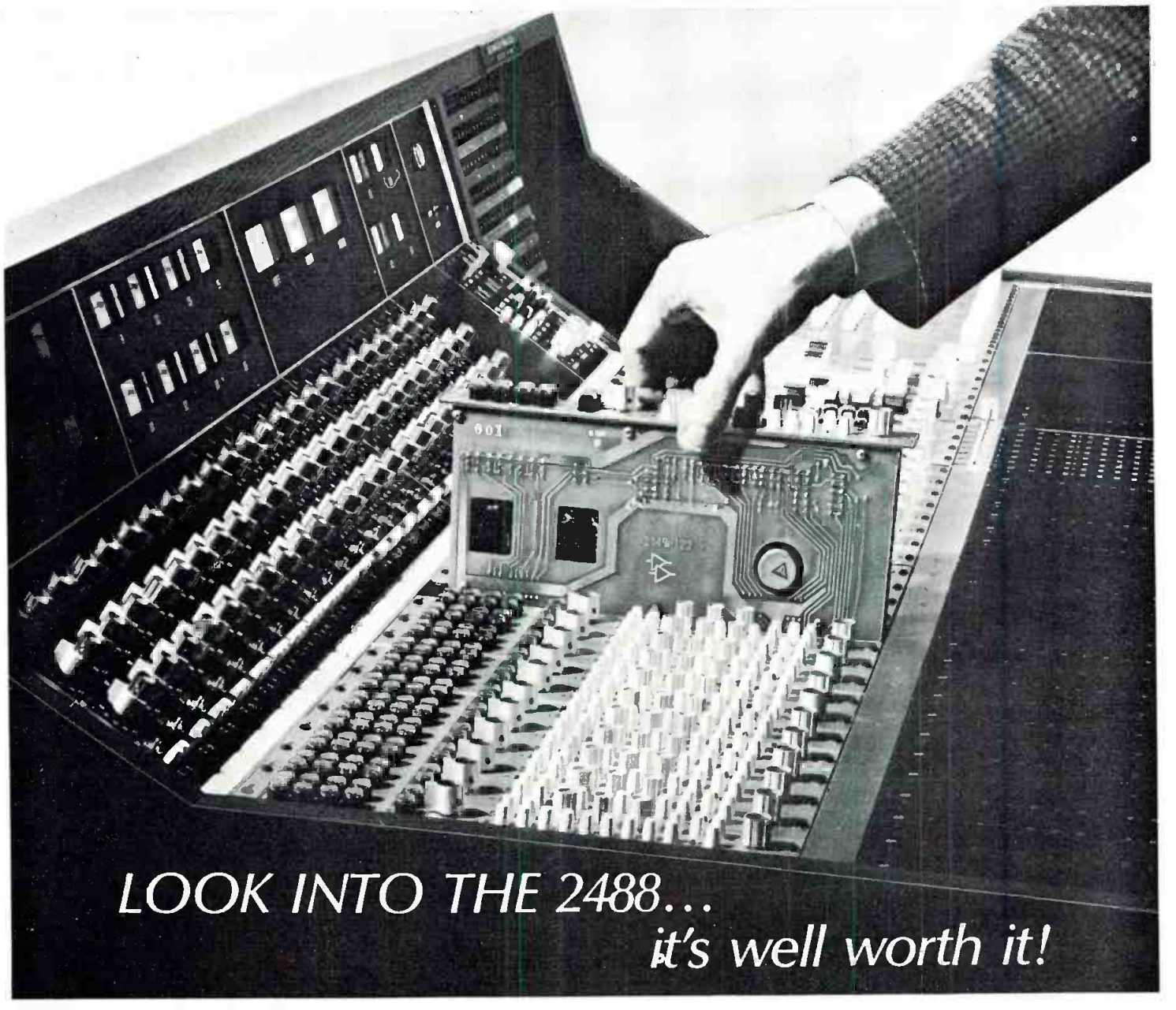
This column has commented before about the double standard I have observed among educators. As Americans, we deprecate a double standard of any kind as duplicity, lack of honesty. But are we right in doing so?

As many of you know, in documents I have made available I have analyzed this matter rather carefully. A person with the most honest of intentions gets himself entangled in this double standard without even knowing it. An instance that struck me as most dramatic, would never "wash" at all, in engineering circles.

I refer to education's standards for reporting the results of a program or project. Such results may not be compared with the outcome of other programs or methods, but only with their own outcome; if only a few students do learn some little thing while participating in the project, the outcome is reported as showing "significant improvement"; the only outcome that would be reported as showing no improvement would be if *every* student actually knew less after than before—an admittedly unlikely outcome of any activity. Yet, when reading someone else's report, an educator takes "significant improvement" to mean much the same as it implies to you and me.

That sort of double standard, written ambiguously, seems dishonest. It results in mediocrity being consistently reported as excellent! But I have seen enough to be sure that this is seldom, if ever, done intentionally. In fact, people who have their thinking thus bifurcated seem completely unaware that it has happened. Those who have sent me the cost of xeroxing copies of my own documentation will have read many more instances taken from throughout the educational system of how this kind of thing has developed.

I mention this only as background for a recent happening that was, for me, a quite thrilling experience. In all this activity, I count myself as an outsider to education, mainly, I suppose, because most educators make it very evident that they count me an outsider. An engineer could never become a dyed-in-the-wool educator! The happening to which I refer came in the form of the most complete confirmation I could ever hope to find, from someone who really is, if he will pardon my saying so, a "dyed-in-the-wool" educator—an *insider!*



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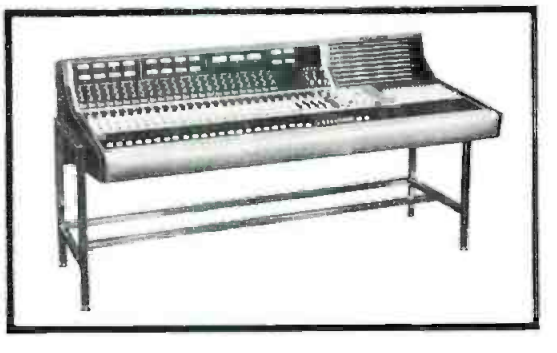

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Carl Salser's father brought him up on university campuses (campi?). When his father retired, some years ago, he was disgusted at the direction education was then taking. Both of them have a deep belief in "the American dream," so much of which became reality since 1776. They realize too that today's education seems hell-bent to destroy that dream. What presents the major problem is identifying how the change came about.

Carl just sent me an autographed copy of his new book, *A Tyrant in Cap and Gown*. After having read it, scarcely able to set it aside to eat, I would prescribe it as *must* reading for anyone with even the least interest in education, or in the future of our nation, to which the right kind of education is such a vital necessity.

The author has lived on the inside, seen some of the changes develop, as a first hand experience. He has also done his homework, beautifully, on what transpired before he came on the scene. The chapters are concise, divided into shorter bite-sized subheadings that are packed both with solid information and with crisply stated and accurate analyses of the points covered. Whether you read it, as I did, by picking out pieces whose captions excite your curiosity, or whether you start at the beginning and take it in sequence, it makes delightful reading, from cover to cover.

So, if you want your money's worth, in something that will steer you well about what all of us can do to help resolve our country's growing problems, I suggest you order this book. The publisher is Halcyon House, 2540 N.E. Union Avenue, Portland, Oregon 97212, price $7.95. The book is worth every penny.

As most of you know, I came at this whole thing quite differently from Carl Salser. Back in the '50s, I found that young engineers had been poorly prepared for their careers by the college courses they had taken. So I sought reasons, with a view to helping to provide a solution. That was when I found myself, unexpectedly, being treated as an outsider.

Back in my native England, working simultaneously as a chief engineer in work that involved me in industry-wide conferences and as a college instructor, I had always regarded industry as being the "customer" for the colleges' "products"—students, graduated, ready to start work.

So the utter disregard for such an objective that I encountered in this country, came as a little of a shock. Not that these educators brushed me aside, exactly. No, the lack of concern showed itself in the ingenuity of their buck passing, by which nobody would accept the responsibility for the state of affairs, or be prepared to do something about it.

The college professors acknowledged that their graduates might be ill-prepared for the world of work. But it was not their fault. They were doing the best they could with the "material"—meaning high school graduates —that came to them. I should look at the high schools. I finished up looking at first grade, about the time my own children were entering the system, and thus started looking all the way up again!

The educators' viewpoint has been very insidiously propagated. Let me cite you an instance. Recently I conducted a number of separate experiments with my different approach to teaching math, which I am putting together in a package I will call *Problem Solving Arts*, simply because it is totally different from anything that educators call either old or new math.

Because of the educators' almost universal propaganda, I sort of expected that the "bright" students would be almost instantly challenged by my new approach, while the "slow" students would take a little longer to cotton on, if they did at all.

To my surprise, the reaction was almost exactly *vice versa!* The "slow students" were with me in no more than ten or fifteen minutes. In this instance, I am talking, believe it or not, about a whole class of students that their teacher had described to me as being totally turned off to mathematics, and who were real discipline problems. These students almost instantly reacted in a way that beamed from their faces: here is someone who can really help us make sense of all this stuff; it could even be fun!

On the other hand, the bright students were puzzled by the same kind of material that the slow students took to instantly. How come! I should have known why, and expected it. My point is that I didn't, because I too had been indoctrinated by the system, without realizing it.

What the bright students are bright at is divining what the teacher wants them to do, and doing it. They understand very little of cause and effect. When you talk to them about it, they react as if nobody understands the stuff—one isn't supposed to, is one? All one does is just to make the appropriate response, and be appropriately credited therefor!

These bright students' brains had in fact been turned off for several grades by now. They had merely acquired a way of "fooling the system." Now, when these students find themselves in "problem solving arts," one thing required, before they can respond to anything, is that they *think*, a process that has become almost a lost art.

So it was, the "slow" students found almost instantly that being allowed to think for themselves can be unexpected fun, while the "bright" students actually took soemwhat longer to make the same discovery!

Things like this I have observed, and documented at various levels. Also my remedies have met with considerable evidence of success. Now Carl Salser's book comes in at the whole situation from a completely different angle, and puts together a lot of the pieces I had inevitably missed, because of our different vantage points. And the way he does it makes truly refreshing reading! ■

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Martin Dickstein

SOUND WITH IMAGES

Video Expo IV and SMPTE

● It is sometimes unfair to everyone, including the reporter, to have to cover two conventions, each worthy of separate coverage, in one story. However, this will at least give you some idea of what was shown and said at the Video Expo IV and SMPTE conferences.

Video Expo IV, which took place at the Commodore Hotel in New York City from September 18-20, was the fourth annual international exposition devoted entirely to private, closed circuit and cassette delivery systems and programming, and was sponsored by Knowledge Industry Publications, Inc., publishers of *Video Publisher*, *Educational Marketer*, *Knowledge Industry Report*, and *Advanced Technology/Libraries*. Simultaneously with the exhibition of hard- and soft-ware, there were two video workshops, a session of *Programming Your Video Cassette*, and the conference, *Video Publishing Year IV*. Over 50 companies took part in the exhibit, and close to 3500 people from industrial, institutional, and educational organizations associated with, or interested in video participated.

In the exhibit area, several firsts were on display. Shown in its East Coast preview, RCA presented its SelectaVision MagTape video recorder, one of the latest entrants into this field. One more first was the showing by Windsor Total Video of its Spectra-Vision back spacer, an editor for video tape with automatic cueing to cut edit time in half. A new entrant in industrial video is Sharp Electronics, known to educational and audio/visual people for the a/v equipment they manufacture. At this show, Sharp displayed a complete video system, including a color camera with a 1 inch vidicon and 3 inch crt viewfinder, a ½ inch cartridge video tape recorder conforming to the EIAJ standards, and a line of monitors and receivers ranging from 9 inches to 19 inches.

Consolidated Video Systems showed, for the first time, its new time base corrector model CVS 502. Basically, helical-scan video has never been up to broadcast time base requirements. Analog time base correction cannot completely solve this problem. This helical digital video signal corrector allows for more storage and processing capacity than the analog unit. The new unit features het-

Figure 1. The BJA Chromaton 10 will produce animated designs and patterns in motion and color on the t.v. screen. It is used in the production of t.v. titles, backgrounds or sets for performers, special visual effects and graphics, and as a direct entertainment tool.

erodyne color and operates on non-capstan servoed vtrs.

Other equipment on display included a Magnavox hand-held color camera which can operate in the relatively dim light of thirty footcandles of illumination, the first EVR showing by a combined exhibit of EVR Systems, and Hitachi with some of the first color film cassettes made in Japan, and the Hitachi magnetic disc memory system. This latter device uses a disc to record up to fifteen still images from any video source in selectable time intervals and then replay them in any playback time chosen.

Image Magnification, Inc. demonstrated its single-head monochrome and three-head color large screen projectors. Both units are specified as capable of images on the screen of up to 20 foot width. The black-and white unit has built-in keystone correction up to 25 degrees while the color units can be corrected up to 20 degrees. This allows the heads to be located off optical center of the screen with no keystone distortion.

Another interesting device demonstrated at Video Expo IV was the Chromaton by BJA Systems. With switches and controls on the front panel, the operator can generate patterns at random or designs according to a predetermined plan, or he can set up for incoming signals such as music or video to show up in patterns on a video screen. With a video signal input, for instance, it is possible to colorize the images being introduced and also to create effects along with, or as background to, the video information.

It would be impossible to list all the exhibitors at the Video Expo show, but among them were Arvin Systems, Audio Magnetics, Kodak, Harvey Radio and Audio, IVC, Martin Audio, Panasonic, Retention Communication Systems, Sony, Videoplay Merchandising, Video Player Magazine, and many more hard- and software companies. Once again, it is necessary that you realize that selection of exhibits or equipment and excerpts of talks are made without reference to their merit, or as comparison with relation to other similar equipment or ideas.

At the "hands on" workshop sponsored by *Media & Methods Magazine*, the subject covered was *Production Problems in Single Camera Systems*. Eight "tracks," or sessions, covered different phases of the subject of cameras, vtrs, and production. *Basic Operating Techniques of a Single Camera Portapak System, Basic Half-inch Electronic Editing, Planning for Structured Productions, Vtr Feedback, Incorporating Other Media Into Your Videotapes, Troubleshooting Your Single Camera Vtr System*, a vtr symposium, and a discussion of how to select a single-camera vtr system and expand it were the topics covered at the sessions.

At the workshops sponsored by the International Industrial Television Association, the subjects discussed were

aimed at video users and covered video systems management and production. Two matters under consideration were *Connecting Up the Organization* and *Production Problems in Multi-Camera Systems*. Members of the ITVA include managers of corporate, government, and institutional television facilities and services. Subjects aimed at them were *Managing Private Video*, *Upgrading the In-House System*, *How to Succeed in Video*, *Production Elements*, and *Remote Shows and Software Distribution*.

The keynote talk for this workshop was given by Mr. Hubert Wilke, president of Hubert Wilke, Inc., communications facilities consultants. In his remarks, entitled *Management and the Tube*, Mr. Wilke raised specific questions on the subject of the use and application of video in management communications and then presented his solutions. One of his questions, for example was "Is now a good time to get into video with all of the non-standard problems? Assuming we did, what happens to other audio/visual inventory: films, filmstrips, audiocassettes?"

Mr. Wilke then answered the question: "There are two questions here, so let's take the first one—timing. One can't blame management for understandable nervousness in the face of conflicting tape and film technologies, and incompatibilities within each technology.

"Well, I don't want to oversimplify an admittedly complex problem, but I'd like to make one or two points. First, most of us are institutional users, and for the great majority of institutional applications in the low to medium volume range, videotape or videofilm is still a good solution. Beyond that, videodiscs could present attractions, and should be examined as and when they are available. Secondly, most institutional use is within a network setting—all programs within that network need to conform to its standard. And thirdly, it would appear that the ¾-U format has already achieved a predominance in this country that practically establishes a *de facto* standard. When these reassurances are put into the balance along with the new uses and possibilities that video opens up, the answer is 'Yes'; I would say that now is a good time to get into video.

"As to the existing audiovisual inventory—to the best of my knowledge, very few organizations going into video have done so at the total expense of their remaining a/v operations. Filmstrips and audiocassettes are having their best years ever. I

Figure 2. The three heads of the Image Magnification large-screen projector. The entire unit can be operated remotely from up to 100 feet away. A detail enhancer is built in.

know of several instances in which video programming, for reasons of portability, is being distributed on Super-8 film, as well as in videocassettes. The fundamental fact is that there is no universal a/v medium. Filmstrips, slides, overhead transparencies, film—each conveys certain messages in certain settings superbly well and should be retained for those purposes. Video, on the other hand, opens up application of great importance, previously untouched, or marginally handled."

Finally, the Video Publishing Year IV Conference on The Development of Various Markets for Video Programming presented speakers who discussed the latest uses and design of video software. Reports were given on video systems and developments in Canada, Europe, North America, and Japan.

SMPTE

The Society of Motion Picture and Television Engineers, an organization that helps to set up and disseminate information on the latest developments and standards in the film and video fields, ran its 114th Technical Conference and Equipment Exhibit October 14-19 at the Americana Hotel in New York City. Over thirty-five companies, including some of the biggest names, exhibited their latest hardware in the film and video fields. Industrial giants in their fields, like Angenieux (lenses for film and t.v.), Arriflex (professional cameras), Bell & Howell, Canon (lenses), Eclair (cameras), Image Devices, Magnasync/Moviola (movie sync and viewing equipment), Nagra, and Paillard were included. One new device was shown by I/O Metrics. The IOM Videodisc, as it is called, uses laser and high resolution techniques to print images on a film disc. One full revolution contains one color video frame. The great advantage of this system is described as being its quantity possibilities at low reproduction costs.

At the talk sessions, subjects covered ran from film production techniques to laboratory practices, from digital techniques and mini-computer applications in television to electronic journalism, and included discussion of recent applications of cassette vtrs, a portable compact color t.v. facility, and the new international 2 inch helical scan vtr. Over sixty papers were given in these subjects, and just to show how extensive was the material covered, a booklet giving just synopses of the papers ran to over fifty pages in itself.

Well, as you can readily see, trying to tell you about eight days of exhibits and talk sessions is well nigh impossible in such short space, but at least we hope your interest has been aroused to find out more about these meetings and to attend a few yourself. There is just one more which took place on November 29, the Day of Visuals which we will cover in some depth next time. ■

E.P.M. Parabolic Microphone

What is it?

The Dan Gibson EPM Parabolic Microphone is a device designed to gather high-quality sound from a distance. The EPM is to sound recording what the telephoto lens is to film.

What models are available?

The EPM comes in two basic versions: the Electronic and the P-200. For ultra-critical sound recording such as music recording, the Electronic is recommended. For less critical work, such as surveillance or nature photography, the P-200 is the most economical route.

What are the general features of both EPMs?

Both the Electronic and P-200 EPMs feature a ¼"-20 mounting thread in the handle. This allows easy adaptation to tripods or camera mounts. The "dish" size is 18¾". The recordist can easily see his "target" through the transparent shield and a built-in sight is provided to accurately pinpoint sound.

What are the features of the EPM Electronic?

The Electronic operates from two easily obtainable 9 volt transistor radio batteries. Its built-in modular circuitry produces amplification of the signal and a feed to the high-efficiency monitoring headset which is included. Virtually flat response from 250Hz. to 18,000Hz. is accomplished by the internal electronics. The effective recording range, under ideal conditions, is up to ¾ mile. The EPM Electronic comes with its shielded output cable "pigtailed."

Output impedance of the Electronic is a nominal 150 to 600 ohms (low-impedance). An equalization switch for "speech" and "music" effectively changes the roll-off characteristics for recording under different conditions. A low frequency built-in tantalum wind filter eliminates unwanted sounds below 150Hz.

How does the P-200 differ from the Electronic?

The physical characteristics of the P-200 are identical to the Electronic. The P-200 has no electronics. Sound output from the specially designed and focused microphone module is fed directly to the "pigtailed" output cable. The P-200 may be wired for high or low impedance. Sound monitoring from the P-200 must be done from the input device, since there is no provision for direct headset monitoring as in the Electronic.

What are the best input devices?

Any high quality tape recorder may be used with either the Electronic EPM or the P-200 EPM. A simple cassette unit will adequately record all but the most critical sound. For super-critical motion picture recording, a location syncronous recorder, such as a Nagra, Arrivox-Tandberg, Stellavox, etc. is recommended. Dut to susceptability to acoustical feed-back, the EPM Parabolic Microphones are not recommended for public address system use, unless the audience is isolated from the sound source.

What are some of the applications of the EPM?

The EPM may be used for feature and commercial films, interviews, press conferences, etc. It eliminates the need for lavalier mikes, microphone booms and the clutter of microphone cables. All film applications, of course, apply equally to VTR, CCTV and radio.

EPM's are ideal for school and training applications. The subject is more at ease, more confident and less inhibited without the distracting presence of close or moving equipment.

In the industrial or commercial fields, EPM Parabolas can be used in conference rooms, in research and development situations, and in industrial equipment analysis. Surveillance and security are prime uses.

The Gibson Parabolic Microphones were originally designed for environmental recording. In addition to the above applications, they are unsurpassed for nature and wildlife recordings.

Model P-200
$119.50 with case

Electronic Model
$299 with case

Specifications

Microphone: Controlled dynamic with large diaphragm.

Frequency response: Electronic: 250-18,000Hz. ± 5dB. P-200: 300-10,000Hz. ± 5db.

Cable: High quality, 100% shielded. Terminated in "pigtail." May be wired for balanced or unbalanced output as required by user.

Shield: Diameter 18¾". Made of non-resonant transparent, high-impact plastic. Temperature range —10°F to 104°F.

Headset: (Electronic model only) High quality, lightweight, high efficiency. Cushioned earcup to seal out extraneous noise.

Carrying case: High density styrofoam. Vinyl covered. Temperature range —10°F to 104°F.

Weight: Electronic: 5½ lbs. P-200: 3½ lbs.

Send check or M.O. to:

TIMEKEEPER

P.O. Box 35, Great Neck, N.Y. 11021

Please send me _____ Model P-200 @ $119.50 and/or _____ Electronic Model Parabolic Microphone @ $299.00. N.Y.S. residents add 7% sales tax. I enclose $_____.

Name _____

Address _____

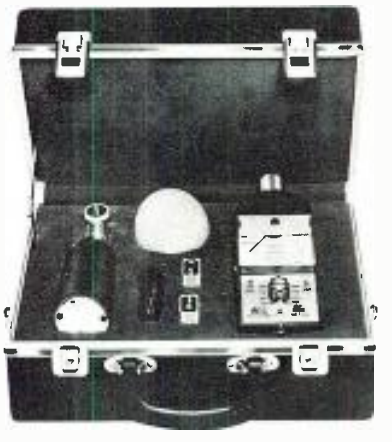
City _____ State _____ Zip _____

NEW PRODUCTS AND SERVICES

DYNAMIC SIBILANCE CONTROLLER

● Operational simplicity marks this new de-esser; there are only two operating controls: a threshold control to determine the level at which the sibilants start to be controlled and a switch to defeat the action without clicks or gain changes. An led lights up to indicate when control is taking place. Essentially a limiter with a frequency-dependent feedback loop, the dynamic sibilance controller features low noise and distortion; the overload/noise ratio is typically 100 dB with harmonic distortion typically below 0.1 per cent. Extremely fast attack and release time permits tight, inaudible control action. Supplied with three independent de-essing channels on a 1¾ inch rack panel.
Mfr: Parasound, Inc.
Price: $395.00
Circle 70 on Reader Service Card.

SOUND LEVEL MEASUREMENT KITS



● Intended to aid compliance with noise pollution regulations, these four kits contain sound level meters, acoustical-type calibrators, wind screens, neck straps, batteries, and instruction manuals, with carrying cases. Model 370-K1 includes model 370 sound level meter type 3 and model 371 acoustic calibrator, single frequency with adaptor for ½ inch microphone. Model 370-K2 contains model 372 multi-frequency calibrator, featuring a three-position toggle switch for selection of either 100 dB or 114 dB sound pressure level and battery check and a five position switch, covering frequency levels 125 Hz, 250 Hz, 500 Hz, 1000 Hz and 2000 Hz. Model 375-K1 includes model 375 sound level meter, type 2, and model 371 acoustic calibrator. Model 375-K2 is the same as model 375-K1, except that it includes model 372 multi-frequency calibrator. All sound level meters utilize an omni-directional microphone, selectable (A), (B), and (C) response and *fast* and *slow* meter response.
Mfr: Triplett Corp.
Prices: Model 370-K1: $397; 370-K2: $512; 375- K1:$472; 375-K2: $587.
Circle 66 on Reader Service Card.

TENSION SENSING HEAD

● Low-mass, high response design enables MTM-103M miniature tension sensing head to detect short, transient tension pulses in magnetic tape, film, web, and other thin strip materials. Using a rotating sensing bar and two guide rollers with ABEC-5 bearings, the unit contributes zero friction to tension readings in situations where precision is crucial. It will handle materials up to ¾ inch wide at high speed. A series of analog readout/amplifiers is also available, enabling the user to configure a complete closed-loop data acquisition and servo control system. The manufacturer also offers kits to convert stationary sensing bar tension heads to rotating sensing bars.
Mfr: Nortronics, Inc.
Circle 61 on Reader Service Card.

QUARTZ CORDLESS CLOCK

● Quartzmatic cordless clock, operated on an ordinary (C) flashlight battery, solves the problem of providing accurate timing in areas where an electrical outlet is not available. The manufacturer claims that the electromechanical quality of the quartz clock movement delivers accuracy to one minute a year, less than two-tenths of a second a day. Twelve inch diameter with a red sweep second hand. Available in black on white, black on tan, or white on black and bronze.
Mfr: Westclox (General Time Service)
Price: $55.00
Circle 64 on Reader Service Card.

Altec, we challenge you.

Any company that achieves a position of leadership must be prepared to meet the challenge of innovation. In the recording industry, this is a particularly crucial factor—because constantly evolving musical material demands ever newer and better recording techniques.

For nearly 30 years, one name has dominated the studio monitor market. Altec. In 1973, Altec had more than twice as many speakers in recording studio use in the U.S. than its nearest competitor. And nearly as many as all other brands combined. (Source: Billboard's 1973 International Directory of Recording Studios.) That's leadership without question.

Now someone is about to challenge that leadership. Us.

Our first step: introduce three all-new monitor loudspeakers. They're a whole new breed, designed for tomorrow's recordings. And they exceed the performance characteristics of every monitor ever made. Including Altec's.

They're packed with improvements and specs guaranteed to satisfy the goldenest of ears. Improved accuracy and definition. Better transient response. Flatter frequency response. Greater bandwidth. Greater power handling. And much more.

Add to all that our 37-plus years in the field of sound reproduction, and we think we're ready to challenge the leader.

Even if we have to do it ourselves.

ALTEC

the sound of experience.

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The challengers.

From front to back, it's the 9849A, the 9846-8A and the 9848A. If you listen for a living, you should know more about them. Write or call. We'll send you all the facts and figures.

Circle 35 on Reader Service Card

POCKET-SIZED SOUND LEVEL METER

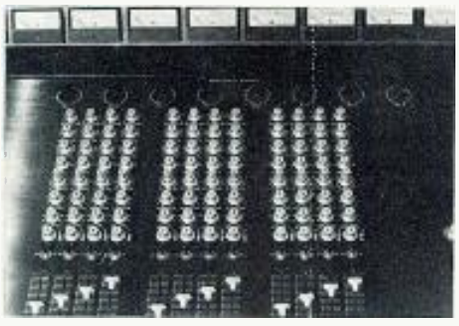
● Small enough to fit into a pocket, model 451C sound level meter gives readings which meet or exceed ANSI type S3C accuracy. A range of 45 to 130 dBc sound pressure level permits measurement of ambient and background noise as well as the signals of interest. The meter reads directly in dBc without interpolation or computation, making it suitable for non-technical personnel. Operated by transistor battery.

Mfr: Scott Instruments
Price: $98.00
Circle 62 on Reader Service Card.

MODULAR MIXING CONSOLE

● Designated B Series, this is an electronically improved modular version of a unit which has already found acceptance from this manufacturer. Channel features include nine frequency equalization, solo-mute, dry channel pan, echo pan, monitor mix, earphone mix, echo send, line-mic switch, input gain trim, bus selector, and in-line fader. Amplification is provided by a plug-in operational amplifier; all signal switching is solid state mos analog switch. All circuits are designed to one per cent tolerances.

Mfr: Multi-Track
Circle 75 on Reader Service Card.



PROGRAM EQUALIZER SOLID STATE DUAL ACTIVE

● Model PEQ-82 features two independent equalizers packaged on a single 1¾ inch x 19 inch rack mount panel. The equalizers are transformer isolated and operate at levels from −20 dBm to +4 dBm. Circuits operate at unity gain with a maximum ouput level of +24 dBm. Each equalizer may be silently switched in and out, with controls which are infinitely variable with continuous adjustment from −12dB to +12 dB at each of four frequencies simultaneously. Each control may be switched to operate at either one of two frequencies: 80 Hz or 150 Hz, 300 Hz or 600 Hz, 1.6k Hz or 4k Hz, and 7.5k Hz or 12k Hz. In addition, each channel provides a high and low filter with −3 dB points at 80 Hz and 10k Hz.

Mfr: Auditronics, Inc.
Price: $325.00
Circle 71 on Reader Service Card.

SYNTHESIZER AND MODULATOR

● Improvements incorporated in the new Performer synthesizer, at no increase in price, include a depth control on the panning control, a variable dial to control the portamento, a new professional keyboard and a rear panel enlarged to include eighteen inputs and outputs. The one piece, self contained, portable unit has 102 color-coded switches, quad output, automatic panning, pre sets, X + Y slide controls and a keyboard octave coupler. The output volume has been doubled. Color contrast is used on knobs and dials throughout. Lights are used to display the engagement of any of the devices and on the manual trigger. The unit, using computer control, is polyphonic and automated; tunings can be macro or micro and well tempered. Two tunings can be sounded simultaneously.

Mfr: Ionic Industries, Inc.
Circle 72 on Reader Service Card.

PORTABLE MIXER

● Designed for mobile use, the Mavis portable mixer has basically 15 fully equalized input channels, plus two high level auxiliary input channels. It can be used in two configurations, either four track full range output or two track output split into three channels each track, each channel controlled by an electronic cross over. The remaining two tracks can be used either as full range tracks or re-mixed into tracks one and two as sub-mixers. The unit also has two fully equalized independent monitor outputs and drive facilities for an external echo system. There is also an output for use with headphones when cueing each channel.

Mfr: Heil Sound Systems
Circle 65 on Reader Service Card.

CONTINUOUS LOOP BROADCASTING CARTRIDGE

● Designed to meet the needs of f.m. stations which broadcast in stereo and require stereo phased cartridges, model A-2SP features critically molded tape guides to permit perfectly parallel fit of tape to the playback head of the broadcast cartridge equipment. It also has a precision braking system to hold the cue accurately in place, a guide-by-angle device which prevents wear on tape and guides as the tape is moved across the heads, and a felt pressure pad. No adjustment screw is necessary. A-2SP comes in the following standard playing times: 40, 70, 90, 100 seconds and 2.5, 3.5, 4.5, 5.5, 7.5, 8.5, and 10.5 minutes. The manufacturer guarantees, when shipped, that the cartridge is under 90 degrees at 12.5 kc.

Mfr: Audio Devices, Inc.
Circle 67 on Reader Service Card.

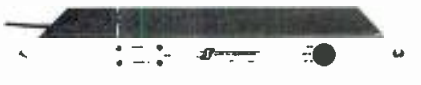
REVERBERATOR

● Named the *Resonator*, this device can be used to add a trace of reverberation to increase the apparent presence of broadcast audio. It may also be used as a full scale reverberation device to add audio effects in spot production. Included is a low cut filter for simulation for telephone sounds intended primarily for spot production. Equipped with unity gain with front panel adjustments for reverberation level, sustain and tone. The unit is rack mountable and may be remotely controlled.

Mfr: Dyma Engineering
Price: $315.00
Circle 60 on Reader Service Card.

DUAL CHANNEL FREQUENCY SELECTIVE LIMITER

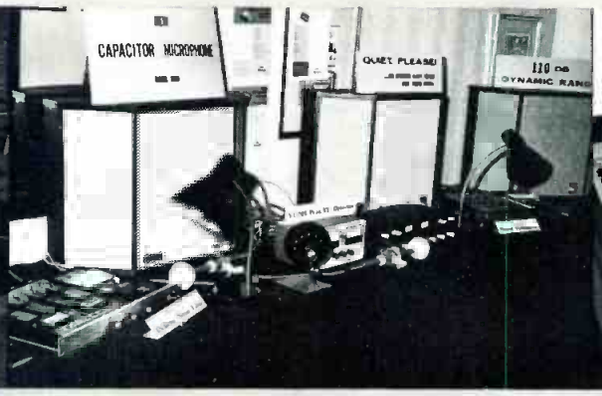
● Model 400 frequency selective limiter is designed to limit high frequency energy below a fixed value, eliminating high frequency distortion or carrier modulation. The unit operates much like a standard program limiter except that it does not cover the full audio band width; only the high frequency components are controlled. The manufacturer particularly recommends it for reducing distortions such as sibilant sounds in cassette duplication. The limiter is totally self-contained, with an internal power supply.



Mfr: Audio/Tek Inc.
Price: $1,050.
Circle 63 on Reader Service Card.

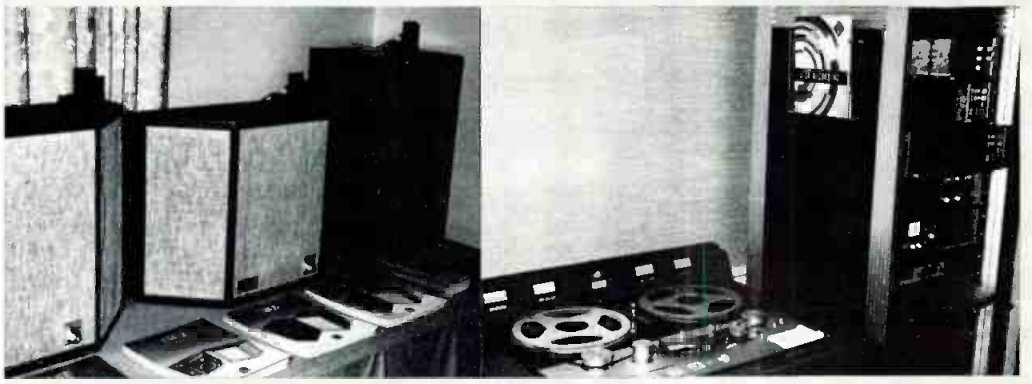
43rd AES Picture Gallery–Continued

Mark Levinson is both distributor and manufacturer. He makes a number of sophisticated mixing systems as shown. Circle 79 on Reader Service Card.



Dynamic Noise Filters, Noise Eliminators, Peak vu Detectors, and a super quiet condenser mic are made by Burwen Labs. Circle 78 on Reader Service Card.

Tascam's Model 10 mixing console can be expanded with this add-on unit holding 13 more input channel Circle 76 on Reader Service Card.



Acoustic Research showed their LST monitoring speaker now also available in a smaller model known as the LST-2. Circle 77 on Reader Service Card.

Gotham Audio can supply complete disc cutting systems, including the Telefunken tape input and rack shown. Circle 81 on Reader Service Card.

In the CBS room, their SQ system was demonstrated. Newly available, a broadcast encoder made by Sony. Circle 82 on Reader Service Card.

Four channel separation capability was being demonstrated by Sansui using their QS variable matrix system. Circle 80 on Reader Service Card.

JOHN WORAM

db Visits—Caribou Ranch

WHEN WAS the last time you went horseback riding during a recording session break? Most of us think twice before so much as stepping outside for a breath of air. For one thing, the chance of running into some fresh air out of doors is remote. And if there's a horse within miles, it's probably got a cop on it.

Our only other acquaintance with horses is when we send out for hamburgers. We send out because it helps not to be present when these things are prepared.

But, things are a little different at James William Guercio's studio. We suspected this was not your run-of-the-mill operation when Jim told us he was thinking about fencing in a bit of unused land nearby. For a parking lot, no doubt? Not quite. Mr. Guercio was thinking about raising a herd of wild buffalo, and figured as how a little fencing would be a good thing. After all, it wouldn't do to frighten the musicians who are out riding during those session breaks.

It didn't take long to invent a reason for dropping by for a visit. As a perennial studio visitor, I usually say something like, "I was just in the neighborhood, and thought I'd look in," or something equally profound. But that strains credulity a bit since Jim's studio is in Nederland, Colorado, which is hardly in anyone's neighborhood, and certainly not in mine.

The studio is, of course, the by now well known Caribou Ranch and it comes with its own neighborhood, since it is built on a 3,000 acre plot. Conveniently located out-of-reach of just about everywhere, the studio is in great demand by people who would like to get away for awhile and do some serious recording.

As I arrived, the group, "War," had just left and the "Nitty Gritty Dirt Band" set-up crew was warming up. They were warming up in the mess hall over plates of pancakes, bacon and home made rolls. No sending out for 'burgers here. For one thing, the nearest greasy spoon is probably in the next county. And anyone who would pass up the home cooked meals served in the Caribou dining room deserves to eat pizza flown in from California.

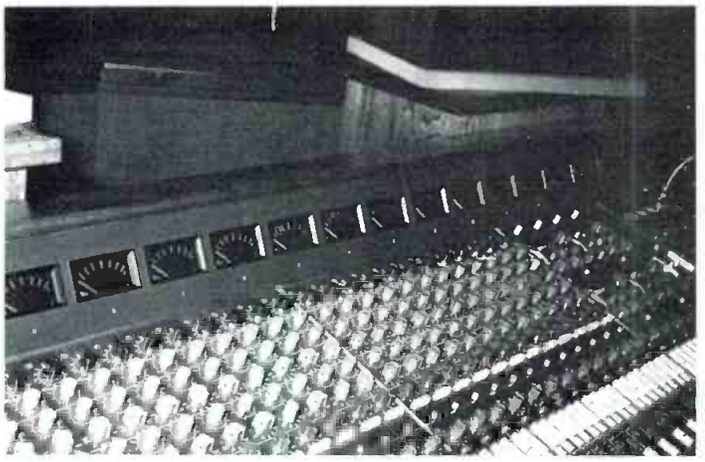
Getting down to business—after all, this is supposed to be a studio story—the barn on the property has been converted into a studio, and the control room boasts a Neve console, plenty of Dolby units, and a rack full of UREI limiters, filters and delay lines. For quad work, there are speakers built into the four corners of the room. And for those long winter nights, there's actually a working fireplace in the center of the rear wall.

The installation of the Neve console is a story in itself. Earlier, Caribou had ordered a "Brand X" console; however despite what may have been the world's lengthiest installation period, the thing just wouldn't work to their satisfaction.

In desperation, Guercio contacted the Neve people. Could they supply an interim stock console in the foreseeable future, one that could be used until a proper custom

James William Guercio at left and Wayne Tarnowski (engineer) at work during a Chicago session. The board is a stock Neve.

Photographs by John Woram and Larry Zide



A closeup of the Neve-supplied peak-reading meters. We were told that they tell much more about what's going onto the tape, and once used to, vu's are hard to go back to.

board could be built to satisfy their specific requirements?

"No trouble," said the Neve man, "but it might take a week or two."

"Very funny!" snapped Guercio.

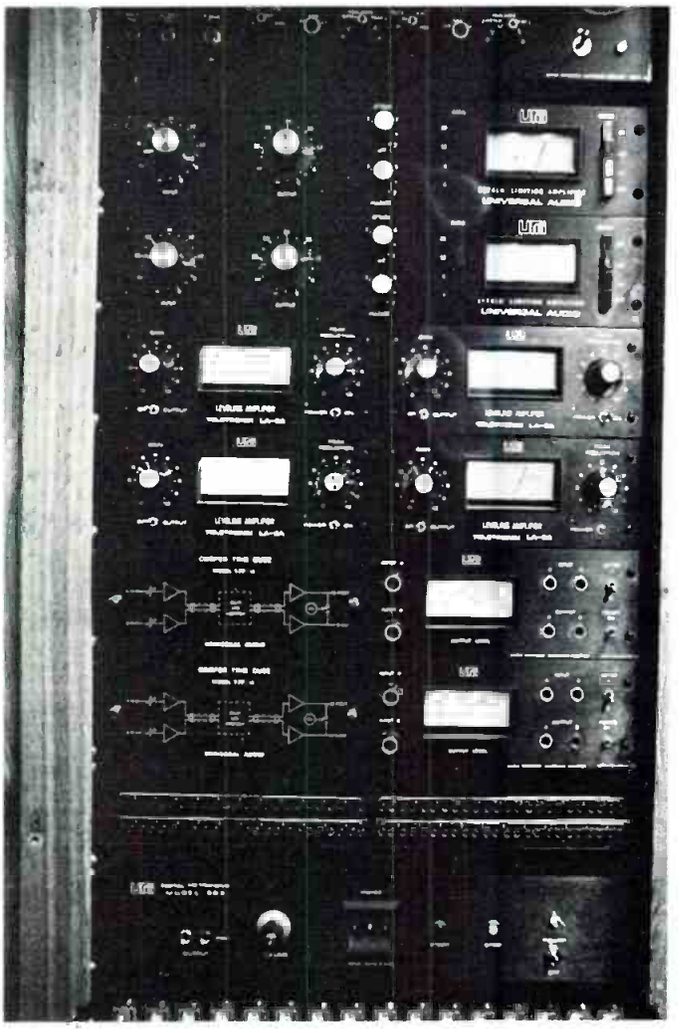
"I'm not being funny." said the man from Neve.

"You're *not*?" said the man from Caribou.

Two weeks later, the console arrived. There was no trouble uncrating it—the airline had seen to that. It seems that the console had to change planes in New York. Now it turns out that the planes that leave New York (for Colorado) are a lot smaller than the planes that arrive in New York (from England). So, although the crated console got off the inbound flight without incident, it wouldn't fit through the doors of the Colorado bound flight—until it was removed from its crate and hauled aboard without benefit of any protective padding.

The Neve people still get a little week-kneed when they recall the story; needless to say, they suspected nothing until the console arrived, *sans* crate, at the Caribou gate. Incredibly, there wasn't a scratch on it. The console was installed in no time, and has been in continuous use ever since.

Out in the studio, I discovered at least one non-standard item—an oxygen supply! At an elevation of 8600 feet above sea level, the just-arrived city slicker often needs an occasional whiff to keep going until he becomes used to the thin air.



A rack at the side contains UREI limiters and Cooper Time Cubes, as well as a Digital Metronome. Not visible, another rack containing ample Dolby's to handle 24-track work.

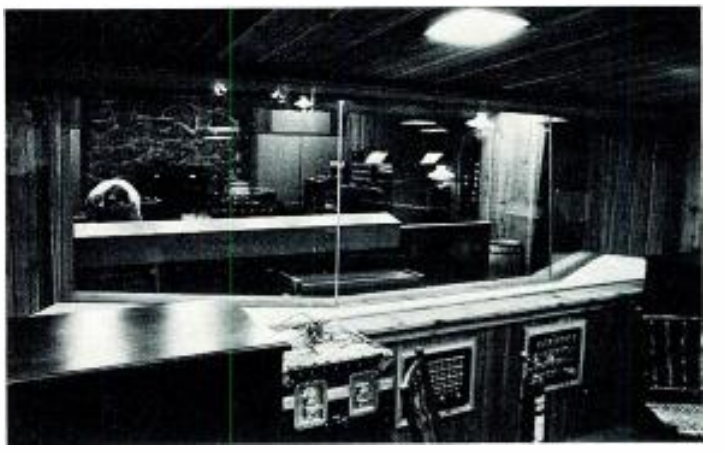
Tucked into a nearby wall is the familiar Westlake Audio piano booth. In fact, the control room and studio are largely of a Westlake design. The drum area is likewise thoroughly baffled, although mercifully it is not also tucked into an air pocket in the side wall.

Just above the control room is a projection room, and at the flick of a switch, the draperies on the rear studio wall slide back and a screen lowers from the ceiling. In fact, Guercio has a good stock of feature films available

Facing back from the console position, the lounge area in the control room is flanked on the left by three 3M two-track machines. The fireplace is functional. You can also see the Westlake speaker systems (rear channel for quad monitoring).

On the right side of the fireplace there is another Westlake speaker, and the two Ampex MM-1100 24-track machines (adaptable to 8 and 16 tracks). They are controlled by Ampex auto-locators mounted at the console. There is also a 3M ½-inch four track.

The Steinway is tucked into an isolated corner in typical Westlake fashion.



This view of the studio looks into the control room. Notice the oxygen bottle at the lower right—just in front of the mic input connectors.

for showing between sessions.

On the lower level (I almost said street level, but there isn't a street within miles) is a well equipped shop, equipment storage area, and an amplifier room containing more Crown DC-300 than I have ever seen gathered under one roof before.

It seems I forgot to mention that the top floor also boasts a recreation room, complete with pool table, for those who are too tired to go horseback riding, and who have already seen the movie.

Sometime after returning to Fun City, we learned that Caribou had just received their new Ampex 24-track recorders. Since some of my photos would now be out-of-date, our editor volunteered (with a straight face, yet!) to drop in and take some more pictures. If I recall, he actually invented a reason why this would be more practical than asking the Caribou staff to simply send along some new photos.

He can't be blamed for this though. Caribou ranch is a delightful place, and the accompanying pictures can only suggest what a pleasure it is to work there.

Just watch out for the buffalo!

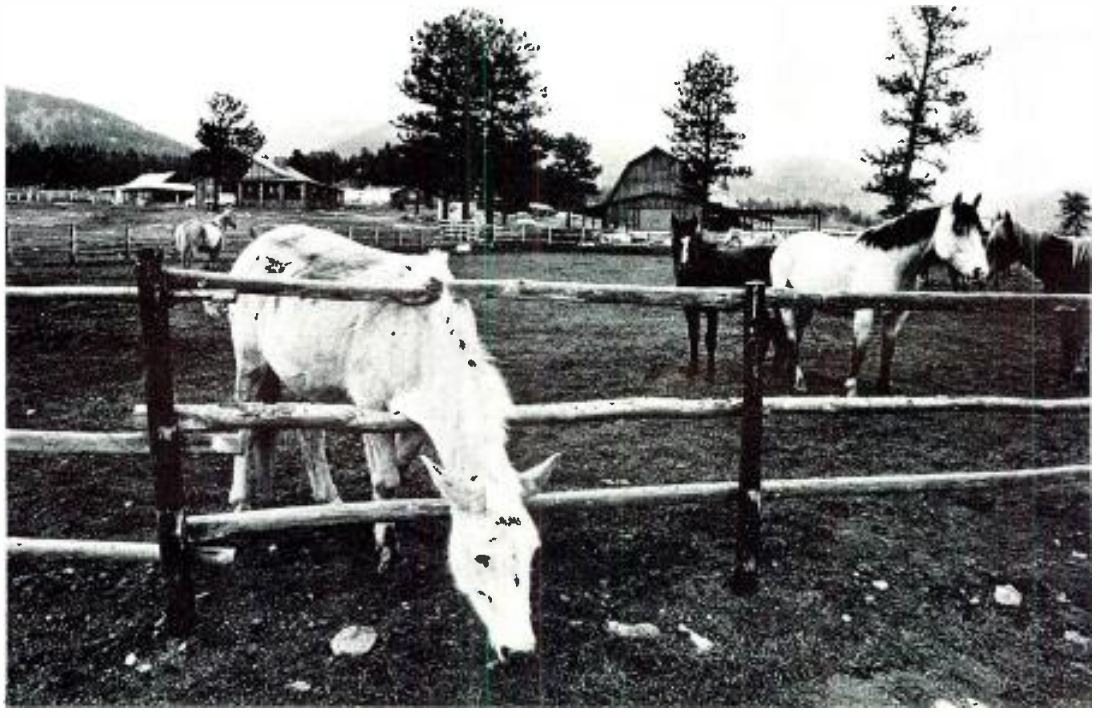
The drum booth offers isolation along with a sense of participation within the studio.

The Ampex machines were installed by the time I made my visit some weeks after John Woram's. Sessions were underway by Chicago, *and during my visit horn parts were being overdubbed. Caribou Ranch has accommodations and facility for about forty visitors, so the temporary residence of Chicago was no strain. In talking with several of the group, I was impressed with their love of the place. They certainly find the peace and isolation of this mountain studio conducive to total creativity. (L.Z.)*

Since Caribou ranch is home to its guests for the duration of their work, we show untechnical but highly functional dining hall—a separate building from the barn.

Three from Chicago at Caribou. On trombone, Jim Pankow; Walt Parazaider on sax; and Lee Loughnane plays trumpet. Although close miked, they are playing into the open part of the studio.

Horses tranquilly graze while work goes on in the studio complex located in the barn (slightly right of center). Hills rise in the background and they are working from an 8600 foot base.



ROBERT E. BERGLAS

An f.e.t. Audio Mixer With l.e.d. Gain Level Display

Here is a simple yet sophisticated mixer, made easily portable that you can build at reasonable cost. As it stands it can be used to interface high impedance unbalanced units such as consumer tape decks and phonographs.

AS AN ENGINEER, producer, and former war correspondent (the Middle East, 1967) for the Pacifica f.m. stations, I have had many challenging and rewarding experiences. One aspect of my work that I consider right up there in satisfaction with the more dramatic elements is the design of new studio and remote hardware. This article describes the latest design, an f.e.t.-input audio mixer with an l.e.d. gain-level display/indicator.

With the mixer proper, four or more high impedance devices—phono pickup, microphone, line inputs, etc.—can be mixed and fed to the low impedance input stage of an amplifier.

The l.e.d. gain-level display is my answer to the slow ballistic movements of the common analog meter, which simply cannot respond fast enough to indicate peaks. The l.e.d. turn-on and turn-off electro-optical characteristics of the present system are certainly faster, and more precise, than any meter's movement (peak reading or not.) The l.e.d.s alone are rated to toggle at 1.0 nanosecond! In fact, the only limiting turn-on and turn-off factor is the comparator's slew rate. The type 709 op amp called for slews at 0.25 microseconds.

Frequency response of the mixer proper is on the order of ± 3dB from 20 Hz to 100kHz. Voltage gain is unity to 5-10 dB, depending upon the individual f.e.t. characteristics.

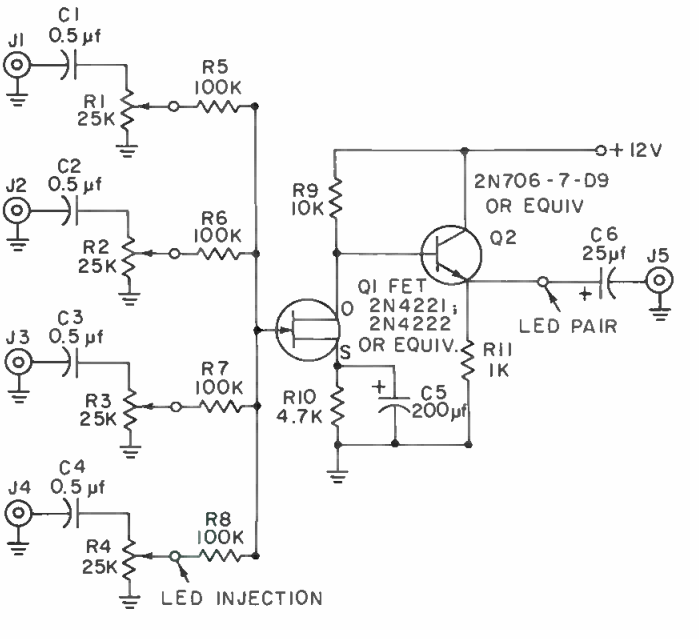
The two subsystems will be described separately, with a final section given over to the important (and oftentimes neglected) consideration of the power supply.

THE AUDIO MIXER: CIRCUIT DESCRIPTION

Referring to FIGUGE 1, we see four input jacks (J1 through J4) connecting the input devices to the audio mixer circuit. The signals at the jacks are coupled through four identical r-c networks to the gate (G) of the f.e.t. (Q1). Capacitor C1 and potentiometer R1 combine to couple the signal at J1 through isolating resistor R5; C1 also prevents any d.c. voltage from flowing between the pickup device and the mixer. The other three input stages operate identically.

Potentiometers (R1 through R4) are provided so that pickup devices having different output levels can be used. Q1 is an f.e.t., having a very high input impedance and a high output impedance. The drain (D) of the f.e.t. is direct coupled to the base (B) of transistor Q2. R9 supplies the base current for Q2 and the drain current for Q1. R10 provides the Q1 source bias and is bypassed by C5 to prevent degeneration. The base bias for Q2 is established by Q1.

Figure 1. The circuit of the audio mixer portion.



Robert E. Berglas describes himself in his very first sentence.

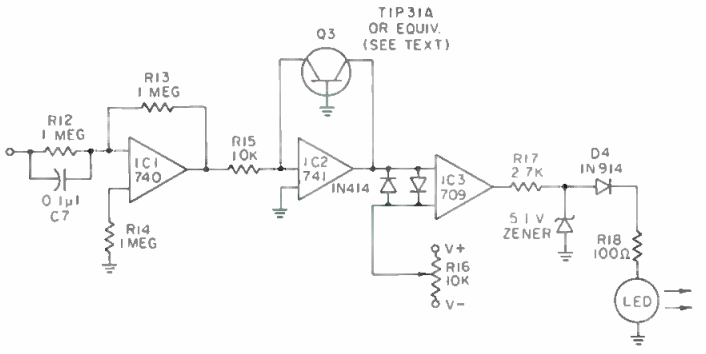


Figure 2. The light emitting diode display system.

THE L.E.D. GAIN LEVEL INDICATOR

A single l.e.d. at the input and a double l.e.d. at the output format has been chosen to permit the greatest control flexibility with some consideration for circuit simplicity and economy.

A single red l.e.d. is properly injected after potentiometers R1 through R4 to indicate individual input gain levels. A double display—one green and one red l.e.d.—is found at the ouput of the mixer, designed to monitor precisely the sum level output.

The electronics of this subsystem are comprised of i.c. operational amplifiers (op amps). Here, they are used in both linear and nonlinear quasi-digital mode.

FIGURE 2 details the schematic of the system. As is evident, what we have here is a flow from one section to the next. Each step is considered below.

1. *Fet Input Op Amp.* An fet input op amp, type 740, is cited because its very low input currents permit a very high input impedance of one megohm—and a gain of one—to buffer properly without loading the signal source.

2. *Logarithmic Converter.* I.c. 2 and its peripheral hardware constitute the circuit diagram of a logarithmic converter I have designed. Under the circumstances below, the output is proportional to the common logarithm of the input voltage. (That is, $E_0 = \log_{10} E_i$ (where E_0 is the input to the logarithmic converter and E_i is the output).

This logarithmic conversion is here necessary because we can now convert amplitudes of random voltage into decibels, which will now "speak" in the terms we wish.

The voltage across the feedback transistor in the logarithmic converter depends logarithmically on the feedback current. A power transistor is used to reduce the series feedback resistance. Here, the feedback transistor is ground-based. The output voltage, then, is proportional to the logarithm of the input voltage.

Furthermore, the following important consideration is accounted for. The logarithm of one is zero. The op amp offset-null is used to zero the output of the op amp for one unit of positive signal at the input. The size of the unit used corresponds to the zero decibel reference.

3. *The comparator.* For the l.e.d. pair at the output of the mixer, the flow divides in two, one to the eventual green l.e.d., the other to the red. (Obviously, the flow remains straightforward for the input indicators.) A single route is discussed.

The part of the subsystem which turns the lights on and off in accordance with precise, preset levels is the comparator.

An op amp is operating in its nonlinear mode when the output of the op amp is not directly proportional to the input. Nonlinear operation occurs when the op amp output reaches either its maximum possible excursion—positive saturation—or its minimum possible excursion—negative saturation. We are speaking now of an essentially digital application of the art.

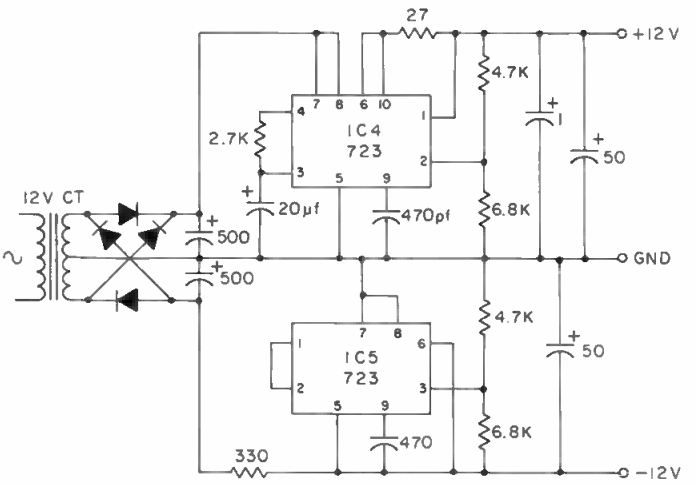


Figure 3. The voltage regulated power supply.

A comparator simply compares an input voltage to a reference voltage. When the input signal is slightly greater than the reference voltage, the op amp snaps into positive saturation—*i.e.*, logical 1. When the input is slightly less than the reference voltage, the output swings into negative saturation—and delivers a logical 0. The reference voltage in this application is made variable by using a potentiometer. Moreover, the comparator has considerable gain, and a difference of a few *millivolts* on the input snaps the output from negative saturation to positive saturation, and *vice versa*.

FIGURE 2 shows the system's actual comparator circuit. It includes a diode input over-voltage protection; the type 709 op amp callout, chosen for its very fast slew rate (because it is uncompensated); and limitation of the large output voltage by a zener diode, making it compatible with l.e.d. voltage specifications.

4. *Rectification and the L.e.d. Display.* The signal is now rectified and fed, through a current limiting resistor, to the l.e.d.

POWER SUPPLY

Since reference voltage stability is necessary for the proper operation of the comparator, we again turn to i.c. devices for power supply regulation.

The supply used consists of a full-wave, center-tapped transformer with capacitor input filters feeding complementary 12-volt regulators, IC4 and IC5 (FIGURE 3). IC4 is a conventional series regulator configuration using the 723's internal pass transistor.

IC5 controls the negative leg in shunt regulator fashion with its terminal voltage set by the 4.7k and 6.8k resistors. This i.c. acts as a "super zener," absorbing any input current variations through the 330-ohm resistor due to a.c. ripple or line voltage changes. It also provides an extremely low source impedance for the minus 12-volt circuits, a condition for good signal-to-noise ratios to be realized.

CONCLUSION

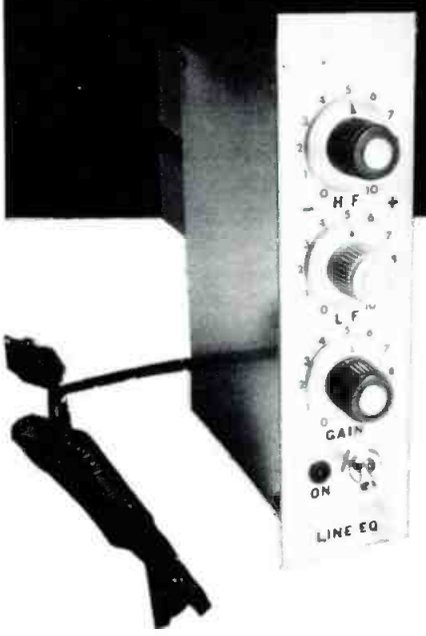
It is hoped that the above disclosure will well serve the serious recordist or studio engineer. Not the least benefit is the visual perspective produced—it is striking. ■

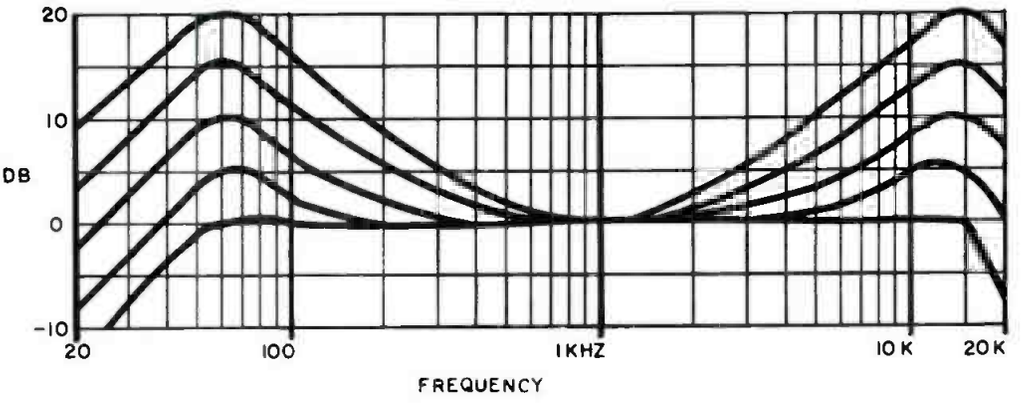
Broadcasters!

Here is an important new device designed especially for you.

TIMEKEEPER

Telephone Line Equalizer





How would you like a compact, self-powered telephone line equalizer for use in radio, TV or communications systems that helps restore signals lost in long transmission lines? One that could be adjusted to suit a variety of conditions—one that can easily be inserted into any existing system and which would provide additional gain when necessary? An equalizer that could have balanced input and output to assure complete line isolation?

The TIMEKEEPER MODEL TLE-1 is just such a unit. Using the latest OP AMP active filter design it provides excellent stability, low distortion and low noise. The extremes of the audio spectrum are purposely rolled off to reduce any further unwanted noise.

USES

Radio talk shows, remote pickups using telephone lines, even stations using their own lines will find this unit essential. Not only can it be used at the receiving end—it can also be quite useful at the sending end. If you know what losses to expect from the line you can pre-equalize the signal to improve response *with less noise!*

The TLE-1 is built to the highest standards in the industry and is unconditionally guaranteed for one year. If you find it does not improve your signal—return it for a full refund. You will find the TLE-1 a great buy at only $295.00.

It's a TIMEKEEPER product.

It's got to be good.

Telephone Line Equalizer Model TLE-1
PERFORMANCE SPECIFICATIONS

Gain, variable	unity—20db
Input impedance	600 ohms
Output impedance	20 ohms (designed to work into 150 or 600 Ohm loads)
Max. input level	+20 dbm (at unity gain)
Max. output level	+20 dbm
Frequency response	± ½db 50-15,000 Hz
Available boost (cont. controlled)	20 db max at the extremes of covered spectrum
Distortion	less than 0.2%
Noise	70 db below 0 db level
Isolation	transformer, balanced floating line
Power required	117VAC @ 1 watt
Dimensions	panel: 1¾" wide x 7" long chassis and transformers: 6½" deep, 6" wide x 1¾" thick 1.5 lbs. mounting rack available
Terminations	Barrier strip, screw terminals
Amplifiers	IC OP amps, plug-in
Controls	ON-OFF switch Gain control Low end boost High end boost
Indicators	LED pilot light

Send check to

TIMEKEEPER
Box 35
Great Neck, N.Y. 11021

Please send me _____ Model TLE-1 Telephone Line Equalizer(s) at $295.00. N.Y.S. residents add 7% sales Tax. I enclose $ _____.

Name _____

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City _____

State _____ **Zip** _____

DON DAVIS

A Simplified Approach to Room Analysis

The author is an established authority on room equalization and analysis. In this article, the basics of the correct way of evaluating a room are examined.

IT IS GENERALLY recognized today that to design a sound system properly one must begin with a careful analysis of the acoustic environment. The days are past when a sound contractor could plug into the environment any transducer he happened to arbitrarily choose or happened to have on hand. If he does so today he risks a real professional following him on the job and showing by demonstration what a correctly designed sound system can accomplish.

WHAT MUST BE MEASURED?

Physically, the internal volume of an acoustical environment must be found: $V = ?$ ft.^{3}. Its *boundary* surface area must be totaled: $S = ?$ ft^2. The distance from the proposed loudspeaker location to the most remotely located listener must be measured: $D_2 = ?$ ft. Acoustically, the average absorption coefficient must be found: $\bar{a} = ?$

Figure 1. A precision sound level meter such as this is required for room analysis.

Don Davis is president of Synergetic Audio Concepts of Tustin, California.

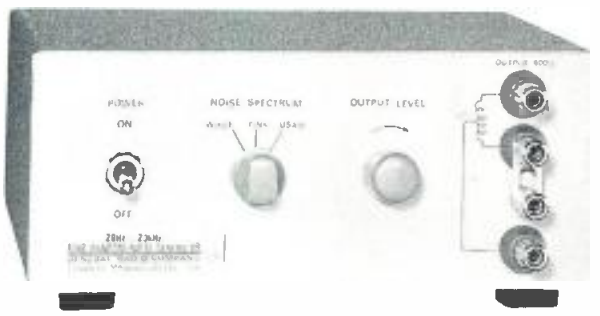


Figure 2. This kind of generator will produce the needed peak noise waveforms.

The ambient noise level should be found: $N_{amb} = ?$ dB-spl.

From these parameters it then becomes possible to find:

1. Minimum Q to allow 15% ALCONS
2. Sabins present *vs.* sabins needed
3. Relative and absolute acoustic attenuation
4. Needed and potential acoustic gain
5. The electrical power required
6. Q of loudspeakers with unknown directivity factors
7. The reverberation time.

BASIC EQUIPMENT NEEDED

The beauty of the approach about to be outlined is the economy of equipment required and the multiple employment of it. The basic equipment needed is:

1. A tape measure (100')
2. An inclinometer
3. A sound level meter with octave band analyzer built-in See FIGURE 1.
4. A random noise generator with pink noise output See FIGURE 2.
5. A test power amplifier
6. A test loudspeaker with a known Q at key frequencies

MAKING THE ROOM MEASUREMENTS

First, use the tape measure to find the length and width of the room. Measure the angle to the ceiling from a spot in the center of the room and then measure the distance from that spot to directly under the sighting position of the inclinometer. See FIGURE 3.

The measured distance times the tangent (tan.) of the measured angle plus the height of your eye level equals the ceiling height.

1. Calculate V in ft³
2. Calculate S in ft²

Now, using the pink noise generator, the test amplifier, and the test loudspeaker with a Q, for example of 7 at 1,000 Hz as a sound source, measure with the SLM set to the 1,000 Hz octave band, the critical distance. See FIGURE 4. (Altec and Strom are two manufacturers who publish the Q of their loudspeakers.)

Two readings are necessary. The first should be close enough to the sound source to insure that you are in its "direct sound" field, *i.e.*, the free field. The second reading should be taken at sufficient distance to insure that you are in the reverberant sound field of the sound source.

Reading #1 (that taken close to the loudspeaker) is used to establish an arbitrary 0 level. See FIGURE 4. This point is used to construct a line that slopes through it so that every halving of distance increases 6 dB and every doubling of distance from it decreases 6 dB. Subtract the second reading from the first reading, plot the second point on the chart, and draw a line through it parallel to the base to the chart. Where the horizontal line (reverberant field level) crosses the slanting line to the right (free field levels) is critical distance, D_c.

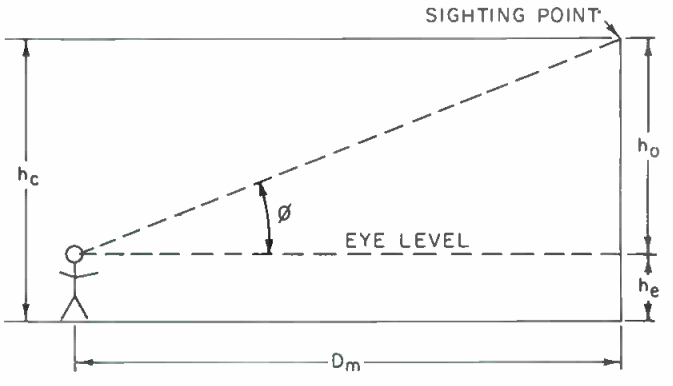
$$D_c = 0.141\sqrt{QR}$$

Where: D_c = critical distance in feet.
Q = directivity factor of the loudspeaker (This is not its coverage pattern but its ratio of contribution to the reverberant sound level)
R = the room constant in feet²

$$R = \frac{S\bar{a}}{1-a}$$

Where: S = the total boundary surface area
$\bar{a}$ = the average absorption coefficient

Figure 3. The room example used in the text.



ø = 22°
D_m = 42'
h_e = 5'
h_o = D_m TAN ø = 42 TAN 22 = 16.97'
h_c = h_o + h_e = 16.97 + 5 = 22'

This equation can be re-written into two very useful forms:

$$R = \frac{(D_c)^2}{0.019881Q}$$

and

$$Q = \frac{(D_c)^2}{0.019881R}$$

We can now choose the second form of the equation and find for our example room that has

$V = 500{,}000$ ft.³
$S = 42{,}500$ ft.²

$$R = \frac{(25)^2}{0.01988(7)} = 4{,}491 \text{ ft.}^2$$

and

$$\bar{a} = \frac{R}{R+S} = 0.096$$

Then, we can use the Norris-Eyring reverberation time formula to find

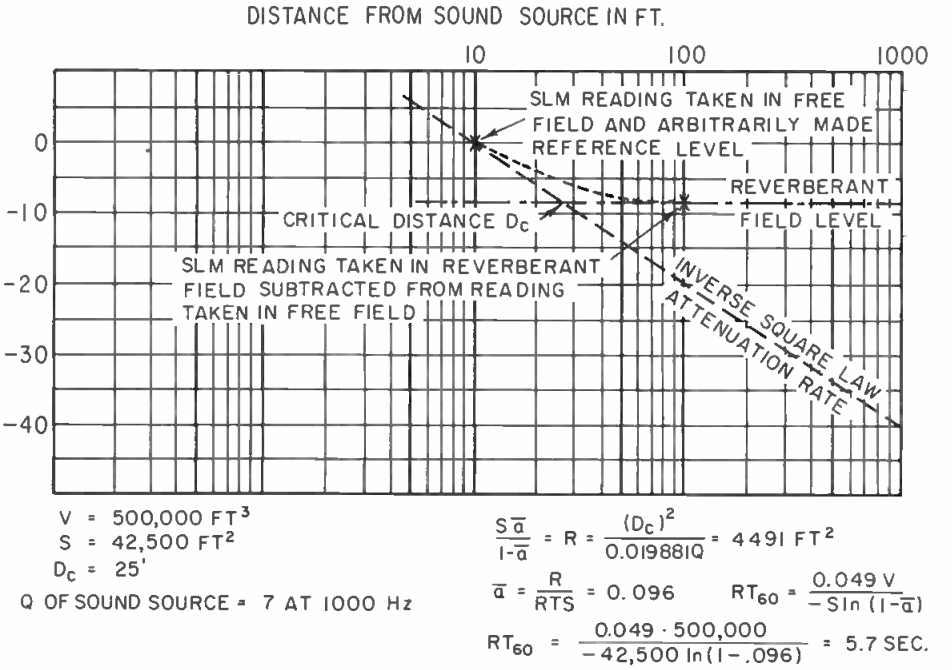


Figure 4. The calculations to be made.

$$RT_{60} = \frac{0.049V}{-S\ln(1-\bar{a})}$$

Where: RT_{60} = the time in seconds for the sound to attenuate 60 dB after turning off the sound source

S = the total *boundary* surface area in ft²

$\bar{a}$ = the average absorption coefficient (dimensionless)

ln = the natural or naperian logarithm to the base e (e = 2.718281828)

Therefore:

$$RT_{60} = \frac{0.049(500{,}000)}{-42{,}500\ln(1-0.096)} = 5.7 \text{ seconds}$$

Sabins are by definition $S\bar{a}$, so we can easily calculate that there are 42,500(0.096) = 4,080 Sabins in the space.

DETERMINING THE MINIMUM Q NEEDED

Our test measurements are made in this case with a loudspeaker that has a Q = 7 at 1.000 Hz. If our distance from the proposed location for the loudspeaker to the most remotely located listener were 125 feet (D_2 = 125 ft.), then we could use the following formula to find the minimum Q that would allow 15 per cent articulation loss for consonants (per cent AL_{CONS}) at the D_2 distance. (Note: All the articulation formulae assume an S/N ≧ 25 dB in order to be valid.)

$$\text{Minimum Q that allows 15 per cent } AL_{CONS} = \frac{641.81(D_2)^2(RT_{60})^2}{15V}$$

or

$$\frac{641.81(125)^2(5.7)^2}{15(500{,}000)} = 43.44$$

Now, this is a higher Q than is realizable in a reasonably sized array (a stack of four of the large Strom single cell horns could reach it at 1,000 Hz) and an excellent approach would be to select a Q that allows an efficient array to be constructed and add the necessary sabins to the space to allow its use. These additional sabins also help quiet the noise in the space and can, if properly placed, control what otherwise would be undesirable reflections.

Selecting an array with a Q = 20 then allows us to calculate the maximum RT_{60} we could tolerate and still achieve 15 per cent AL_{CONS} at 125 feet.

$$\text{Max. } RT_{60} \text{ that allows 15 per cent } AL_{CONS} = \sqrt{\frac{15VQ}{641.81(D_2)^2}}$$

or

$$\text{Max. } RT_{60} = \sqrt{\frac{15(500{,}000)20}{641.81(125)^2}} = 3.87 \text{ seconds}$$

This still leaves the church, auditorium, or arena sufficiently reverberant for any musical purpose and yet reduces our Q requirement from 43.44 to 20.

Again, using another form of the Norris-Eyring equation we can calculate

$$\bar{a} = 1 - e^{-\left(\frac{0.049V}{S.RT_{60}}\right)}$$

or

$$\bar{a} = 1 - e^{-\left(\frac{0.049(500{,}000)}{42{,}500(3.87)}\right)} = 0.138$$

Therefore, $S\bar{a}$ = 42,500(0.138) = 5,865 ft².

We had originally 4,080 ft² in sabins; thus we need to add *properly* to the space 5,865 − 4.080 = 1,785 sabins, probably on the rear wall, rear ceiling and along the rear of one side wall, but one should seek the services of an acoustical consultant to determine the exact placement.

All of this information was achieved with the most basic measuring instruments and a bare minimum of actual measurements. The next steps would be to manipulate the basic sound system parameters to achieve the desired needed and potential acoustic gain relationships and to calculate the electrical power required to cover the audience uniformly.[1]

SUMMARY

A careful study of these simple measurements and calculations will reveal a wealth of implied uses. These simple examples are intended as a waymark to the sound professional who will, in studying and using them, find many other fascinating trails to follow on ihs own. ■

1. The author's paper *Equivalent Acoustic Distance* preprint #911 (C-1) AES Spring Convention 1973 gives a description of the most efficient methods available today for these calculations.

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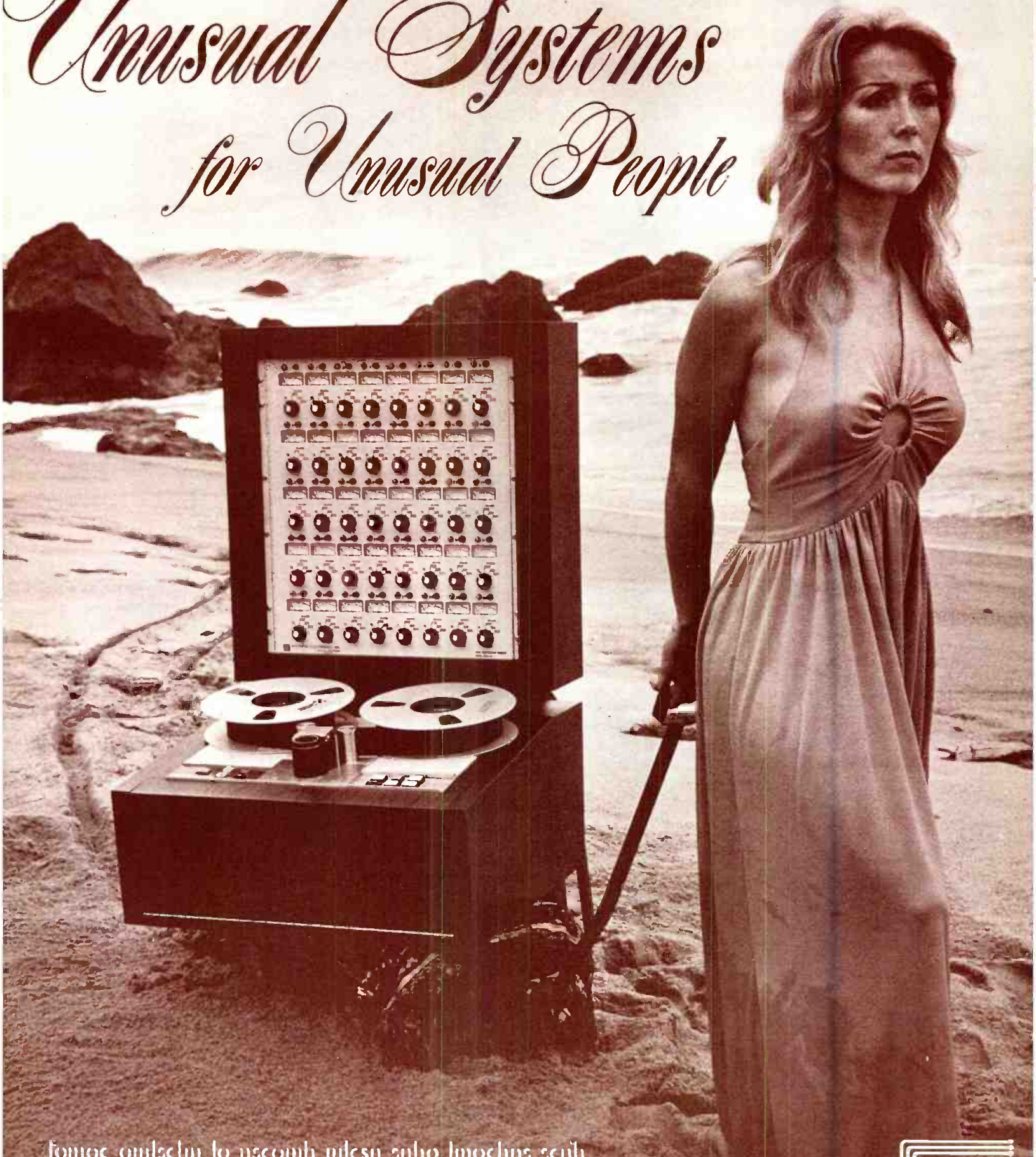

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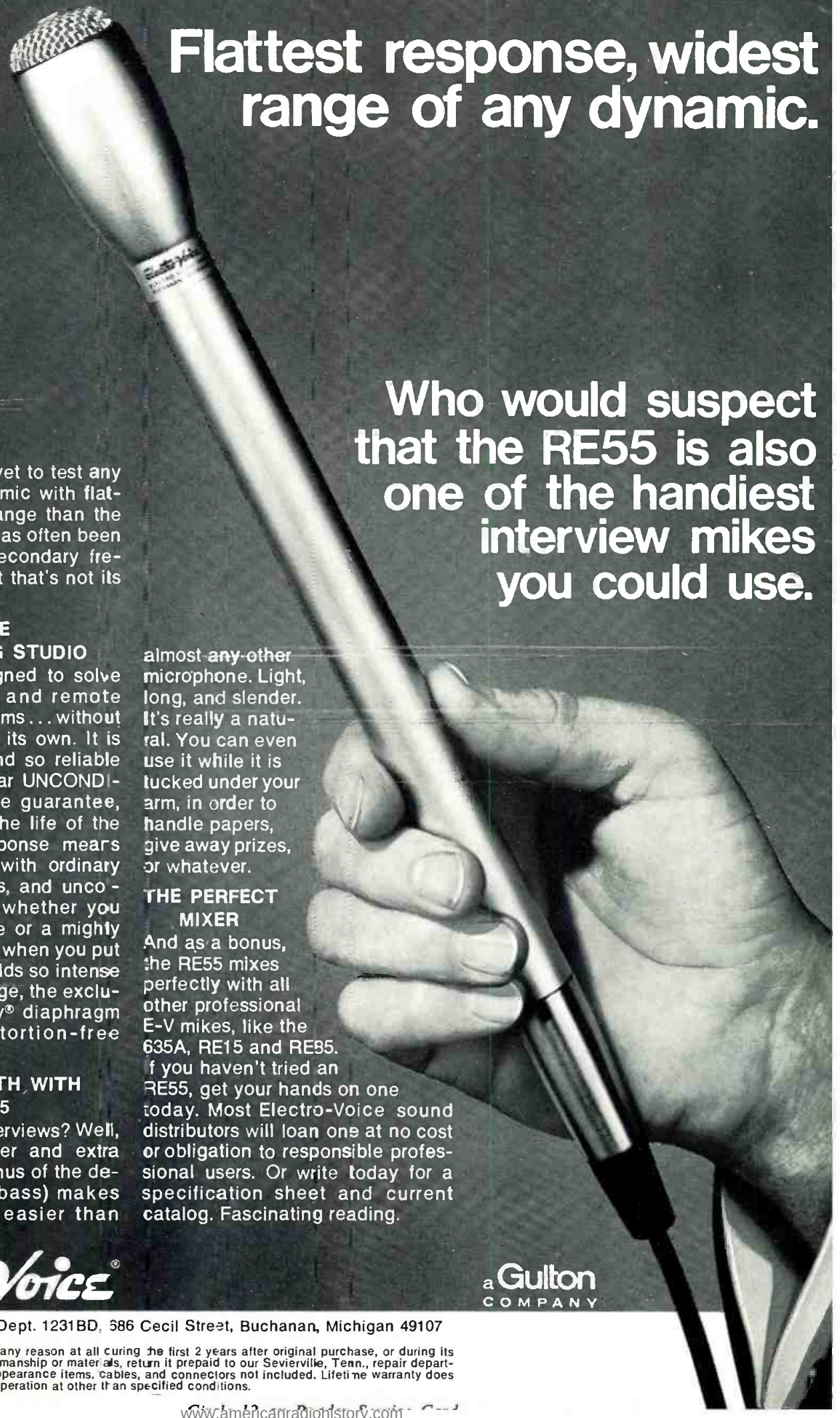

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