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April 1979

Volume 10 — Number 2

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• **STUDIO DESIGN** •

**Rudi Breuer** — 45  
**Michael Rettinger** — 62  
**Kent Duncan** — 68  
**Rich Houston** — 80

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APRIL 1979  
 VOLUME 10 — NUMBER 2

## Contents

page 30 — Horizon Records' TOMMY LI PUMA . . .  
 from promotion — to production — to label president —  
 by Tom Lubin

### • Acoustics - Design - Construction •

page 45 — The Rudi Breuer Approach —  
 by Rudi Breuer and Jim Riordan

page 62 — Sound Insulation Requirements for Recording Studios —  
 by Michael Rettinger

page 68 — Studio Design Requirements for the Next Decade —  
 by Kent Duncan

page 81 — Increased Height, Active Trapping, Improve  
 Remote Van Control Room Acoustics —  
 by Rich Houston and Jeff Brown

page 89 — Live Performance Sound Reinforcement:  
 BEATLEMANIA —  
 by Patrick Maloney

page 106 — RECOGNITION 1978: A tribute to the 1978 Grammy  
 Winning Engineers, Producers and Studios

page 110 — "AN AMERICAN PRAYER" . . . John Haeny's story  
 of the dedicated research, production and engineering  
 of the Jim Morrison epic —  
 by John Haeny assisted by John Weaver

page 124 — Microphone Applications for Classical Recording —  
 by Carson Taylor

### VCA's ROUND II:

page 130 — B&B's David Baskind's response to Allison's Paul Buff

page 136 — Paul Buff's response

page 142 — Harvey Rubens, Marvin Caesar, Edward Bannon  
 and Michael Sanders

page 146 — New Products Review: ECOPLATE™  
 by Larry Rebhun

### The Cover:

Sierra Audio's latest installation, Mr. "D's", Kendun Recorders, Burbank. Photo shows large volume multi-delay isolation room featuring fully adjustable mid-band delay time; .1 to .7 seconds. Also depicted is the ghost of a musician past. Photography: Bill Miller.

### Departments:

Letters	10
New Products	150
Classified	170
News	172
Advertising Index	178



## Introducing Altec Lansing's Incremental Power System. And Its Closest Competitor.

Lately a lot of the big names in professional amplification have been making head-to-head comparisons with their competition. And, understandably, the brand being featured in each ad usually comes out on top. But one product that no one is comparing themselves with is Altec Lansing's new Incremental Power System.

That's not really surprising since Incremental Power is a lot more than just an amplifier. Each main frame actually contains a flexible array of power amps, electronic crossovers, line amps and input devices. So you get a complete amplification system that's prewired and ready to use. And since it is a system, Incremental Power offers a degree of flexibility that's unmatched by any single amplifier. In fact, to match the overall performance of one Incremental Power System you'd need a rack full of traditional components.

Skeptical? To prove the point we've devised a head-to-head comparison that you can make for yourself. Below you'll find the

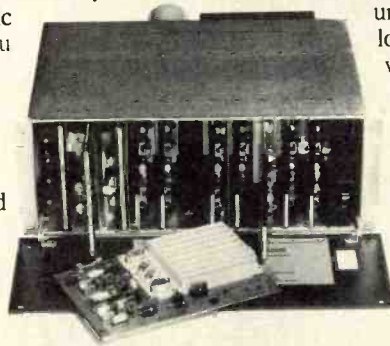
published specifications for an Incremental Power System set up for stereo, triamplified operation. Simply select the competitive components that you'd need to match Incremental Power's performance and then judge for yourself.

There's a lot more to Incremental Power than we have room to tell you here. So if this kind of performance and package size sounds good to you, contact our Commercial Sound Sales Department for the details. Or check the Yellow Pages under Sound Systems for the name of your local Altec Lansing sound contractor. Either way you'll get the complete Incremental Power story. We think you'll agree that our short story makes the competition look a long way behind.

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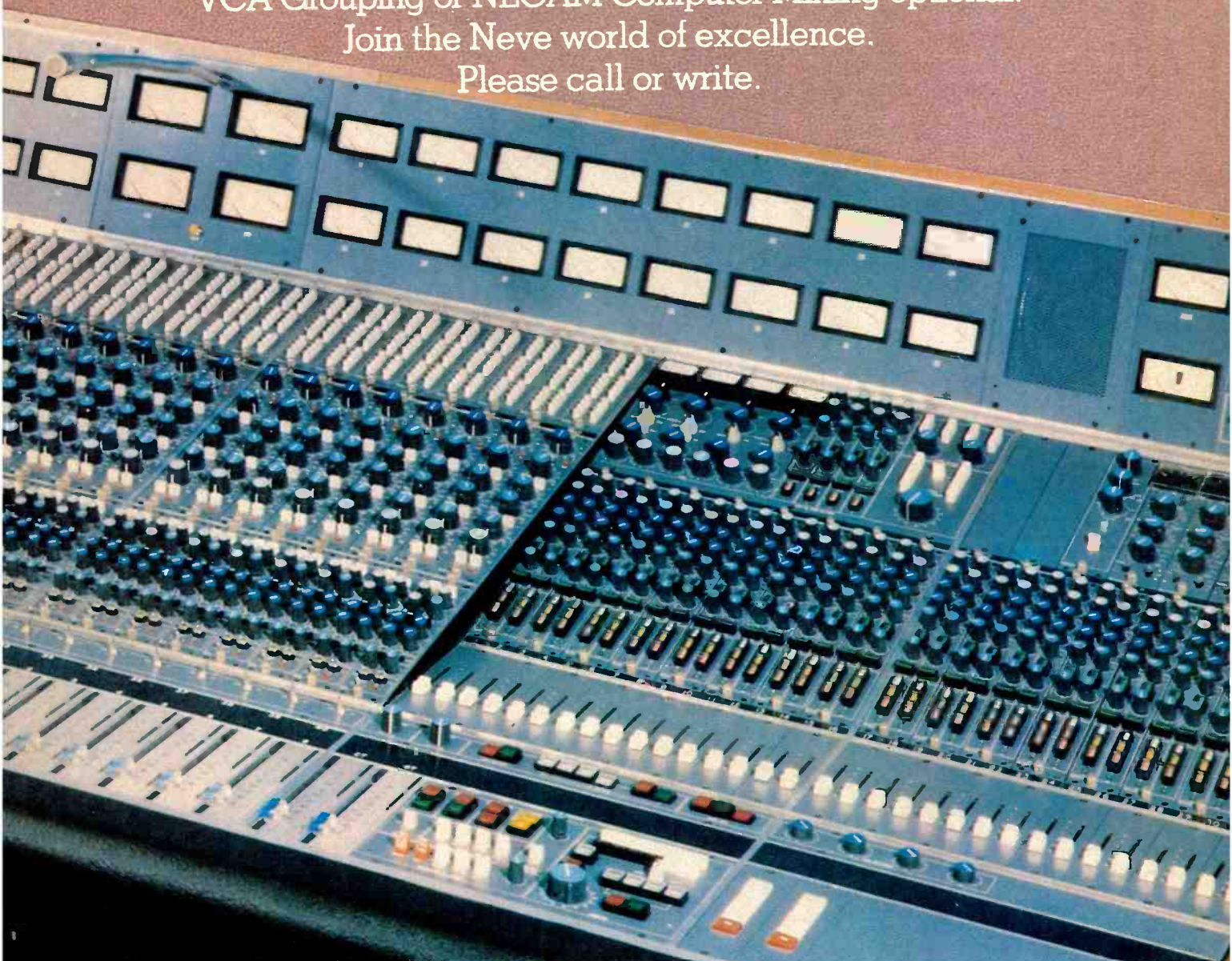
	Power Available for L.F. @ Mfg. Rec. Load	Power Available for M.F. @ Mfg. Rec. Load	Power Available for H.F. @ Mfg. Rec. Load	Electronic X-over	Cooling	Weight	Height	Reliability
Incremental Power System	300 Watt Total 150 Watt/Ch. @ 8 ohm	150 Watt Total 75 Watt/Ch. @ 16 ohm	150 Watt Total 75 Watt/Ch. @ 16 ohm	2 or 3-way Selectable Freq.	Built-in fan blows side- to-side	70 lbs.	7"	Excellent each unit factory tested





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# Letters

from: **Kenneth R. Fause**  
**Fause & Associates**  
**Newbury Park, CA**

The companion articles in the last issue by Don Davis and Chips Davis describing, among other things, Live End - Dead End (LEDE) control room acoustics raise some points which I feel invite commentary. To be entirely fair to the authors, I must state that I have not yet made the pilgrimage to Las Vegas to hear the prototype room which the articles discuss. Colleagues have given me glowing reports, so I am quite willing to accept the fact that the scheme works in the manner discussed.

In architectural acoustics, as in most aspects of life, there are few absolutes; there are options, choices, and engineering trade-offs to be made among these options. Thus, I would claim that in LEDE, we have not *the* solution, but one more member in a family of potential options which might be appropriate to a specific case at hand. The control room is a large and expensive tool; the more closely this tool is fitted to a given task or situation, the more efficiently it will function in executing that task.

In my own consulting practice, experience has shown that when all the necessary people and technical equipment are arranged in an ergonomic manner suitable for the intended use of the control room, the spatial arrangement of the room has already been strongly defined. We prefer, in fact, to start with a blank piece of paper and arrange the people and their equipment first, and then proceed to wrap a suitable architectural enclosure about them. The problem becomes vastly more complex when the high value of real estate in the major geographic recording activity centers is considered. The studio designer proceeds to polish up his shoehorn when the owner describes how much space he can afford to lease or purchase; usually about two-thirds the area the studio designer had in mind.

Unfortunately, it appears that the LEDE scheme may be considered only when a certain minimum dimensional envelope is available. To meet the proposed "initial time delay gap" of 20 ms. would likely require that the reflective surfaces, wall or tape machines, be about 9 to 10 feet behind the prime mixing position. To meet the loudspeaker spacing suggested with a sensible stereo azimuth, the loudspeakers would be at least 10 feet forward of the mixing position. Add an allowance for the depth of the loudspeaker enclosures and the necessary undulations of the rear wall, say 4 feet total. Massive sound isolating

construction adds at least 6 inches at both front and rear, usually more. Add all this up and you have a gross front-to-back required dimension of at least 25 feet! We are often, and quite seriously, given spaces half that size to turn into useable control rooms. The point is simply that here is another choice the facility owner must make: floor area cost versus desired acoustic performance.

The authors declare, and I will strongly agree, that close-order reflections are undesirable in control room acoustics; the "early sound" (say the first 2 ms.) is most likely to have a comb filter spectrum, and image "smearing" may also result. Don Davis proposes that the solution is to "put the sound source in as nearly anechoic space as you can achieve. . .". This certainly works. It is worth noting that it is possible to avoid early time anomalies in designing a hard front control room by paying very careful attention to reflection paths. Tricky, but possible. This is not mere conjecture; a control room of our design based on that approach has been operating in Hollywood for nearly a year. The last time I visited, I dragged along our newly-acquired TDS to see if theory, measurement and "golden ears" (not mine) would agree. The raw, unequalized response of both left and right channels overlaid is shown with a time



window of approximately 1.5 ms. (1.7 feet). The dip at about 3.5 kHz is inherent in the anechoic response of the particular loudspeaker installed. Yes, Virginia, it can be done.

The worst close-order reflection problems we have encountered to date have been reflections from the console top, which will remain a design problem no matter which ends of the control room be hard or soft. It does not appear that this 3 by 8 foot or larger reflective surface is likely to disappear or shrink markedly in the immediate future.

The comments about reverberant field starvation being common in "rear dead" control rooms are true, but again, this is a matter of design specifics, and is not

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R-e/p 11

# PROFESSIONAL Ohio Disco Packager, SWB Electronics, uses Stanton Exclusively.



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Larry L. Decker, Designer/Owner, examines finished control table for Disco use.

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inevitable in the generic approach.

Another potential decision variable in selecting a geometry may present itself: a portion of the studio time-buying marketplace absolutely demands, insane as it may be, the capacity to blow themselves away with sound level on playback, a type of acoustic massage. It is unrealistic, and it is hazardous to hearing, but if you want to serve this lucrative part of the market, you gotta play the game. In a simplistic analysis, at low frequencies, a "dead end" source is close to an omnidirectional radiator,  $Q=1$  by definition. The same source mounted flush in a stiff barrier, a proper soffit for example, and working sufficiently close to another stiff boundary in the form of a hard ceiling, radiates into an approximation of a quarter space, for a source  $Q$  of 4. The direct sound is thus 6 dB higher at a given sampling point with respect to the case where  $Q=1$ . The winner of this race might more likely be determined by the total sound level, in which case the specifics of each type of design would need to be compared to calculate reverberant sound level to arrive at the total sum. Again: option, tradeoff, decision.

Two minor quibbles: It is stated that the "initial time delay gap... may be adjusted to provide the psychoacoustic effect of a large space." Is this a desirable goal? Most commercial product, Disco excepted, is auditioned by the end customer in a domestic living room or den, which may or may not be a "large space." As many investigators have observed, it would appear desirable for there to be some correlation between the spectral and temporal characteristics of the "typical" living room, whatever that may be, and the control room. A matter for further research.

Also, it is implied that the "precedence zone" window is 20 ms. In a fairly extensive literature search on the subject, it appears that among the various investigations consulted, the precedence effect is at very least, a function of the source signal impulsive character, the absolute level of the direct sound, the time delay of the reflection, the relative sound level difference between the direct (or first) and the reflected (or second) sound, the spectral character of the reflected sound referenced to the direct sound, and the direction of arrival of the reflected sound referenced to the direct sound. Consider the possibility that the optimum reflection pattern in a LEDE control room might be different for different types of music — not so far-fetched; modern concert halls are often constructed with variable acoustics for this reason. Again, a matter for further investigation.

I hope neither the authors or the readers will find these comments to be carping. My sincere compliments to Don Davis for his intuitive leap away from conventional

thinking on the subject and developing a potential alternate solution for consideration in designing control rooms. My double compliments to Chips Davis for having had the courage to plunk down his money and build the first one, and thus prove that the LEDE scheme is indeed viable.

from: **Jerrold S. Tiers  
Clayton, MO**

The article, and subsequent defense of same, by Mr. Ray Kimber, concerning speaker wire, is substantially in error and is misleading. Mr. Kimber's error is in the use of an inappropriate equation without regard for the origins of the equation or the physics of electromagnetic speakers. The numbers obtained through the use of this equation do not have any necessary relationship to the force available to resist cone motion, except in comparisons using the same speaker, and are in any case not proportional to the damping force, i.e.: doubling the number does not double the force. Proof in a moment.

Lest I become embroiled in an audiophiles' subjective controversy, I hasten to point out that I am not attacking Mr. Kimber's favorite wire, just his technical explanation and formula. If you like the new wire, use and recommend it; just don't claim that halving the wire resistance doubles the damping. Now for the proof.

Let's start at the beginning. A loudspeaker is intended to transfer energy by air, by setting the air in motion, alternately creating high and low pressure zones near the cone. In order to move air, the speaker cone must move. The cone has some non-zero mass, so it has kinetic energy which is non-zero. The energy is stored when the cone is accelerated, and given up when it slows down. Because of this storage, the cone does not instantly reach full speed when a "step" of voltage is applied to the voice coil, nor does it instantly stop and reverse direction when the polarity of the voltage is reversed. When the cone is moving, its kinetic energy must be removed in order to stop it. That is, since work equals force x distance, and also work done on a moving body equals the change in kinetic energy of the body, a force must be applied while the cone moves some distance, in order to stop it. The force applied may be due to suspension friction, it may be due to the air resisting cone motion, or it may be due to electrical damping. If the rate of energy removal is low, (low damping, low friction, and poor coupling to the air), oscillations may occur at the resonant frequency of the speaker — the characteristic "hangover" or "tubbiness" in the bass (ringing also occurs in tweeters, and is often controlled by adjusting the suspension friction).

Neglecting everything but electrical effects, let's see what causes the damping

# Wait till the Word gets out.

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force. The force exerted by the voice coil is given by:  $F = Bli$ , where "B" is the magnetic flux density in the voice coil gap, "l" is the length of wire in the gap, and "i" is the current flowing in the voice coil. "B" and "l" are fixed by the coil and magnetic circuit assembly, and are constant. The variable is "i." Note that this force is either the force exerted by the coil, or the force exerted on the coil. (Microphones also "speak" if power is supplied to them.) In the case we are discussing, the energy is being supplied by the stored kinetic energy of the cone, and the current "i" is due to cone motion.

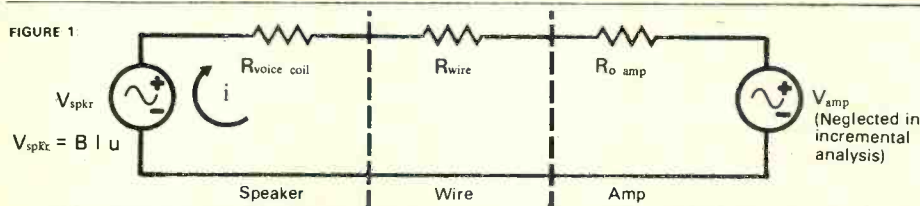
Now, taking the low frequency case, current = volts/resistance by Ohms law.

If we are considering the speaker/wire/amplifier system, the equivalent circuit in Figure 1 is useful.

The speaker-generated voltage,  $V_{spkr}$ , equals  $B l u$ , where "u" is the velocity of the voice coil, while "B" and "l" are as before. Therefore, the current "i" from the first equation is given by:

$$i = B l u / (R_{vc} + R_w + R_o)$$

FIGURE 1



and combining,

$$F = B^2 l^2 u / (R_{vc} + R_w + R_o) = B l i$$

We are neglecting the amplifier output voltage by invoking the principle of superposition, allowing separate solutions for the currents due to the two sources.

Plainly, the damping force "F" is dependent on the current, "i" which is inversely proportional to the sum of the resistances, including the voice coil resistance! Now, since the voice coil resistance is the largest resistance in the circuit, typically 5 - 7 ohms for a nominal 8 ohm speaker, it is the determining element. The formula used by Mr. Kimber, since it neglects this resistance, is invalid.

With respect to Mr. Kimber's "justification" of the omission, in which he claims that it's okay, since "the only difference would be the amount of power available . . .", his reasoning is faulty, precisely because the amount of power available will vary with voice coil resistance. Power, P, equals  $i^2 R$ . Reducing the resistance will increase the

current. Because the current is squared, while R is not, the increase of  $i^2$  more than offsets the decrease due to diminution of R. The net power supplied by the speaker will increase. Power is the rate of transfer of energy, so a given amount of kinetic energy can be removed in a shorter time if the rate of removal, power, is greater. So, again, the damping effect is greater if the voice coil resistance is decreased, if other resistances are held constant. It's not that the wire has nothing to do with damping, rather, voice coil resistance has the greatest effect because it is the largest resistance in the circuit.

It is erroneous to assume that any version of the "damping equation" used by Messrs. Kimber, Dickensheets, and Brooks provides any definitive information on speaker damping, since their formula, as well as my own observations above, has neglected an additional resistor which is the acoustic radiation resistance. This provides additional damping, varying from little, in an inefficient acoustic suspension speaker, to a possibly dominant effect in a high efficiency horn system. The horn system is likely to be very tolerant of low damping ratios, as the cone is coupled to a greater mass of air, so that its own mass becomes less important by comparison. The effect is similar to suppressing the "ringing" of an L-C filter by properly terminating the output. Speakers

## The Sound Workshop Series 1600 recording console.

As technology advances at an ever increasing rate, it has become easier to design and build recording equipment that yields "professional" specifications. But specifications alone do not define a product. As we conceived the Series 1600, we saw the need for a "true" professional console that would be at home in major multi-track installations, yet offer the cost effectiveness that other manufacturers promise.

The Sound Workshop Series 1600 employs a modular design philosophy, allowing numerous initial configurations, and the ability to add features and function as need dictates and cash flow allows.

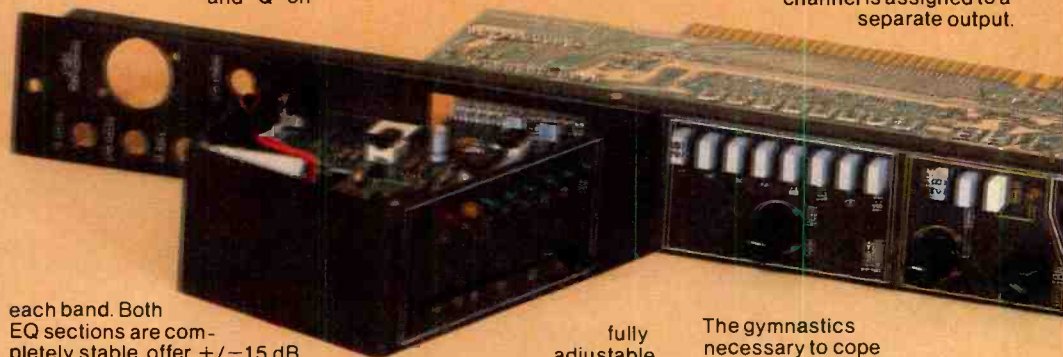
The Series 1600 is available with our standard transformer coupled mic-pre or our new transformerless design which features the TRANS-AMPLZ\* amplifier module.

Two equalizers are offered: the standard 3-Band 12-Frequency;

and the optional full parametric which offers complete control of frequency, boost/cut, and "Q" on

LED metering with even greater resolution than standard meters. All of our LED indicators feature

groups allowing from two inputs to the entire console to be controlled by one fader, even if each channel is assigned to a separate output.



each band. Both EQ sections are completely stable, offer +/- 15 dB range, and include an 18 dB/octave switchable low-cut filter as well as LED status indication for EQ IN and LOW-CUT IN.

The standard level indicator is an LED column which can be ordered with or later retro-fitted with Peak reading capabilities. Our new High Resolution Meter Module offers the convenience of

fully adjustable intensity to compensate for ambient light conditions, and accept our Spectrum Analyzer which adds Real-Time Analysis to the Series 1600. Standard Vu Meters are available on special order.

Our VCA Grouping Package permits assignment of each input channel to up to 3 Input Sub-

The gymnastics necessary to cope with today's complex mixes are handled by ARMS Automation, leaving the engineer and producer to return to their art; music and creativity. ARMS is a true computer based system featuring INDEPENDENT MUTE WRITE (if you are considering other automation systems, don't buy one that can't write mutes independently!!!), Auto-nulling,

\*Registered trademark of the Valley People, Inc., Nashville, Tennessee.

generally have an optimum amount of damping, with which they perform best, and the designer picks a tradeoff involving efficiency, size, range, then adjust the damping to conform to the desired filter function response. See the various articles in the *Journal of the Audio Engineering Society*, *Audio*, etc., for more information, especially concerning the large family of bass reflex alignments worked out by A. N. Thiele.

With that caveat regarding the usefulness of any fancy "damping" equations, let me summarize:

1) Electromagnetic forces in the loudspeaker are a function of the current in the voice coil.

2) For a given voltage, the current in the coil is determined by the total circuit resistance, including that of the coil.

3) Therefore, whatever the actual utility of the equations, it is incorrect to leave voice coil resistance out.

4) Since the voice coil resistance is large with respect to other resistances in the circuit, Mr. Kimber's linear relationship between wire resistance and damping has no basis in reality, the actual relationship looks more like a log curve, and diminishing returns catches up in a hurry.

5) Those wonderful damping ratios in the 30s and 40s are wholly imaginary, and those amplifier D Rs of 1,000 will not be attainable

in practice.

I am very interested in what the actual assumed source resistances in the speaker industry are. It makes more sense to me to assume a small non-zero value, and assume a normal statistical distribution around that value, than it does to assume zero source impedance, since you are certain not to attain exactly zero. In any case, there must be some sort of convention or standard rule of thumb.

In conclusion, Mr. Kimber's numbers seem a poor basis to choose wire on. It certainly seems adequate to keep wire resistance to around 5% of the voice coil resistance, in order to minimize power losses. Certainly #000 buss bar seems excessive, no matter what glorious numbers result from Mr. Kimber's formula.

reply from: **Ray Kimber**  
**RKB Industries**  
**Rexburg, ID**

In my article I was not trying to state the final word on dampening factor. Rather, the main purpose of the article was to show that there are some differences in cable resistance due to environmental temperature, stranding makeup, and the presence of tin coating on the conductors. I was only pointing out in *simple terms* that the cable resistance is a factor, and that the cable I was speaking about was sufficient to satisfy

such requirements.

But the low resistance is not the main attraction of the new speaker cable, rather the fact that low resistance, plus distributed capacitance and braiding (no coherent antenna) serves to significantly lower the affect of nearby power cables, lighting circuits, and RF fields. The cable also permits proximity with microphone lines to a much greater degree than possible with cable normally used with speakers.

Mr. Tiers is to be complimented on what essentially is an "article" on the subject of dampening factor; and I think a very good one. My apologies for oversimplifying the subject in the article. I essentially agree with Mr. Tiers, except that I still think my numbers are not a "poor" basis to choose wire on. I think that under a few circumstances wire resistance of 5% of the resistance of the voice coil would be adequate.

I do, however, think that between 2 to 5% of the voice coil resistance is better and, in fact, meets my original requirements. Taking into account the factors as mentioned by Mr. Tiers, one can easily decide which way to move within that 2 to 5% range.

And, for the record, I do not recommend #000 buss bar.

— continued on page 140

## A new philosophy of console design.

computer controlled Entry and Exit modes, programmable mixing, in-place-solo and more. ARMS will accept our soon to be released Super-Group option which allows an UNLIMITED number of programmable input subgroups.

Almost all of the options available for the Series 1600 can be retrofitted with no additional expense over the cost if factory installed. Write for additional details. We're choosy about who sells the Series 1600, so if you need assistance in finding the right dealer, call Emil Handke, here at Sound Workshop (516-582-6210).

The Series 1600 also features Penny & Giles faders; fully balanced inputs, transformers coupled track outputs, independent Studio and Control Room sections, 4 send busses with Input-sourcing and output assignment; and our unique modular, balanced TT Patch Bay.

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1324 Motor Parkway, Hauppauge, New York 11787 (516) 582-6210

# STUDIO UPDATE 1

## *Northeast:*

□ **LONG VIEW FARM** (North Brookfield, MA) is in the process of doing overdubs with **TIM CURRY** and co-producers **RICHARD WAGNER** and **MICHAEL KAMEN** for their upcoming album project for A&M Records. Engineers **KEVIN HERRON** and **BRUCE TERGESEN** are sharing the console. **FRED HELLERMAN** is mixing an LP for **PETE SEGER** in Studio B. **RANDALL BARBERA** has joined the staff as studio manager. *North Brookfield, MA 01535. (617) 867-7662.*

□ **PART I OF II RECORDING STUDIO** (North Dartmouth, MA) formerly a mobile recording service, has expanded its facilities to become a full-service 8-track recording studio. The studio is located midway between the capitals of Boston, Massachusetts, and Providence, Rhode Island, and draws customers from all over southern New England. The main studio was designed by the owners, and features a uniquely damped drum booth. *9 Sable Avenue, North Dartmouth, MA 02747. (617) 996-9728.*

□ **P & P STUDIOS** (Stamford, CT) announces the opening of their new **JOHN STORYK** designed 16-24 track studio. According to studio owners, **JOHN FISHBACK** and **TERRY PUFFER**, the facility also includes two smaller studios, a soundstage, high-speed cassette and reel-to-reel duplication, film editing and transfer and multi-image programming and projection. *17 Viaduct Road, Stamford, CT 06907. (203) 327-9204.*

□ **NOLA RECORDING STUDIOS** (New York, NY) has recently finished segmenting an upcoming event for the King Biscuit Flower Hour, with **RITA COOLIDGE**, **KRIS KRISTOFFERSON**, and **STEPHEN STILLS** headlining at the Havana Jam. The show was taped during a live performance in Cuba. Owner/engineer **JIM CZAK**, and staff engineer **TIM MULLIGAN** are engineering advertising campaigns with producers **BURT JONES**, **TRADE MARTIN** and **HORACE OTT** for spring releases on products including Gallo Wines, Yves St. Laurent and the Gillette Company. *111 West 57th Street, New York, NY 10019. (212) 586-0040.*

□ **BLUE ROCK STUDIO** (New York, NY) has been doing tracks with **ALAN GORDON**, writer of the **BARBRA STREISAND** hit "My Heart Belongs To Me," for the Entertainment Company and Screen Gems. The sessions were engineered by **MICHAEL EWASKO**. Also in the studio is **KEITH AVEDON** being produced by **ALLAN SCHWARTZBERG** and engineered by **MICHAEL EWASKO** and **EDDIE KORVIN**. *29 Greene Street, New York, NY 10013. (212) 925-2155.*

□ **MAGNAGRAPHIC RECORDING STUDIOS** (New York, NY) has just purchased a 16-track Scully with full remote control, updating the studio from 8- to 16-tracks. Other studio equipment includes: a custom Spectra Sonics console, dbx noise reduction, MicMix reverb and digital delay. *72 Bedford Street, New York, NY 10014. (212) 691-2333.*

□ **RIGHT TRACK RECORDING** (New York, NY) has recently updated their Auditratics 501 console with the Allison Research Fadex system giving the studio automated mixdown capabilities, according to studio owner, **SIMON ANDREWS**. *44 West 24th Street, New York, NY 10010. (212) 243-4782.*

□ **RECORD PLANT** (New York, NY) unveiled its flying remote recording package at the onset of the CBS Havana Jam at the Karl Marx Theater. Record Plant's director of remote recording, **DAVID HEWITT**, described the operation as "a complete packaging system which allows us to transport our gear via the small aircraft and limited ground transportation available in South America." The control room sets up in available space complete with adjustable wall treatment. *321 West 44th Street, New York, NY 10036. (212) 581-6505.*

□ **SIGMA SOUND STUDIOS** (New York, NY) is currently recording tracks and overdubs for the next **STEELY DAN** album. The sessions are being produced by **GARY KATZ** with **ROGER NICHOLS** handling the engineering chores. Other activity at the studio includes **JIM BURGESS** for **DOOBIE BROTHERS** with **ANDY ABRAMS** engineering. Also, **JIMMY SIMPSON** mixing **DEODOTO** with **ANDY ABRAMS** engineering. *1697 Broadway, 10th Floor, New York, NY 10019. (212) 582-5055.*

□ **THE SOUND PALACE, INC.** (New York, NY) has recently installed a monitor system designed for the studio by **TED ROTHSTEIN**. The system utilizes the UREI time-aligned crossover with the Altec 604, JBL super-tweeter, and three sub-woofers in each cabinet. The studio accommodates up to a 30 piece orchestra and utilizes an MCI series 536 console which is fully automated. *237 West 54th Street, New York, NY 10019. (212) 541-4870.*

*have you?*

- **increased track capacity - gone 24, 16, 8 •**
- **added key people • won awards •**
- **moved or expanded • added important equipment •**

*these are some of the interesting news items that can be announced in the next available issue. Write:*

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Box 2449, Hollywood, CA 90028**



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for additional information circle no. 6

R-e/p 17

# STUDIO UPDATE 2

□ **DAWN RECORDING STUDIOS, INC. (Farmingdale, NY)** announces their recent relocation into a new studio complex. The new studios feature a custom built Xedit 16-track recorder, a Van Eps stereo disk cutting system, API and Gately 16-track consoles, plus outboard equipment. A second 16-track studio is presently under construction. 756 Main Street, Farmingdale, NY 11735. (516) 249-9619.

□ **WIZARD RECORDING STUDIOS (Briarcliff Manor, NY)** announces its expansion to 24-track capability with the acquisition of a new Lyrec recorder, one of the first of the line to be introduced in the U.S. by Neve. Other equipment includes a Tangent 3216 console. Studer A-80 2-track, Big Reds with Mastering Labs crossovers, Auratones, and a custom designed house monitor system. All outboard equipment as well as BGW power amplifiers, White monitor EQ, and crossovers are housed in custom built enclosures. P.O. Box 25, Briarcliff Manor, NY 10510. (914) 762-3015.

#### Southeast:

□ **ALPHA AUDIO (Richmond, VA)** recently installed a new 32-channel, automated Sphere Eclipse "C" console. Among the initial users of the new console were producers **RON DUNBAR** and **GEORGE CLINTON**, completing album projects for Parlet and Bootsy's Rubber Band. Alpha's engineer for the sessions was **NICK COLLERAN**. 2049 West Broad Street, Richmond, VA 23220. (804) 358-3852.

□ **STRAWBERRY JAMM SOUND COMPANY (West Columbia, SC)** has expanded from four tracks to sixteen over the course of the past two years. The studio features MCI 16-track recorder with AutoLocator, MXR digital and analog delay, dbx noise reduction, three control room monitor systems, three isolation booths, and five echo systems. Plans for the future include 24-track with automation within the year. 3964 Apian Way, West Columbia, SC 29169. (803) 356-4540.

□ **CRITERIA (Miami, FL)** has been recording a new album for **PURE PRAIRIE LEAGUE** with **RON** and **HOWARD ALBERT** for **FAT ALBERT PRODUCTIONS** producing, **DON GEHMAN** engineering, and **KEVIN RYAN** assisting. Criteria president **MACK EMERMAN** personally took over the engineering for a new double LP, by the **UNIVERSITY OF MIAMI CONCERT JAZZ BAND**. 1755 N.E. 149th Street, Miami, FL 33181. (305) 947-5611.

□ **SRS INTERNATIONAL RECORDING CORPORATION (Ft. Lauderdale, FL)** has finished basic tracks on a new **BUDDY GRECO** album with final mixing to be completed in April. Also in production are **FREDERICK MICHAEL ST. JUDE**, **ABBY LINCOLN** and **DINK RAMSEY**. 790 Northeast 45th Street, Ft. Lauderdale, FL 33334. (305) 772-0008.

□ **FXL SOUND STUDIOS (Sunrise, FL)** has recently opened its new 8-track studio with **GOVERNOR BOB GRAHAM** cutting a symbolic recording tape to mark the opening. Studio equipment includes MCI 8- and 2-track recorders, a Loft console, Crown amplifiers, and Big Red monitors. The new studio is under the owner/management of husband/wife team, **FRANK X. LUCONTO** and **PHYLLIS FINNEY**. 7766 N.W. 44th Street, Sunrise, FL 33321. (305) 741-7766.

#### South Central:

□ **JACK CLEMENT RECORDING STUDIOS (Nashville, TN)** has been working on the movie soundtrack for the upcoming film, **THE VILLAIN**, a Rastar Films-Engelberg Production starring **KIRK DOUGLAS**. Production on the project was being supervised by producer/arranger **BILL JUSTIS**. Also in the studio was **BOBBY BARE** with **BYRD BURTON** producing and **GARY LANEY** engineering. 3102 Belmont Boulevard, Nashville, TN 37212. (615) 383-1982.

□ **YOUNG'UN SOUND (Nashville, TN)** has recently updated the studio and control room, according to owner **CHIP YOUNG**. The **VALLEY AUDIO** designed room features a Sphere Eclipse "C" with Allison programmer, and two Ampex 24-track recorders with sync-lock capability. Monitors available are Westlake, 4311s, and Auratones. Still under construction are Studio B and a separate re-mix room. 114 - 17th Avenue South, Nashville, TN 37203. (615) 244-5656.

□ **MUSIC CITY MUSIC HALL (Nashville, TN)** formerly RCA Studio A, has recently updated their Neve 8038 console by adding Allison Research's automated fader system, the Fadex, according to **BILL HARRIS** and **BILL VANDERVORT**, the studio engineers. 30 Music Square, Nashville, TN 37203. (615) 255-9084.

— continued on page 23

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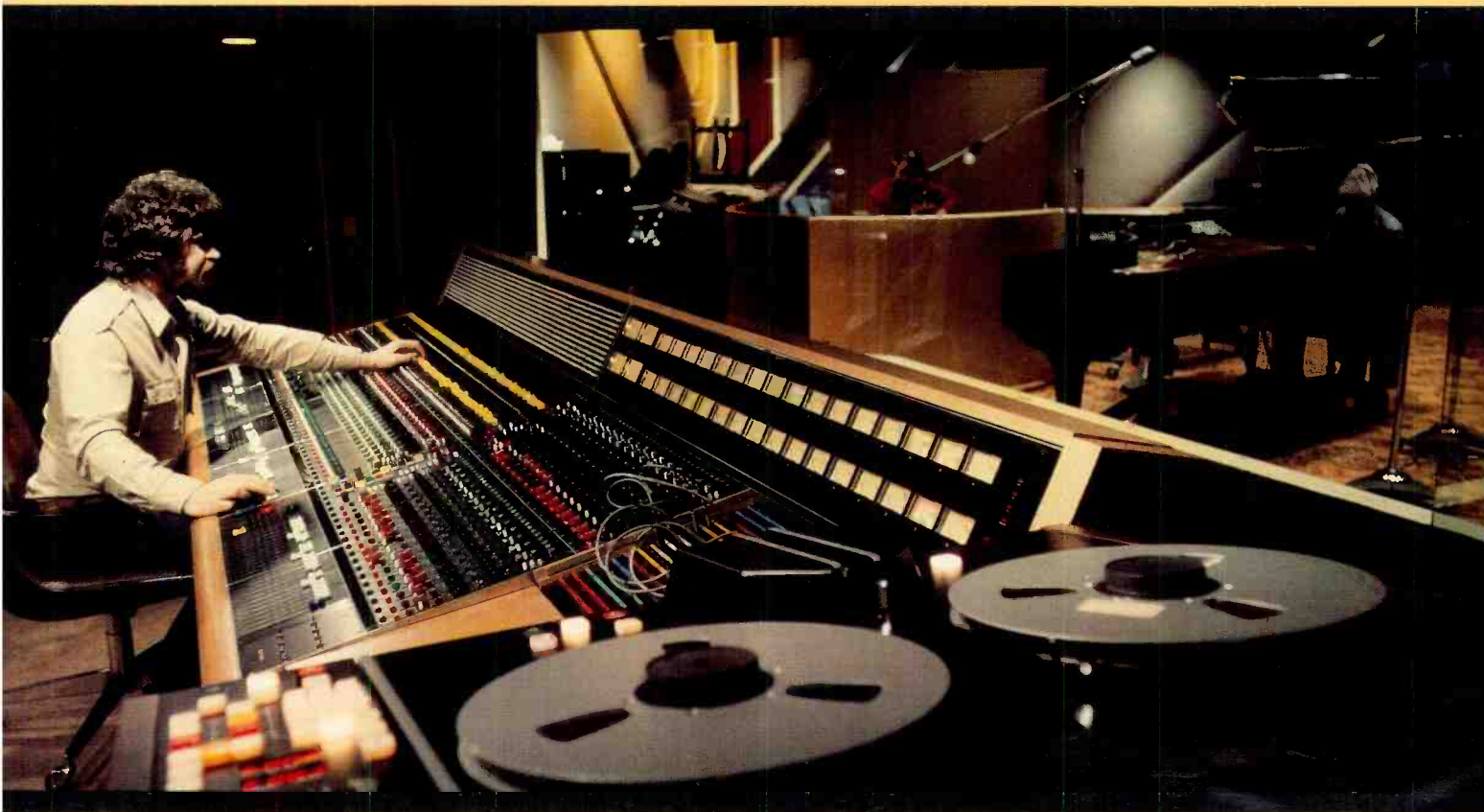
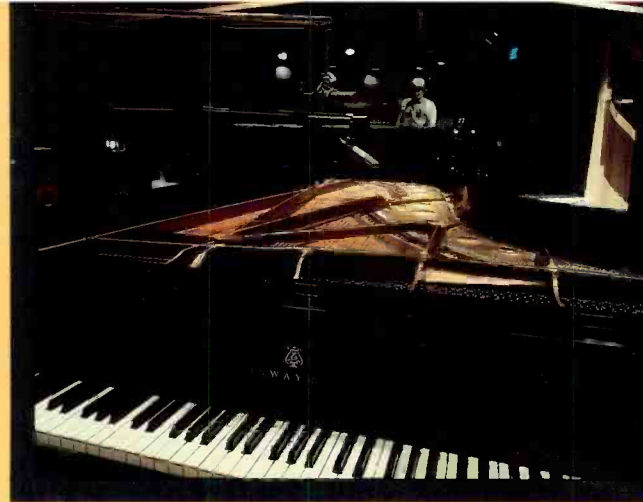
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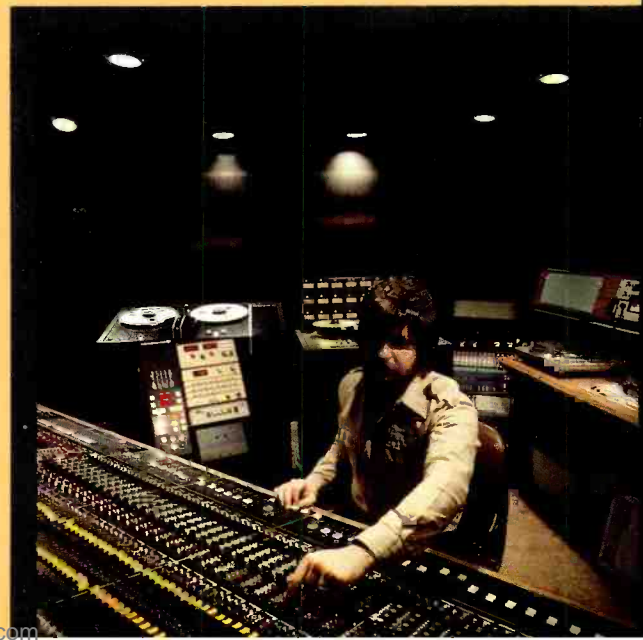


## Definitely a World Class Studio.

You've heard about Sound 80 in Minneapolis. About how the latest technological developments and equipment are always available in our studios. About our reputation for technical excellence and leading the industry in equipping studios with revolutionary recording systems. Well, we've just topped our own reputation.



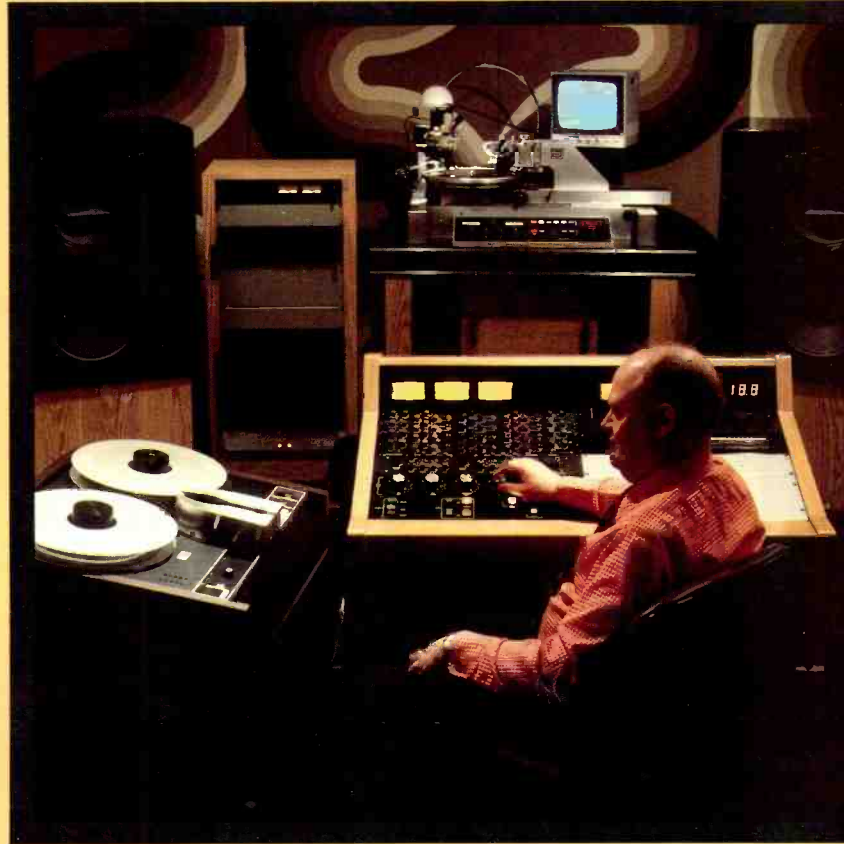
Now there's a reason to do more than hear about Sound 80—there's a reason to come and see (and use) our studios. Simply stated, Sound 80 has the finest "beyond the state-of-the-art" recording equipment available anywhere today. From the 3M digital 32-track recorder to a selection of new consoles chosen for their "musical" characteristics; from the results of years of research in monitor systems to the disc recording and remote recording systems described here: Sound 80 is definitely a world class studio.

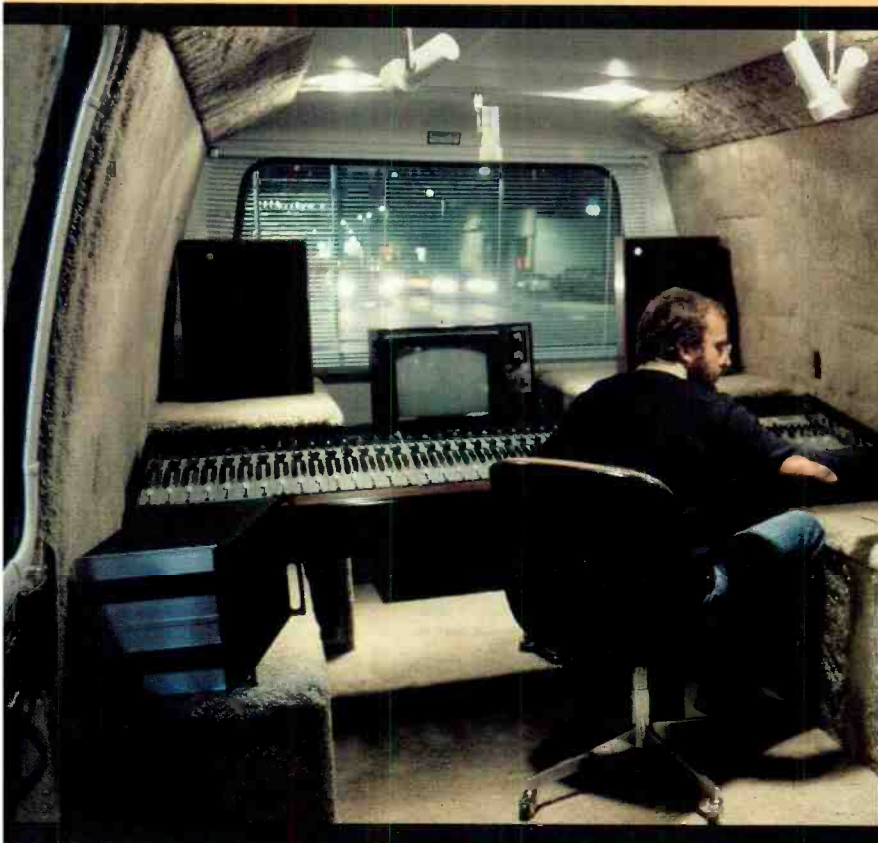
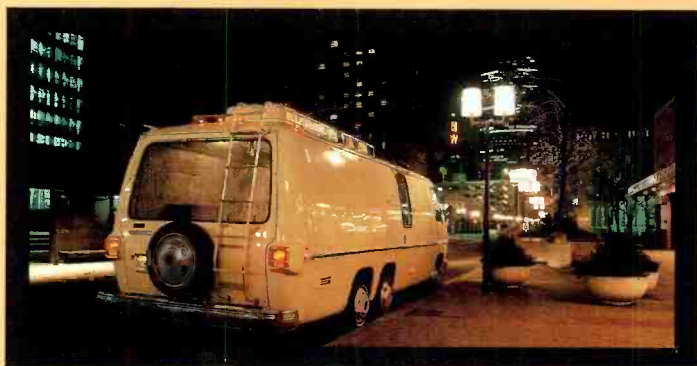




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## Road 80.

We call it Road 80 because our remote truck can take Sound 80 technology—including multi-track digital—anywhere. Our GMC Coach is the only remote unit available in the midwest, but it's receiving national attention because its acoustical environment sounds as good as most control rooms. Road 80 can capture those great midwest audiences on 32-track digital, 24-track analog or two 24-tracks locked together (46-track).



# SOUND80

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Minneapolis, Minnesota 55406  
(612) 721-6341

# STUDIO UPDATE 3

continued from page 18

□ **ARDENT RECORDINGS, INC. (Memphis, TN)** is currently constructing a third studio which will offer automated mixdown with recording capability up to 42 tracks. Meanwhile, the two existing studios are kept busy with **DENISE LASALLE, ZZ TOP** and **THE MEMPHIS HORNS** among the groups using the 24-track facilities recently. 2000 Madison Avenue, Memphis, TN 38104. (901) 725-0855.

#### North Central:

□ **SUMA RECORDING STUDIO (Painesville, OH)** has just completed final installation of 24 channels of Dolby Cat 22 Noise Reduction, interface with an Ampex MM-1200 24-track and Ampex MM-1000 16-track recorder, in addition to technical improvements in Suma's 24 x 48 channel console. Other equipment in use includes DeltaLab digital delays, EMT echo, Eventide Flanger, Studer and Ampex tape machines, and JBL and Auratone monitors. 5706 Vrooman Road, Painesville, OH 44077. (216) 951-3955.

□ **K&R RECORDING STUDIOS (Southfield, MI)** has just celebrated its first year in business. Equipment includes: 8- and 16-track Scully machines, 4- and 8-track Tascam machines, Otari and ReVox 2-track machines, JBL and Auratone monitors, Model 5 Tascam Mix board, dbx compressors and noise reduction, Kepexes, and Orban and EMT reverb. 29111 Greenfield Road, Southfield, MI 48076. (313) 557-8276.



□ **CLOUD BORN PRODUCTIONS STUDIOS (Grosse Pointe, MI)** announces its expansion to 24-track MCI with Dolby and dbx noise reduction. The facility is owned by **KEN SANDS** and **GARY PRAEG**. Additional equipment includes an MCI console, Eventide Harmonizer, UREI limiters, Kepex Noise Gates, EXR Exciter, and a choice of two monitoring systems. 18000 Mack Avenue, Grosse Pointe, MI 48224. (313) 882-0566.

□ **LANSING SOUND (Okemos, MI)** is now a 24-track facility. The building was designed and constructed from the ground up as a recording studio. The studio features a MCI 24-track recorder, Neotek console with full complement of mikes and outboard equipment. Engineer and chief designer **BOB BALDORI** has formerly worked with Lou Adler, Chuck Berry and Motown Records. 2719 East Mt. Hope Road, Okemos, MI 48864. (517) 351-6444.

□ **WESTMINISTER SOUND STUDIO (Ft. Dodge, IA)** has released plans for a major expansion, including the acquisition of 24-track state-of-the-art recording equipment for their Westlake facility. According to studio manager **JACK STOWE**, Milam Audio will be installing the new equipment. Box 220, Otho, IA 50569. (515) 972-4475.

#### Southwest:

□ **INDIAN CREEK RECORDING (Uvalde, TX)** is currently under construction, incorporating the newest design from **WOODY SMITH**, of Abadon/Sun, Inc. The new studio is being built from the ground up with 18-inch thick rock walls resting on bedrock along with fifteen hundred square feet of glass enclosing the structure. Equipment consists of a Neve console and Lyrec multitrack with Ampex ATR-100 mixdown machines, Lexicon digital reverb units, with monitoring done through an array of three JBL 4343s bi-amped with Crown PSA-2s and equalized by White sixth octaves.

□ **WELLS SOUND STUDIO (Houston, TX)** has just upgraded to 16-track facilities from 8-track. Also in the changeover, a 32-input Speck console was installed. Monitoring is done through Altec 604s, with outboard equipment including delay lines, dbx, and signal gates. 2036 Pasket, Houston, TX 77018. (713) 688-8067.

#### Mountain:

□ **SANBORN PRODUCTIONS (Boulder, CO)** is now operating its new mobile unit designed by **GENE REYNOLDS** and **CARL FROST** utilizing the near-field monitoring with bi-amped JBL 4333A monitors. Other equipment includes a Sound Workshop 1600 console, and an Ampex AG-440-8. The 27-channel snake system uses Jensen splitter transformers and AMP Coaxacon connectors. An oversized heating/air conditioning unit floats independent of the control room. All of this is housed in a 22' van atop an International Loadstar. 1280 - 28th Street, Suite 10, Boulder, CO 80303. (303) 443-2372.

have you?

- increased track capacity - gone 24, 16, 8 •
- added key people • won awards •
- moved or expanded • added important equipment •

these are some of the interesting news items that can be announced in the next available issue. Write:

R-e/p STUDIO UPDATE  
Box 2449, Hollywood, CA 90028

# STUDIO UPDATE 4

□ **COMMUNI-CREATIONS, INC. (Denver, CO)** has started operations in their newly completed 24-track room. **ALAN BURNHAM**, former designer and technician at Caribou Ranch, now a staff member at Communi, designed and installed the new studio. The facility now has three complete recording areas, including a 50' by 35' by 18' sound stage, a newly remodeled eight track room, video capabilities in all rooms, and all Ampex equipment including the ATR-100. EMT reverberation units are also featured. 2130 South Bellaire Street, Denver, CO 80222. (303) 759-1155.

## Southwest:



□ **LOCATION RECORDING SERVICE (Burbank, CA)** has reopened their Studio 4 with a new Trident TSM 32-24-24 board, which will be interfaced with the first Studer A-800 to be delivered in the U.S., late in April. The new board features a custom layout, and special mods to provide optimum, transformerless, interface with the new Studer. First sessions in the new room will include: Backstreet/MCA's artist, **ROBBIE PATTON**, with **MIKE VERDICK** producing, and Epic Records' group **PAGES**, with **BOBBY COLUMBY** producing, and **MIKE VERDICK** engineering. 2201 West Burbank Boulevard, Burbank, CA 91506. (213) 849-1321.

□ **KENDUN RECORDERS (Burbank, CA)** has promoted **LEILA GREENSTONE** to director of administration, and **LEAH BERNSTEIN** to director of creative services. Also joining the engineering staff are **JOHN STRONACH** and **BAKER BIGSBY**. Artists in the studios include: **BLUE OYSTER CULT**, **IGGY POP**, and **JOACHIM KUHN**. 619 S. Glenwood Place, Burbank, CA 91506. (213) 843-8096.

□ **SOUND AFFAIR RECORDING (Santa Ana, CA)** has opened its new studio featuring an Ampex MM-1200 16-track machine and a Sound Workshop 1600 series console. Monitoring is through JBL and E-V Sentry III speakers. Studio design includes drum and vocal isolation rooms and piano trap area. **EXPRESS SOUND** served as a consultant and installer on the project. 2727 G. Croddy Way, Santa Ana, CA 92704. (714) 540-0063.

Sound Affairs Studio



□ **SALTY DOG RECORDING (Van Nuys, CA)** has opened its new 24-track studio with 4,000 square feet of floor space and new equipment, including MCI JH-528 console, 3M-79 24-track machine with Audio Kinetics AutoLocator, Ampex 2-track machines, stereo EMT, Marshal Time Modulator, UREI Time Cube, Kepex, Gain Brains, MXR Phasor and Flanger, with monitoring done through Ampex monitor speakers. 14511 Delano Street, Van Nuys, CA 91411. (213) 994-9973.

□ **SPECTRUM STUDIOS (Venice, CA)** has added a Stephens 24-track tape recorder and an EMT/250 Digital Reverberation system to their already 24-track studio, bringing total recording capability to 46 tracks using their 3M-79 24-track and the new Stephens interlocked. The studio has also modified their automated Harrison console to include tri-stable null lights, automated mute and high frequency peaking/shelving option. The studio is currently completing an LP for **DAVID CASTLE** (Casablanca/Parachute), **JOE FARRELL** (Xanadu), and **DAVID SOUL**. 3015 Ocean Front Walk, Venice, CA 90291. (213) 399-9218.

□ **LIONS GATE FILMS (Los Angeles, CA)** the production company founded by **ROBERT ALTMAN**, has recently gone into post-production with the establishment of **LIONS GATE SOUND**. **RICHARD PORTMAN** has been named vice president. Portman's credits include seven Academy Award nominations. Two new state-of-the-art dubbing stages are being constructed which will be able to accommodate 15 films per year. All time is already booked through 1979. 1861 South Bundy Drive, Los Angeles, CA 90025.

□ **KSR STUDIOS (Hollywood, CA)** has opened their new 24-track facility, according to president **KEN STORY**. The studio is MCI equipped with 36-in and 24-out. Monitoring is done with UREI Time Align Monitors. **JERRY WEAVER** (Casablanca) is currently cutting tracks at the new studio for the R&B group, **FRIENZ**. The sessions are being engineered by **HAL SACKS**. 1680 Vine Street, Suite 706-713, Hollywood, CA 90028. (213) 467-0768.

□ **ELDORADO SOUND STUDIOS (Hollywood, CA)** was operated for fifteen years under the supervision of chief engineer **JOHN CEVETELLO**. On February 1st, John died while in Paris recording a Carmen MacRea album at the NEDAM convention. The studio will continue to operate under the new management of **NADA RAY BELL**, previously an assistant to John. 1717 N. Vine Street, Hollywood, CA 90028. (213) 467-6151.



# FOR THE SMALL STUDIO OWNER WITH BIG IDEAS.

If you're a small studio owner, you may have a problem: your ideas are far beyond your present equipment.

Maybe you're an engineer, dreaming of an automated 24-track studio. Maybe you're a producer, searching for "the next big thing." Maybe you're an artist, trying to land a record contract. What you need is something that will get you from where you are to where you'd like to be.

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# STUDIO UPDATE 5



□ **JENNIFUDY RECORDING STUDIOS (North Hollywood, CA)** has opened their new 24 track studio according to an announcement by owner and chief engineer **Phil Kaye**. The studio is equipped with a Harrison Model 3232 console. Available are a number of different monitoring systems including the UREI 813 'Time Aligned' and Mitsubishi DS-35B speakers. Kaye recently engineered a direct-to-two-track album for producer **Dave Pell's** "Prez Conference" featuring Joe Williams. The record was produced for GNP Crescendo, and is called "Prez and Joe". 11115 Magnolia Boulevard, North Hollywood, CA 91601 (213) 980-3872

□ **THE AUTOMATT (San Francisco, CA)** has been recording **CON-FUNK-SHUN** for Mercury Records with **SKIP SCARBOROUGH** producing and **FRED CATERO** engineering. Also in the studio were **THE DUROCS** with **ELIOT MAZER** producing in conjunction with members **RON NAGLE** and **SCOTT FREE**, and **SPELLBOUND** with **ROY SEGAL** engineering. 827 Folsom Street, San Francisco, CA 94107. (415) 777-2930.

□ **TEWKSBURY SOUND RECORDERS (Richmond, CA)** has just acquired an Ampex MM-1000 wired for 24-tracks, a pair of Ampex 440 2-tracks, and two ReVox quarter and half-track machines. Other new equipment includes: a Nakamichi cassette deck, Orban Parametric Equalization, a Schoeps stereo microphone, and a Mason-Hamlin Concert Grande, 9' long, which was built in 1910. 6026 Bernhard, Richmond, CA 94805. (415) 232-7933.

□ **VILLA RECORDERS (Modesto, CA)** has opened its new 16/24-track studio located on an 80 acre almond ranch. The studio is using a Trident 28-in, 24-out console, Ampex MM-1200 16/24-track recorder, two Ampex ATR-100s, and a custom monitor system with Altec 604s, JBL 4311s, and Atratoners. For rest and relaxation the studio has a swimming pool, hot tub, and Swedish sauna. 3013 Shoemaker Avenue, Modesto, CA 95350. (209) 521-1494.

Villa Recording Studios.



## Northwest:

□ **KAYE-SMITH PRODUCTIONS (Seattle, WA)** announces the reopening of their Studio A, which features an API custom console recently retro-fitted with the Allison Research Fadex system. According to **DAVE MATHEW**, chief maintenance engineer for the facility, Studio B also utilizes an API console, which is automated with an Allison 65K Programmer. 2212 Fourth Avenue, Seattle, WA 98121. (206) 624-8651.

## England



□ **LANSDOWNE HOUSE (London)** has recently installed a new Scamp outboard rack consisting of four F300-S Expander/Gates, two S01 Compressor-Limiters and the new effects modules S23 Pan Effects Module and S24 Time Shape Modules. The rack has been built into a self-contained signal processing "trolley" which may be wheeled to any part of the studio. Lansdowne House, Lansdowne Road, London W.11. 01 727 0041.

□ **ODYSSEY RECORDING STUDIOS (London)** has completed its new 52-track studio in London's West End. The facility includes two studios with large control rooms, a broadcast facilities studio, copying rooms, and will eventually include disk cutting facilities. Each control room will have MCI 24- and 32-track machines which can be locked together. In addition both studios are electronically connected making it possible to tie all four machines together.

## Australia

□ **STUDIOS 301 (Sydney, Australia)** has opened as a state-of-the-art facility consisting of two main studios, a mixdown suite and mastering rooms. The studios offer fully synchronized video for film and television work, direct-to-disk recording of up to 45 tracks with sync-locked Studer tape machines. Acoustic design was done by **KIGEL WAKE**, with all studios, including the mastering suite and mixdown suite, being acoustically matched. Other equipment includes: Neve consoles, and dbx or Dolby noise reduction in addition to all of the usual special effects equipment. 301 Castlereagh Street, Sydney NSW, Australia. (02) 20912.

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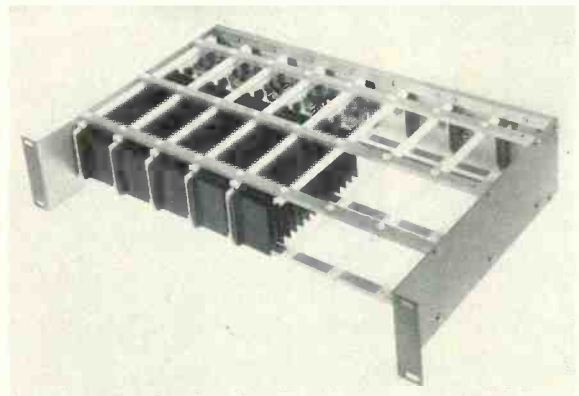


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## Horizon's Tommy LiPuma

- from promotion • to production • to president -

by Tom Lubin

photography: Art Rex

*R-e/p [Tom Lubin]: In the past you've started and built a couple of labels. Horizon is your new label . . . tell me about it.*

**Tommy LiPuma:** Hopefully it's going to be as eclectic as my personal tastes are. I enjoy a lot of different types of music and I feel a record company has to have a strong base. It has to be involved in all types of music. When I say all types, I don't feel we should venture into country, or classical since I feel there are other people who do that a lot better than I. But other than that I'd say Horizon is going to be rather broad in range. Not just because I feel it's important to have a good solid base but because that's the way my tastes are.

*R-e/p [Tom Lubin]: Do you think Horizon, a small label, operating under the umbrella of a much larger company, A&M, is indicative of a trend in the business? Do you see more small labels being distributed through much larger companies?*

**Tommy LiPuma:** I think distribution deals will probably become more prevalent in order for the small label to survive.

You know there was a time when a small label could make it with independent distribution. At the time that was the state of things, but today it's become so sophisticated. The manner in which Columbia or WEA distribute their product to the retailers and directly to the consumer makes it very hard for the small company to stay right up there with them, and they have to, just to compete. It's not only a question of good music, though I guess I'll always feel that good music will win out, it's a question of getting your product out on the street. I think that any smart individual, an entrepreneur, who wants to start a label

should put some serious thought into it.

I learned that the best way, by hard knocks. I started in 1962 with a Cleveland record distributor. It was a good experience. I packed records for M.S. Distributing. Shortly thereafter I got into promotion. I came out to L.A. and went to work for Liberty Records. They sent me to New York for a year in the same capacity, and then I came back out here and got into publishing. That was when I was able to start delving into the studio. I was doing song demos with writers and was able to learn producing without having to put my ass on the line making a record. It gave me a chance to play around in the studio. I realized I really enjoyed it.

I had been a musician, a saxophone player, and had traveled with bands for a few years. I averaged three or four nights a week. During the day I was a barber by trade. That might have spurred me on because I hated barbering to such a degree that I began to drill myself to achieve whatever it was I was going to do just to get out of that.

*R-e/p [Tom Lubin]: How is it you went into promotion rather than developing as a musician?*

**Tommy LiPuma:** I suppose I was a bit insecure. Then again, now that I think about it, it could have been just how I felt at the time. It seemed like a good way to get into the business. I was always a record freak. I had a big collection of albums, so it was an exciting thing to be into. The insecure part of it was that I wasn't a schooled musician. I could read, but I wasn't good at composition. I felt you had to have a background in conducting, and so on. It

never really occurred to me to enter it as a player, not once I heard John Coltrane play in a club. I knew I wasn't in that category, so I went into promotion and that brought me out here.

*R-e/p [Tom Lubin]: Is that when you got involved with A&M?*

**Tommy LiPuma:** No, A&M was the first job that I held as an A&R man. Prior to that I was doing A&R work with Imperial Records, which was a subsidiary of Liberty. I had moved myself from professional manager of the publishing firm into making some records. At that point Jerry and Herb asked me to join them. That was when they were just starting to expand. But we've gotten off the beaten path. We were talking about surviving in the business.

The biggest lesson I had was with a company that I co-owned — Blue Thumb. Dave Mason, the Pointers, the Crusaders, Dan Hicks and the Hot Licks, Sylvester and a few others were on the label. This was before ABC got involved with it. It was three-and-a-half years of survival. We were trying to exist as an independent, but we had a terrible time collecting from distributors. We had to pay our bills because it was the only way we could get our records pressed, but it was tough getting our money. At that particular time, in the late 60s and early 70s, the big labels were really getting into bidding wars over artists, so we were really flying by the seat of our pants. Nonetheless it was a real lesson for me in marketing. I realized just what you're really up against if you're a smaller label.

There was a list of independents. A&M,

— continued overleaf

Motown, and a few others, were at the top and they got paid first. We were at the bottom of the list. To get back to the original question. Yes, I think you're going to see more small record labels using major distribution providing the major knows and trusts the abilities of those involved.

*R-e/p [Tom Lubin]: Many artists have tried to start their own labels in an effort to showcase their talents and generate interest in their region. Often they hope that a major will see some action on the act and pick up the product. Do you think an act has a chance by approaching the record business this way?*

**Tommy LiPuma:** First of all they need a good amount of capitol in order to just make the record, pay for the manufacturing and distribution, and support whatever it takes in the way of promotion to break the record out. I wouldn't want to say that it couldn't be done, but I think that it's practically suicidal as far as getting something out of it. I think an act would be better off putting their energies into making the act as good as it possibly can be. The band should have their material good and tight so they're really ready to go when it does start happening.



At Sound Labs with engineer Al Schmitt.

*R-e/p: Once they are ready who should an act first approach? A record company, an attorney, an accountant or management?*

**TL:** I'd say for an unknown group that doesn't have anybody handling their management, they should go to an attorney. A music attorney, not just "a" attorney, because for the most part attorneys are connected with people in the record business on a daily basis. If they hear something when someone comes into their office for some sort of business negotiations, it's very easy for the attorney to say, "I just heard something today. The guy plays really well, and I think you should hear the tape." If that happens there's a possibility that someone will hear the tape.

Trying to hook up with a manager who is known for an act that is unknown, is almost impossible unless the manager sees the group and gets excited and wants to manage the act. Getting someone to

represent you as your "manager" for the sake of being your mouthpiece isn't much help either. If he doesn't have any more power or clout to open doors than you do, then you're both in the same boat. There are very few individuals that have the aggressiveness and ingenuity to get in the door and become a great manager. So, I guess it comes back to the best thing they can do is find a reputable music business attorney. If the attorney can't directly help he will definitely know somebody who could. If he's into it and likes the people involved and wants to take them on as clients then, obviously, he's going to work with them.

*R-e/p: Do you think performance is an integral part of promoting the record product?*

**TL:** I have seen cases where it didn't seem to matter; such as Steely Dan, or Pink Floyd, but I think it really helps. In the case of George Bensen, when he's traveling he's probably reaching 20,000 people a week. If you do that over a period of thirty or forty weeks, and maybe every six months you go back to the same town, you're not only seeing a lot of people, you're building up a following. Your name is always out there in one form or another.

*R-e/p: If a band is third on a bill they're probably not even meeting their expenses. In order to make it happen for them are record companies getting more involved in the financing of the road production?*

**TL:** Very much, but it depends on what type of tour is booked. It's got to make sense. If a band comes to the label and wants tour support and their manager has booked them in a lot of towns that aren't important, then the company isn't going to do it. The cities don't have to be major cities like L.A. or New York, but they have to be break-out markets like Seattle, Washington/Baltimore, Boston, Philadelphia or Atlanta. It's important that they be seen in those areas, especially to coincide with the release of a new album; but it's got to make sense, the dates have to be right. Another thing, when you're dealing with a good manager it's amazing the things you can do. The staging of the show. If they're good at it then things go as smooth as butter.

*R-e/p: Like Bill Graham.*

**TL:** Yes, or Shep Gordon.

*R-e/p: Since they're already financing tours do you think record companies are going to get more into management as well as record production? Will the two become integrated?*

**TL:** Well, in a sense it goes on now when an act doesn't have a manager. Sometimes they're better off not having one. If the record company is on top of the situation

they can act as a liaison between the group and an agent or club. But something tells me that it would get off-color if suddenly you had record companies dealing in management. I think it would be unhealthy.

*R-e/p: It seems that jazz is becoming an ever increasing part of the record market.*

**TL:** I think it has more visibility. I see more articles and magazine features. There's more being written about it and more people have become interested in it. The artists that have had huge success such as Chick Corea, and George Bensen aren't really making "jazz" albums. I don't think *Breezin'* or any of the other albums I've made with George are strictly jazz records. Those record are very broad in nature and have a lot of different influences in them. By contrast a Bill Evans album falls much more into the category of jazz. Those albums, even though they may have had increased sales commensurate with the increase in the buying public, aren't really doing any better than they were five years ago. I'm sure that if Bill sold 30,000 copies of his last album that would be a lot. It's unfortunate, too, because he happens to be one of the best.

*R-e/p: He did an excellent album with Tony Bennett.*

**TL:** That record sold more, and had "pop" overtones by the very nature of Tony Bennett.

*R-e/p: A&M has always taken acts and developed them. They've always been willing to keep an artist who consistently sells, though not millions of units. Many labels seem much more prone to drop an artist if their first record isn't a million seller. Do you think labels are going to continue this practice, or become more involved in nurturing and developing an act?*

**TL:** I think it will depend on the nature of the act. In the case of A&M their very existence made them do what they've done, which is develop talent. There's a few reasons for that. First, I don't think Jerry is the kind of individual who is inclined or, if it really got down to it, would want to compete with, let's say, a Columbia. He gets more of a jolt out of finding an unknown act that he has an instinct about, and building that act. I can't think of one act with the exception of Joan Baez, or someone of that stature, that was a known act prior to being with the label. It's the very nature of what they've built this small empire on. It's what they get a kick out of. To tell you the truth, so do I. It's not that I've made that a quest in my life, it's just that I get some bit of excitement out of developing an act. I think that's where my strengths lie.

I guess, too, I don't particularly like dealing with an established act. You have less of a one-to-one relationship when you suddenly walk into a situation where you're



At Sound Labs with drummer Steve Gadd.

confronted with an act that's sold several million copies. Suddenly, you're sitting there and they say to you, "Okay, schmuk. What have you got to contribute?"

The thing I thrive on is being able to develop talent. It's seeing the potential, and working with it.

*R-e/p: How important is the attitude of the artist in your decision to work with them?*

**TL:** That's one of the big things. First of all, it's very obvious there is a multitude of talent out there. Some talent seems to work at their art in a negative manner and some work positively. I've worked with both. When the talent is so great that I overlook some potential problems, then it will always, some way or another, come back and disturb the situation. An act has to have all the elements, not only whatever it is, the vocal or musical creative part, but also a determination and positive attitude that they've got the goods. It's just a question of getting all the right elements and working at it and making it your career. That's another thing. An artist sees what's conceivable and what's possible and they say let's go and do it; let's get a platinum record. That's probably the worst thing that could ever happen to an absolutely unknown group. If they get a platinum record the first time around, they are suddenly put in quite a position. With the inexperience that they have it's likely that they're just going to be ground up. I think people have to look at it as a long term career just like anyone else who goes into a profession.

*R-e/p: How do you approach producing?*

**TL:** Every case is unique. In the case of George Benson, or someone like that, I get very involved in the selecting of the material; the early stages; the cast of musicians, such as Harvey Mason and Ralph McDonald; and picking the right arranger. In that particular case we used Claus. On "Living Inside Your Love" I used Mike Manari because Steve Gadd had played me some things he'd done and they knocked me out. I'd say it's casting in George's case, and being his objectivity in the booth. I think one of the hardest problems for an act is that there is no way to be both subjective and objective. It's very tough when you're out there doing it to suddenly walk into the booth and listen to the broad spectrum without wondering

whether or not you played one particular passage well. Sometimes musicians get hung up on a bar or a part of the song that is really insignificant to the whole.

I like going for a performance. That's one of the things that makes working with Al Schmidt such a joy. I've worked with him for eight years. Al is probably one of the best mixers that I've had the pleasure of working with. And it's in the manner in which he does things which is so wonderful.

When I'm working with him I know he has it covered, and I don't have to concern myself with the sound. There have been a few instances when I've gone to New York to do some recording, and Al didn't come along, when I just wasn't sure I was getting things properly on tape. It was a well-established studio and the engineers had been at it for twenty-five years, but they had an attitude that they were just putting in their time. You'd ask them to change something and you'd get these vibes. They weren't listening, they were just there. Their minds were somewhere in New Rochelle. It's different with Al, and all the good engineers I know. They're dedicated and have a pride in their craft.

Another thing that's fantastic about Al is his microphone technique. It's a real forte. It's how he places them and which mike he uses. It's all there. In the re-mix we might use some outboard equipment to create effects. Nonetheless it's put on the tape with very little processing. Also, he works in a smooth, swift, and as quiet a manner as he conceivably can. That's been the biggest asset to us working together. I'm able to catch that spontaneity because, barring any unforeseen problems, within twenty minutes to a half-hour there's a more than reasonable balance. If things are starting to get hot we can get it.

It's like anything else. The players start off at one level and play to a peak, and then it slides downward. We may do another eight takes, but the fact is that if you've got it you can always go back to it. I don't ever say to them, "That's it! You don't need to do it anymore." Not if they feel they want to do another one. The fact is, if we're ready when that magic happens, we've got it. And that's what I'm looking for, the magic.

*R-e/p: Do you do much overdubbing?*

**TL:** It depends. In the case of *Weekend In L.A.* we did quite a bit of overdubbing. But, again, it's no different than making a film in that all you're really trying to do is create an illusion. If the illusion is correct I don't think that anyone will question how you got it. It's making it feel right and seem like that's the way it's supposed to be. That's your job, to make sure that it does. The other thing we do is fix just what doesn't work. If I can keep 70 or 80 per cent of an original performance I would rather replace that 20 or 30 per cent if, in fact, that thing that's hitting me right in

the face is the truth. There's no sense in trying to belabor something. With the exception of Dave Mason, who has an amazing capacity to get better as he does overdubs, I can't remember that many cases where recutting a part over-and-over improved the performance.

*R-e/p: What sort of hours do you like to work?*

**TL:** I don't like epics. First of all, it's an absolute waste of money. After awhile you're just punching a time clock. The creative juices and stamina will only last so long. There's a lot of tension in a session because in a sense everybody is under the gun. With a few exceptions six or seven hours is about it. After that I lose my objectivity, and I clam up. I originally was a night person who would work evenings, but I find now that if I work during the day I get the musicians at a fresh part of the day before they've been in fourteen sessions. Even if they're not session guys they've been up since 11 o'clock bouncing around or doing whatever it is that they're doing. By 11 o'clock at night things start going in the other direction. I like working days.

*R-e/p: Do you think the U.S. is just catching up to the interest that Europeans have displayed in jazz over the past few years?*

**TL:** Yes, I think so. The Europeans have always been aware of the players, and so forth.

*R-e/p: In the early sixties there was a definite English style. There seems to have emerged another European sound, this one having its root in Germany and France. Do you think that influence will continue?*

**TL:** Most definitely, and not just the disco. There are also some great things coming out of Japan. I was in Japan in December, and I was knocked out with the musicianship I heard. While I was there I picked up an album for the rest of the world. A group called *The Yellow Magic Orchestra*. It's sort of in the same genre as *Tangerine Dream* or *Kraftwerk*. I would say it's one of the most original things I've heard come out of Japan. The guy who composed and put it all together is Harry Hosono. I was very impressed with not only the performances of the orchestra in person and the people's response to them, but with him as an individual. That gets back to what we were talking about that an act not only has the talent, etc., but he can walk into a room and you feel the charisma and the guy's presence. Then you're talking about an artist who can do more than have a hit record.

*R-e/p: Would you expect more artists from non-English speaking countries will cut English versions of their records?*

**TL:** Of course, because they are more



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**first** boards six years ago and it still runs a tightly packed schedule of original vocal session recording and mix-downs", says Ken Justiss, Operations Manager of TM Productions in Dallas. "Since we do more commercials and station ID's than anybody else in the world, we produce literally thousands each year, and at some point they've all gone through this Son-Of-36-Grand (serial number 011)."

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conscious of how important that is. They know they have to be understood.

*R-e/p: You work with Al Schmitt a great deal. He produces and engineers many projects as well as engineering many of your productions. Do you think that the engineer/producer has a difficult time falling into the role of engineer only?*

**TL:** I have never felt it with Al. It's a mutual respect for one another as to what our roles are, what it is that we do. Even in the cases where we've co-produced such as Al Jarreau. Al Schmitt heard him at the Bla Bla Cafe, on Ventura Boulevard [Los Angeles]. Al Jarreau's manager and Al Schmitt got some money out of Columbia to make a demo that didn't work out. And then I saw him at The Troubadour, in Hollywood, and was knocked out. I called Mo Ostin and we went down on a Sunday night and that was it. So Al Schmitt was really responsible for Jarreau getting his first deal. Subsequently, after the first album, we decided we wanted to produce the album together and it worked out beautifully. And, as I think about it, it's been a long term thing since we were close prior to working together. Al was producing records for RCA, Sam Cook, Henry Mancini, and so forth, and I was a promotion man and we were friends. Al went into business for himself with Steve Douglas. They had a company called Penegram. Steve Douglas played saxophone, he was on the last Dylan tour, and was the chicken sax player on the Spector Records.

Al hadn't mixed a record in . . . I'd say eight to ten years. He'd stopped mixing records in the early 60's. When I was doing the Dave Mason album the engineer that I'd been working with had to go on to another project. I don't know why it occurred to me, but I decided to ask Al if he would mix the album down for me, just as a favor. He was very excited and really wanted to do it. I think consequently when we did that album — that was the Dave Mason *Alone Together* album — that it gave him a second look at how talented he was in an area he had not pursued for eight or ten years. I was very pleased and so was he that he got back into it.

*R-e/p: What does it take to be a good producer? What should an act look for when someone says they want to produce them?*

**TL:** Someone that's not only objective, but has the ability to draw the right things out of you. Or, spontaneously being able to know when something is right. Being able to point it out and saying, "You know, this is what it should be like." And when it's off the mark the producer has to be able to tell the artist that it's not working. Someone who is sensitive to material. That's a big, big part of the problem. I mean, you can have a great

singer, and a fantastic band, but if the material sucks, it won't work.

*R-e/p: George Benson writes, plays, and sings. Jon Mark, Johnny Almond and Dave Mason all have similar broad talents. Is it getting where the complete artist who does it all is the only one that is going to be able to make it?*

**TL:** Conceivably so. However, if the individual who doesn't write but has a great voice also has the ingenuity and wherewithal to hear good material and build a catalog of songs they can perform, then they can make it. There are still people who write songs and others who push them. And you'll always have great singers because someone will come along and say, "You're a great singer. I want to make an album with you."

*R-e/p: How does somebody find great material? How does the guy that lives in Oshkosh find great material?*

**TL:** If you hang around crowds of music people maybe you'll hear something. Or, you just might start by going out and buying the hits. I guess if I was an individual who was trying to do something, the first thing I'd try to do is get out of Oshkosh and go to a hub. That's not necessarily just L.A. Any area where music people congregate: New York, Nashville, Boston, San Francisco, Chicago, Philadelphia, Detroit, Texas, Atlanta. There are pockets all over the country.

*R-e/p: The exposure to other acts helps a new act to develop their own abilities.*

**TL:** Not only that, it allows the act to rub elbows with a variety of music people.

*R-e/p: If someone has an unknown act and they want you to hear them, what do they have to do? What sort of presentation?*

**TL:** Someone has got to get my attention. This is very difficult for a lot of people to



understand. If I had to actually sit down and listen to every tape and talk to every person who calls me, I would be sitting here twenty-four hours a day. That's just not productive, not in my particular case. What I do is have someone whose ears I respect highly, and they listen to them and pull out what they feel to be the highlights. From there they narrow it down even more. If a manager, producer, arranger, or musician I respect calls me and tells me, "Hey, listen, so-and-so has this tape, or is playing somewhere and I think you should hear them," then I'll go and listen to them. I guess that's what it gets down to. Other than those things that run across my ears when I'm out, I guess I respond to people I know and respect.

As far as the demo itself, I swear I expect nothing more than whatever it takes to get the point across. If it's a song, a piano or a guitar and the voice will do because a good song is a good song, and a twenty piece orchestra is not going to make it better or worse. In the case of a band, just going in there and doing the best material that they think they have, keeping it down to a minimum because quality is not quantity. Some people call me and say they've written four hundred songs. That's great, but which four or five out of that four hundred are any good. What are the best ones. Picasso didn't paint a masterpiece everytime he sat down.

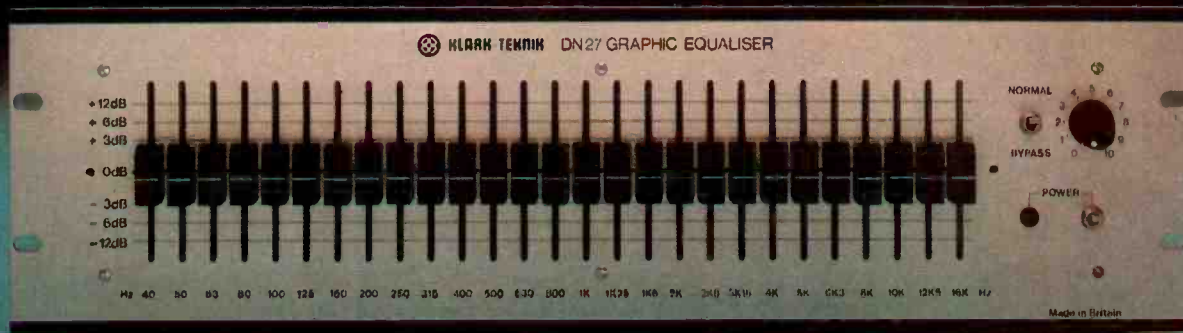
*R-e/p: When someone wants to take an unknown artist into the studio should they deal with the legal practicalities before starting to work with the musical creativity? This seems to have always been a business where some participants in it have alleged rightly or wrongly that they've been creatively or financially ripped off. What is your perspective on the ethics of the business?*

**TL:** Anytime you deal with individuals I think you'll find things run pretty steady, the world hasn't changed; and I don't think that it's going to get any better. But I don't think it's any more-or-less unethical than any other business that I know of. I mean, you have honest people and you have thieves in any business you're in. What it gets down to is that people have to be astute as to who the assholes are, and who the honest people are. Sometimes that's very difficult to do. Very often the person who's unethical has other things going for him such as charm, or a glib tongue. If you're an inexperienced individual and just coming up, or you're a kid or whatever and somebody makes you laugh or says something that rings a bell, you get sucked in. All the fanatical religious movements that are going on have proven that people want to follow like sheep. They don't want to think.

This is really as far afield of the music business as it's possible to get, but I think it's appropriate. If there's one thing I fear today it's the loss of the individual. I see the

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R-e/p 37



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individual shrinking. Forget whether it's socialism, or capitalism or whatever. It's like Fritz Lang's *Metropolis*. We are starting to miss the individual. That's what I see missing. When you think back to the pioneers they were very individual people. When you speak specifically of the record business pioneer like Sid Nathan, who was owner and head of King Records, he might have had some questionable business dealings, but he was an individual.

*R-e/p: A&M is uniquely individual.*

**TL:** Yes, it's a haven.

*R-e/p: Those who might now be in school. To them what would you suggest? What sort of background is best suited for this business?*

**TL:** What specific area?

*R-e/p: Engineering, producing . . . those aspects.*

**TL:** I would say, first of all, that practical experience will do it every time. I would say if I were going to college and had to do it all over again, I think I would try very hard to get a law degree. Not really to practice law, but to just survive. It's a lawyer's world. I'm not saying you have to be an attorney; forget about being an attorney. But just as a basis to sustain you through situations that you're going to find yourself in the rest of your life. A legal background is one way to get into anything that you want to get into. If you want to get into the business end of the situation, and I don't mean strictly the business end of it. I mean like Clive Davis, he's the head of a record company. I'm the head of a record company, but I'm still very much involved in the creative end of it.

In my case it was just a question of having been in every aspect of the business for seventeen years. Just through experience and osmosis that comes from being around people who know it. Getting knocked on my ass a few times, and being able to get up again helped. But I think there are easier ways to do it. If you have aspirations of being the head of a label, of getting involved with the executive end of the business along with the creative end, you've got to be an attorney or have some business background. It would be a tremendous help.

To want to make records? Man, I would get myself a job at a recording studio, or just hang out. Or work at studio instrument rentals picking up Fender Rhodes and taking them to the studio in the city. I don't know what other words to use except to get on the circuit. Getting a job as a second in a good recording studio would be an absolute asset to anybody who wants to learn how to make records. Sitting back there running the tape machine, learning how and where to make punches, learning the musical structure of things. Even though you have a responsible job there, your ass isn't on the

line regardless of whether it's a hit record or not. You're there and you're learning. If it's a good studio you'll just pick it up if you have the passion and desire to do it.

*R-e/p: How do you prepare a budget? Is that something you learn by just being around it?*

**TL:** I learned a bit that way, but I kind of just use a formula of my own. I know the average amount of days that it takes me to do tracks. And the number of musicians that I'm going to use. I'll multiply the cost of the musicians times the number of hours and days that I'm going to use them. That's added to the studio time. I know how much the studio is costing per hour. I use an average as far as tape. At \$125 a reel that can get out there, too. If you're using interlocked machines the number of reels increases, and I record at 30 ips. You go through a reel pretty quickly at that speed. So you add that up. If you are



working with a vocalist you know you're going to have to spend a lot of time with repairs and vocal overdubs. That could mean figuring in an additional week or two weeks. It's working out whatever you think it's going to take in studio time to do the vocals, or instrumental overdubs, etc. Then you try to bring it in for that. The thing about doing a budget is that it can only give you a guideline as to what you think you're going to spend or want to spend. You're talking about an intangible thing. It's not like going out and building a building. Knowing you're going to need so many feet of wood, so many workers and so many yards of plaster to put it all together. Maybe you'll be ten per cent over your original budget. With recording you're dealing with an intangible. You have to go with what you think is

necessary. If you bring the album in for \$10,000 under budget and it sounds fantastic then that's just a bonus. But you're defeating your purpose if you don't spend the additional \$25,000 that makes the difference between making it right and just putting it out the way it was when you hit the budget line. You've got to realize that what you're trying to sell is a product. When you walk into Tower Records it's awesome what they have available today. You see how much competition there is and what you're up against. You just can't go in there thinking about budgets, you've got to think about making the best possible album you can. That includes all the elements that go into it. Material, packaging, performance, everything!

*R-e/p: Album art seems to have become a very important part of the marketing process.*

**TL:** Yes, but I guess I'm from the old school, again it's the medium. We sell records through airplay. Once airplay has moved the record into the top twenty or thirty then I think the manner in which you've done — let's say the graphics or whatever else you do to advertise and market a record — will help sales. But prior to that you've got to get airplay. If it's got it, and it's in the grooves, you can sell it in a brown paper bag.

*R-e/p: It must be a big help if an act participates in the promotion by visiting radio stations, record stores and promo men when they're on the road.*

**TL:** Believe me, that helps. Today though, I think it's more difficult to get an act into a radio station, or a radio station to respond to an act. In many cases they don't want to deal with that. When an act goes to a city, it gets down to them working a club that's a good showcase and then the press and radio people are invited down to hear them. That creates some kind of excitement, but I don't think you get that much out of radio interviews. It's airplay. It's not like selling a pair of shoes. If that's what you're selling you get a half page in *Playboy*, and if those shoes are what's happening then that's what they'll buy. Great. But with music you can't say, "Take my word for it, folks!" They want to hear it.

*R-e/p: How involved do you get in the engineering?*

**TL:** Very little. I haven't gotten into automated mixing as yet only because the studio I do most of my mixing in doesn't have it. We do most of our recording at Sound Labs, or have been for the last year-and-a-half. Prior to that it was all at Capitol. I still mix at Capitol. For one thing they have one of the best echo chambers in the country. I think one of the big reasons why those rooms are so good is George Augsburger who tunes the rooms. I've

become accustomed to what I hear when I mix it down there. When I take it out, it sounds true. I just can't add EQ to compensate for what I'm hearing or not hearing in the room so that the tape will turn out right. I just can't do that. It's very important to me that I hear exactly what I'm doing.

I suppose at this particular point, if I were suddenly put on the spot and had a good second, I could probably get a balance. There's no conceivable way that you can work in studios for ten years and not have it rub off on you. I'm very conscious of engineering when things don't sound right, when there is something wrong; but I've chosen to put my emphasis on the music and being finely tuned-in as to what's happening in the studio. As far as the recording, I leave that up to Al.

*R-e/p: Do you refer back to rough mixes at various times as an aid in remembering what was originally cut on the "basic" sessions?*

**TL:** Yes, as far as making sure that I don't over indulge the track. I try to stay very conscious of what it was I originally heard at that specific time. The spontaneity or the magic, or whatever. It helps to know if the basics are being enhanced or detracted from with the addition of each overdub. You have to make the right decision, and being

able to make decisions is a very important part of producing.

*R-e/p: What do you think about the quality of record pressings?*

**TL:** It's terrible.

*R-e/p: What can be done?*

**TL:** I guess what the record companies could do is take substantially less in profits, or they could charge an additional dollar.

*R-e/p: Do you think record companies might start to release two versions? An audiophile version, and normal product?*

**TL:** I think that's possible. Actually, it's happening right now. The thing is the record companies don't want to put in the time, energy, or money that it would take to set up a department that would specialize in that type of product. So what they're saying is that they'd rather take a portion of their profits and give them to someone else who's doing that sort of thing as his living.

*R-e/p: Such as Mobile Fidelity's Original Masters? They have an audiophile version of Breezin'.*

**TL:** I have one of them here. They master at half-speed, and press them in Japan. As far as the vinyl compound is concerned it's incredible. The disk is very quiet. The only fallacy in the process is that what they say



Tommy, Al Schmitt and second engineer Linda Ty

they are doing is making a pressing that is exactly as the master tape prior to adding any mastering EQ, etc. They want to hear it exactly as the tape.

This is an area that I think a lot of people pass over and don't give a lot of attention to. It's probably the most important, and the most drastic point for me. I go through more traumas when mastering a record because there are such fine lines and such subtleties that can be done to the original master while cutting. There is so much that can happen, so many variables when you're taking a two track tape and putting it on a disk. I know a lot of people that once they have a two-track they send it to the guy to make a disk. When they listen to it, they say it's great, but Jesus Christ!, that's the most important step. I mean, you're spending \$100,000 on something and when it gets down to the last thing you say, "Well, screw it!" I spend a good deal of time on the mastering. That

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doesn't mean just getting an acetate to take home and listen to. Let's say they've enhanced it by adding additional highs to the program. What you've got to remember is that everytime you add something you also have to think about what it is you're subtracting. Also, what is it that you're bringing out along with what you want to enhance. The only way you can do that is by sitting at home and listening to it over a period of time so that the subtleties start coming out. What is it that you're really listening for? I don't like to rush the mastering step, because the next thing you know something that sounded great like the little edge that you might have added, starts to sound abrasive once you've listened to it several times.

You might find you want to raise it only a dB rather than two, or maybe not add it at all. Or, if you did something to the bottom in the mastering, when you cut the disk it sounded right because you were trying to zero in on a specific thing. But when you sit back and hear it, it just doesn't sit right with you. It's sort of like having a glass of bad milk. Mastering requires the time to relax and listen to, remembering what it was that you had on the original tape as compared to what you ultimately ended up with on the disk.

When I EQ a disk I don't EQ it to blow it up or to make it bigger. All I'm trying to do is make it sound as much like the tape sounded as possible. In some cases I find that Mike Reese, the guy we work with at Mastering Labs, will suggest something. Since he's listening to the tape for the first time his objectivity quite possibly is better than mine. He might hear something that didn't even occur to me that will really make a difference. He'll make a disk, and I'll go listen to it and let him know what I think. In a lot of cases what he has done works.

The only thing about these original masters is that I don't think you're hearing them in their best light. In those cases where I've cut things flat from the tape to the disk, their records are even closer to the tape than the regular pressing. I really wish I had someone here who is more versed in cutting than I, because I'm not sure what happens when you cut it at half-speed. It may really do something for the high end, but what is it doing to the low end? That's where I notice an incredible difference; there's a boominess.

*R-e/p: What's on the horizon for Horizon?*

**TL:** Quite a few things. We just have a new release with a group called *Seawind*. We signed Richard Evans, and a girl by the name of Eleanor Mills. She was on the Norman Connors album, *This Is Your Life*, and a fantastic singer-songwriter, Brenda Russell.

*R-e/p: Are you going to produce all the product?*

**TL:** There's no way that I could. When I took this position I realized that there was only so much that I could do as a producer. What I was really giving a workout to was being able to delegate authority and projects to other people. I'm now picking producers, and the other people that I surround myself with. It's taken a year to build the staff that I have. To find the right people for particular jobs, that's the challenge I have now.

You see, the promotion, marketing, sales, all those other areas are as important as what I do. You can make great records but it won't happen if you haven't surrounded

yourself with people who can make sure that all the other elements are done correctly and put forth in the right manner. They need to know what to do once it's recorded. It requires daily attention.

That's another thing, daily attention. It's easy for a company this large, that has forty or fifty acts, to lose something now and then. If I'm in the studio I have to delegate responsibility to those I trust.

That's the essence, other than obviously having to come up with the talent, and that's been the toughest part of my job. □ □ □

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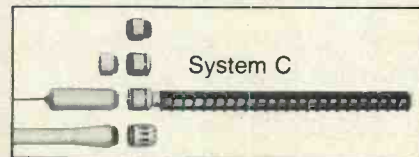
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Shadetree Studios, Lake Geneva, Wisconsin.

## studio construction The Rudi Breuer approach

by  
**Rudi Breuer**

with the assistance of  
**Jim Riordan**

Naturally, the first step in constructing a studio is finding the right location. Occasionally, as a designer and contractor, I am called on before the site or building has been selected. Careful consideration of the location can save a lot of headaches later. For instance, here in California we're earthquake prone. We have to have certain seismic calculations. In particular, some of the buildings out here are old but spacious. Let's say you want to use a building that was built prior to 1933. It would probably be unsafe for anything in the eyes of the building department. You could bring it up-to-date, but why do that unless you're going to buy it. Why put the money in someone else's pocket when the lease is going to be over in ten years? The potential client must be made aware of many things which he may be totally in the dark about.

Parking is another big problem here in L.A. The codes say that for every five hundred square feet of building you must have one parking space. The musicians here

don't come by bus as they might do in Chicago or New York; they come by car. We have a severe parking problem here.

Another location problem is being near airport take-off or landing patterns. Superscope is in such a position. We had to build their room in a relatively small area that was about 20 by 14 feet. We used more than four hundred pieces of drywall to isolate the rooms from the plane noise. It was a location problem which we had to correct. That's one of the challenges that makes this business so interesting. Each studio is different.

At Shade Tree, in Lake Geneva, Wisconsin, the only problem we had to consider was the winter. We had to make sure the heating and air conditioning were right. To do this we used an economizer unit. The net result was by taking the cold air direct and cutting out the compressor, a lot less electricity was used. It's a little more expensive to install a unit like that, but it's well worth it. You need adequate heating,

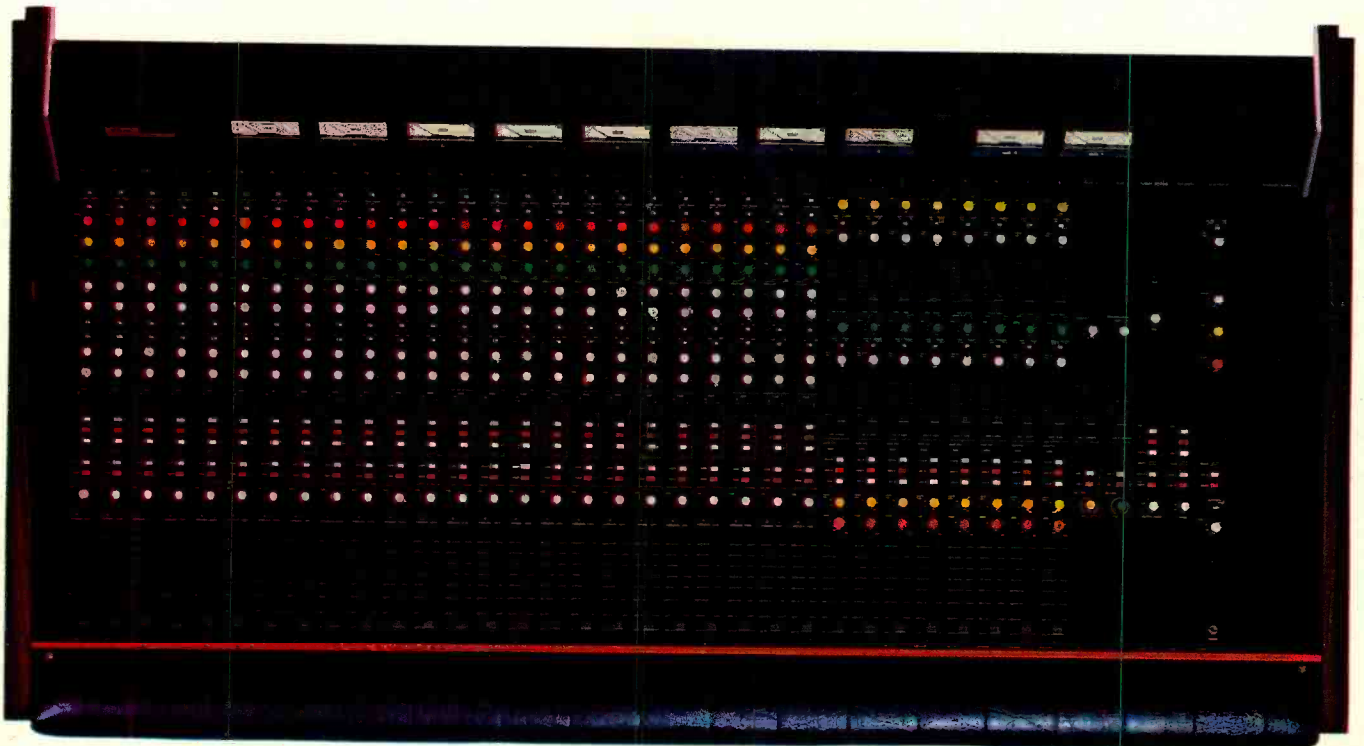
but with the way we insulate and isolate the walls, the factor of losing heat is virtually down to nothing.

### **Zoning and Permits**

Of course, every area is a little different as far as the building and zoning regulations go. Often it is difficult for an artist to get around these regulations to build a studio in his home. The only way is if he can show that the studio is for his private use. The artist who wants to build his own room should recognize there are limitations. I'm working on a studio with an artist now where the situation is right, but, again, not everybody can afford to have a studio on his private property. He's going to have to live there a long time to get his money's worth unless he sells it to another musician. Not just anybody is going to be willing to pay him two hundred thousand to four hundred thousand dollars more just because there's a studio there. Most people wouldn't know what to do with it. Then again, being in the position where he can use it for his private

continued on page 48

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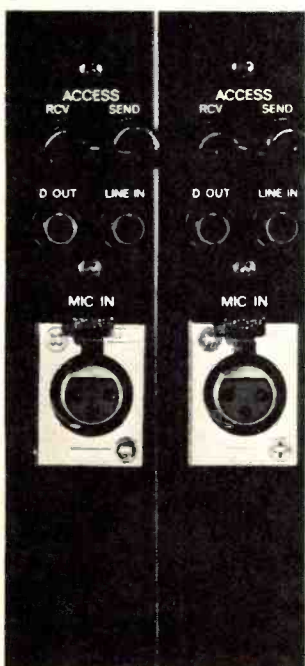


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Included in the cost. The meter bridge is already wired. Included in the cost. The separate power supply plugs right in. Also included in the cost. It's not unusual to get your board in the morning and do your first session that same night.

With the Model 15, you've got performance and flexibility wired, too.



From the discrete microphone pre-amplifier, equivalent input noise is  $-126\text{dB}$  (weighted). With one input assigned to one output buss, signal-to-noise is  $76\text{dB}$  (weighted).

Formats are 16- or 24-channel input/8-buss output. Fully modular.



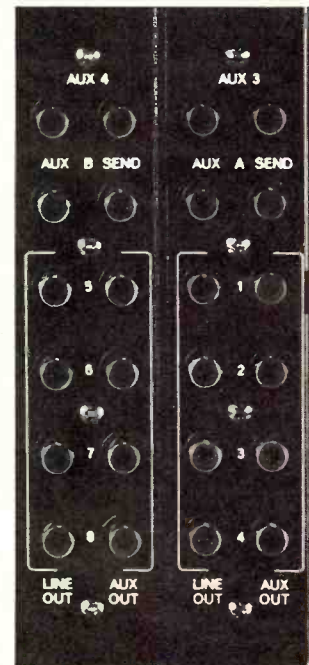
The Model 15 will drive any 16-track recorder and give you a vast array of mixing, monitoring and cueing capabilities. For example, the Cue mixing position can be fed by 48 sources simultaneously (all the inputs plus all 16 tape playback positions plus all eight echo receives).

Out of the crate, you'll have a lot more mixer in the Model 15 than you can get elsewhere for the money. Add your savings on installation (both parts and labor), and the Model 15 becomes even more cost-effective.

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The Model 15's functions, interior layout and complete specifications are described in our 10-page Product Information Bulletin. See your Tascam Series dealer or write us for a free copy.

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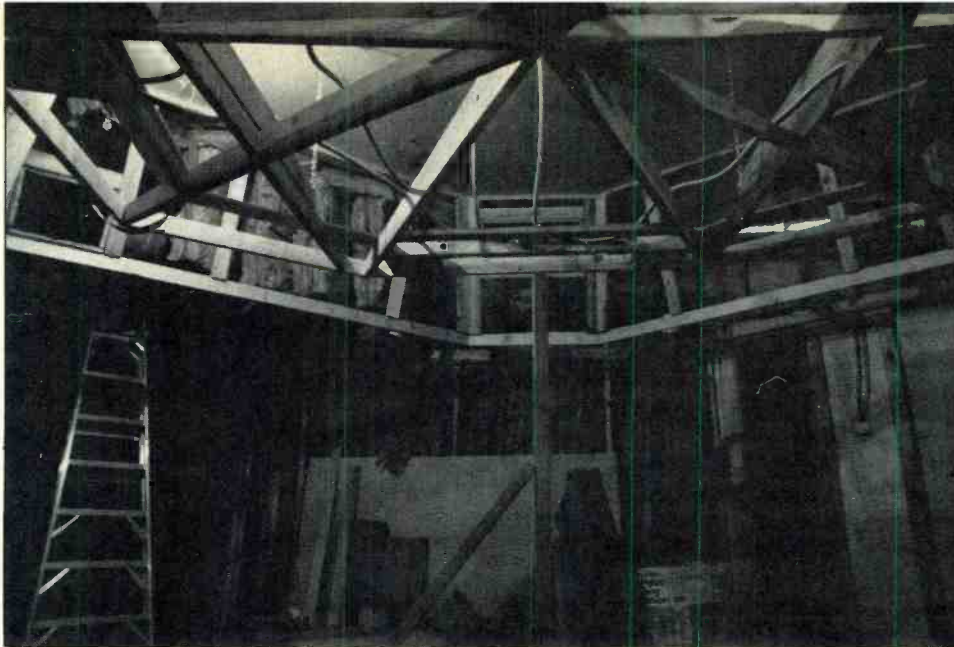
# TASCAM SERIES

TEAC Professional Products

Rudi Breuer was born in Germany and came to the United States in 1955. By 1958 he was working as a tradesman, and by 1963 he had formed his own construction business. He began building studios as a sub-contractor in 1967, working on such facilities as The Record Plant, Bell Recording, and Wally Heider. Four years ago, Rudi began designing his own studios with the stipulation that he build them. In recent years, he has designed and constructed many innovative and successful studios, including Bayshore Recording, in Coconut Grove, Florida; The Shade Tree Resort Studio, in Lake Geneva, Wisconsin; and KBK Earth City Studio, in St. Louis, Missouri; and built the Village Recorder's Studio D and Group Four, to name a few.

James Riordan writes a syndicated rock column called *Rock-Pop* which appears in several newspapers around the United States. Riordan has also been producing records for the last ten years in Nashville, Chicago and Los Angeles. He recently moved to the Los Angeles area from the Mid-West.

Photo credit: Steve Finestone



Control room ceiling detail — Village Recorders, Studio

use is a definite advantage for him as a recording artist.

Whenever we've worked in Canada we've had problems with building permits. Being contractors is one thing but being contractors in a foreign country is another story. The inspectors have a hard time believing the amount of materials that we put into these things. For example, Sound Interchange, in Toronto, was a new structure with two concrete block outside walls, and a concrete roof. It was first class

all the way. But the inspectors were bewildered at all the angled walls, floating floors and how nothing was parallel the way it is in regular construction. To the inspector it looks like a puzzle. Most of the things we do are strictly unorthodox in the normal building industry.

When I am hired to do a job, I go in and look at the place and then come up with several proposals. Once everyone agrees to the final plan we go to the building department for permits. Material shortages can vary in the process and are occasionally a problem. Drywall and insulation continue to be very scarce. Sometimes it takes up to a year to plan and acquire the materials for a job. You've got to be very solid financially to even attempt it. You also have to go with good designs that are original and accurate in order to get successful results.

#### Decoupling

We finish the control room first so that the electronics people can get an edge on installing the equipment. We try to do so much each day, putting in long hours for the duration of the job. Of course, building time varies for each studio. It took us 63 or 64 days to build Shade Tree, which is pretty much our average. Their outside structure was completed when we got there. Then we did a slab separation by cutting the floor with a water cooled concrete saw. That's all that was necessary. We separated the floor from the outside structure, the control room from the isolation booth and the studio from the control room.

In an existing structure where buses, trucks or sirens go by it's probably going to be necessary to use dual wall construction and floating floors. The building used should have a high ceiling. Even the control room should have a minimum height of 13 feet before the construction begins. I think any structure with a ceiling less than that is compromising. You just can't do it without getting into a pinch, and that becomes more

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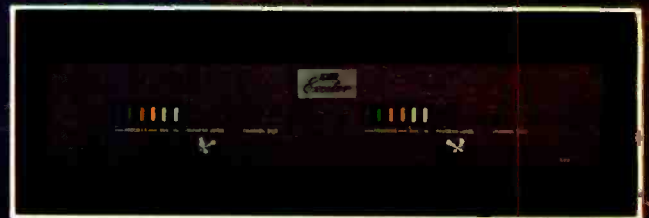
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difficult and expensive. I always tell people, "Sure, we can build one at the end of a runway and next to a railroad track, but how much do you want to spend?" Isolation is expensive. Perhaps it's the single most important thing in studio construction. Floating or de-coupling a particular wall or the studio floor can make the difference between a good studio and a bad one.

Of course, what determines the type of isolation technique needed is the structure and the outside noise level. Are there other tenants in the building below you or behind you?

If you use a floating floor and floating walls then you establish a totally isolated base from the existing structure. No part of the walls touch any of the existing structure. It's de-coupled from the ceiling, the floor, and the other walls. There's rubber between the ceiling and the wall and rubber between the floor and the wall. If the wall shifts, it's against the rubber.

Both the floating floor and the existing floor are concrete but one of them floats on top of the other. They are two separate systems with only one of them coupled to the structure. If you use a floating floor you don't have to cut the existing floor because the floating floor is about ninety-nine per cent de-coupled.

The floating floor system is supported by isolation pads under plywood, which forms a floor. You use three-and-a-half inches of concrete and then build the studio on top of that. If the existing structure won't support such a system, they you better reconsider. You can't float one on top of it. In such cases the vibration level outside becomes much more a factor in how isolated the studio can be.

Some of today's kinetic isolators are fantastic. They are made of compressed fibrous (synthetic) material pressed into little cubes. If you were standing on a slab that was poured on these kinetic isolators

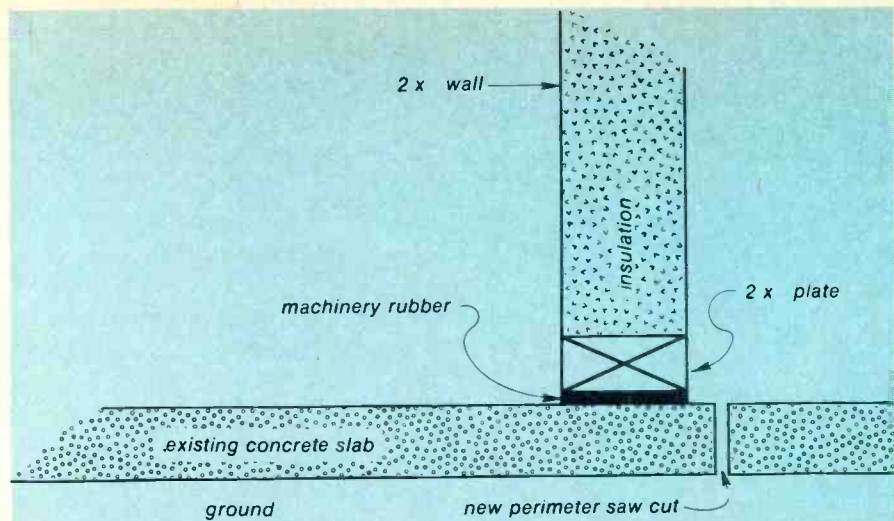


FIGURE 1: STANDARD STUDIO CONSTRUCTION

and somebody blindfolded you and blocked out the sound, we could hit a sledge hammer on the original floor no more than six inches away and you wouldn't feel it.

Another method of achieving isolation is by de-coupling the floor from the outside structure. It involves cutting the floor between the studio, the control room and the rest of the building. But the first method is better, though more expensive.

#### Walls

Wall construction will vary with the job, but usually the first wall may be built on the floor of the existing structure right next to the outside wall, or it might be floated. The floating wall gives the best isolation. It is held up with rubberized brackets on each side so everything is actually de-coupled. The amount of drywall will also vary depending on what you want to achieve, but generally we use as many as five layers. The first layer is soundboard, then three layers of drywall, another soundboard, and then the other two layers of drywall.

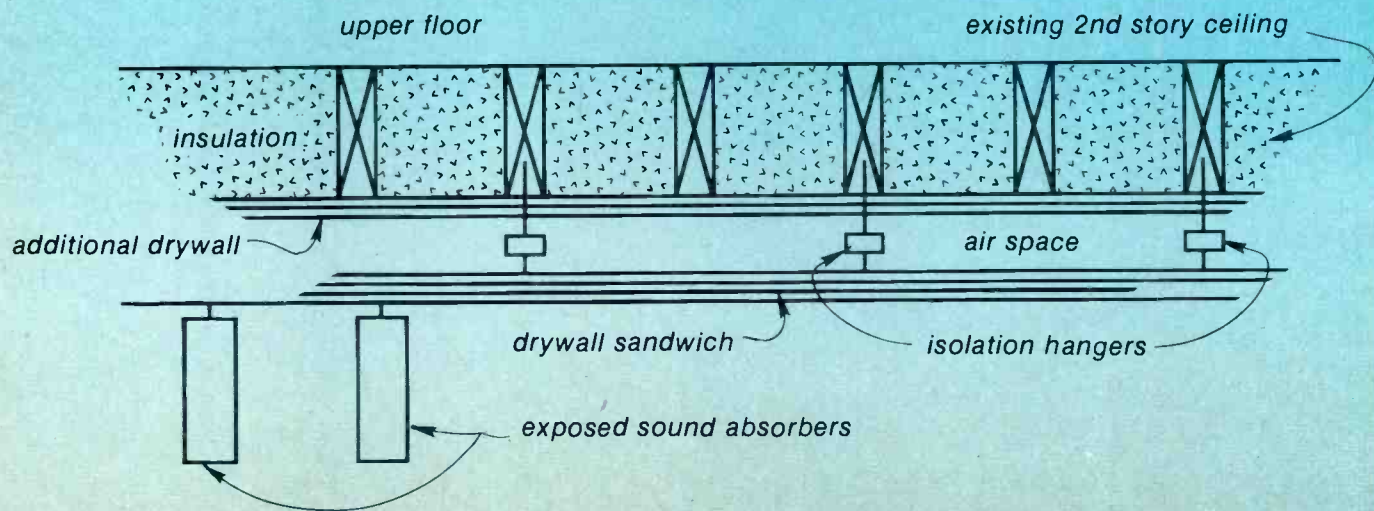
We finish the wall, seal it, caulk it; and then start another wall. Possibly on a floating

floor. The wall on the floating floor isolates it completely.

As of this point, none of the electrical and audio equipment has been installed. They are on the second wall on top of the last layer of drywall between the furring strips. Over that we install wood, felt, or whatever. We try to punch through over the soundlock. It's the best spot. Over the soundlock is also a good place to run air conditioning to the air handlers. By running from the control room and studio over the air lock a lot of the sound is shut off. The sound lock usually is next to the control room leading into the studio, so one sound lock can serve both areas. This efficiently utilizes the space and keeps things centrally located, making it simple and effective.

The sound lock is also made of double wall construction with the sandwiched-type walls and ceilings. Sometimes, if we have a spacious attic we utilize that area for such things as amp storage. It can be separately air conditioned, have a drop-down stairwell, or a built-in ladder. It's a good place to put remote dimmers, which cuts down the cost of long electrical runs.

FIGURE 2: TYPICAL CONSTRUCTION (VILLAGE RECORDERS' STUDIO 'D')





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R-e/p 51

## Locations

... a floating floor about fifty per cent of the time. In Group Four [Hollywood] (designed by Harry Newman) we didn't have to do it because the location was ideal. It was set back quite away from the street and the existing slab was six inches thick. The place used to be a print shop and it has tremendously high ceilings... about twenty-four feet in height. All we had to do was take out the false ceiling that was there.

Another example is Captain and Tennile's new studio. They have a large warehouse-type building that once was a store in the western San Fernando Valley. In their case we needed to isolate the floor and use a multi-wall system so they could do future expansion at their spacious location. It is necessary to do all proper isolations at this time.

There are some unique things in their studio. One is my design of a drum booth that's below the surface of the studio floor. It's going to be an all-glass cage and it will have traps underneath the regular studio floor. So the kick drum will be totally isolated.

One of the most interesting but difficult sides of the studio construction business is dealing with the many varied problems in structure that face you when you take on a job. One of the studios I built for Westlake Audio was Century 21, in Winnipeg, Canada. The temperature was one hundred degrees different from California. We tried to cut slab as we do on most jobs for the isolation around the control room and the perimeter of the studio, but we found that the concrete was twelve inches thick and it had half-inch rebar steel reinforcements in the concrete. We found that the soil there is clay and when it gets moist it expands. In other words, the whole structure actually lifts up as it expands. Obviously, we couldn't use a thin slab like in California, because of

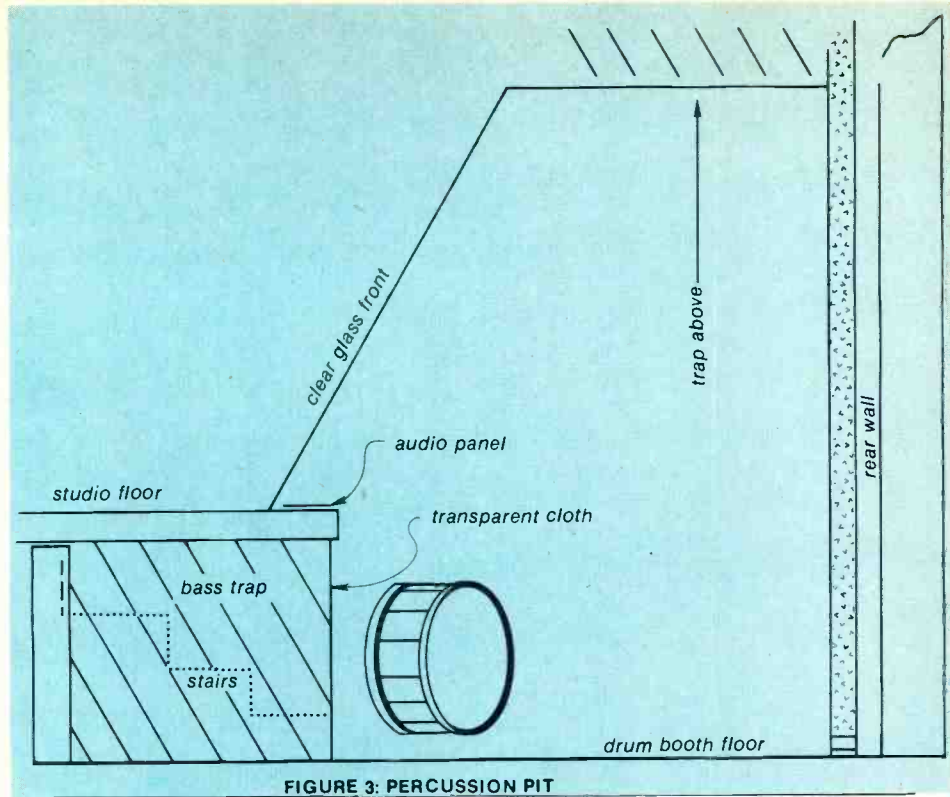


FIGURE 3: PERCUSSION PIT

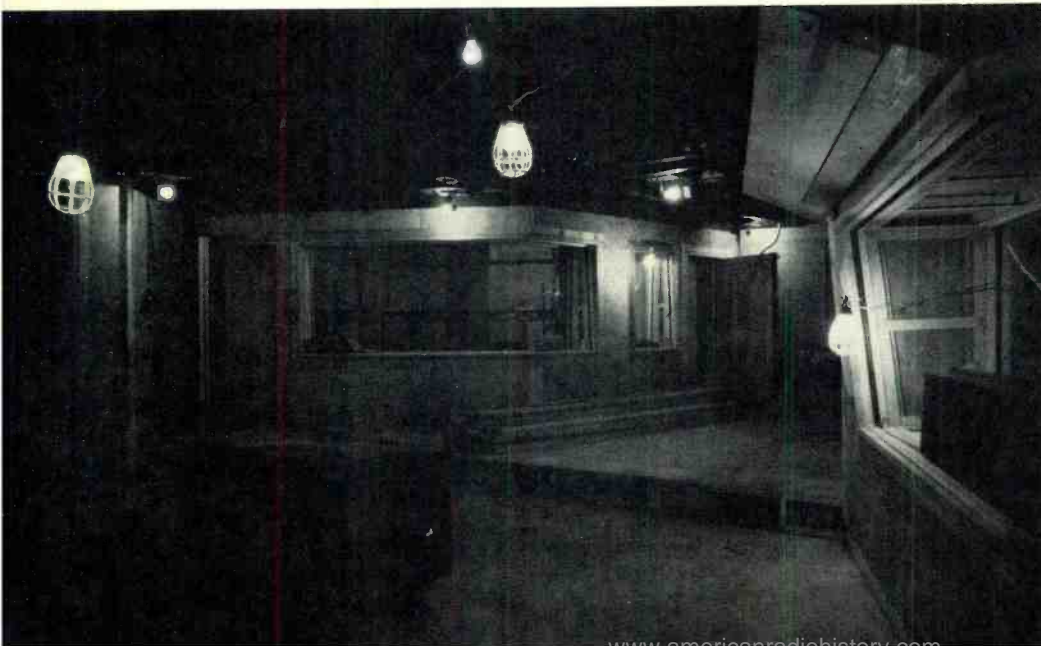
the expanding soil it would break up. We used a jack hammer to see how thick the floor was and it was incredible! You could roll tanks across that floor and not hurt it. I'd never seen anything like that before. The only problem in not cutting that slab would be if they built another studio next to this one without floating the floor. They might have difficulty running simultaneous sessions since low frequency "flanking" would occur through the floor. I think if they had been right next to a road with heavy traffic they would have had problems with low frequency resonance originating from the outside. A good set back took care of that.

When we built Record Plant C [Los Angeles] before the fire there was an eighteen inch brick wall between it and Studios A and B. Nobody ever thought this would leak, but Gary Kellgren and I discussed the possibility. The proposed design idea called for building this big concrete block wall in there, de-coupling the roof, and allowing the existing wall to flow freely. Structurally, it wasn't feasible. The foundations would still have been coupled together. To build such a wall you have to go into the ground quite away to have substantial footing. Because the two walls were parallel and close to one another there was nothing to be achieved. You'd still be coupling. What we did was cut the slab and I floated a wood wall in there. It took a weekend to do. A weekend job that cost seven thousand dollars could have been a forty thousand dollar wall. That was just the savings on the wall; to de-couple the roof and all that goes with it would have been another three to four weeks. That's how a studio contractor can save people the bucks. They were willing to take this route and to do it my way and it was quick. There was virtually no down time for the studio. The wall we built did the trick. I shouldn't say it stopped it one hundred per cent, but it stopped it well enough to do simultaneous sessions, and that's all we were after. You don't want to expensively overbuild; you just want to get it right.

I think my two most challenging projects have been Village Recorders Studio D and Bayshore. The challenge at Village was that we had about seven weeks to finish the job. The other difficult aspect of that job was that

Under construction Studio D — Village Recorders, Hollywood.

Photo: Steve Finestone.



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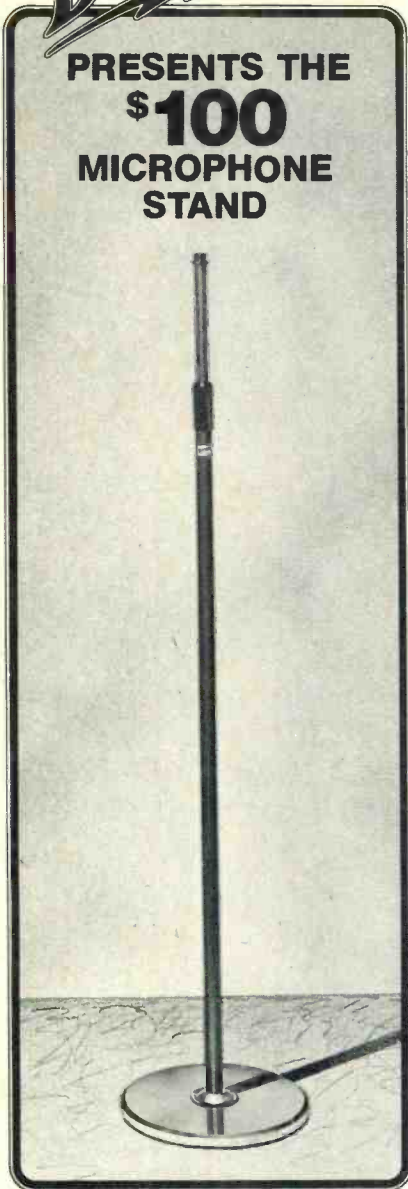
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R-e/p 53

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we had to do structural remodeling at the same time. The place where the studio was going to be had four posts in it which we had to take out. We temporarily shored the building up while we re-did it. We used a fork lift inside the building to get all the beams in place. It was really a thrill-a-minute trying to get those beams to fit precisely where the old columns had been. It meant putting it into just the right spot. It was down to the nitty-gritty. It was down to a sixteenth of an inch and that's pretty close for steel work. It's nothing like a new job where you can shimmy this or that. It's old, and the old beams are already there, and you're trying to fit this new girder into the existing support structure. Besides having to make several structural modifications we were pressed for time.

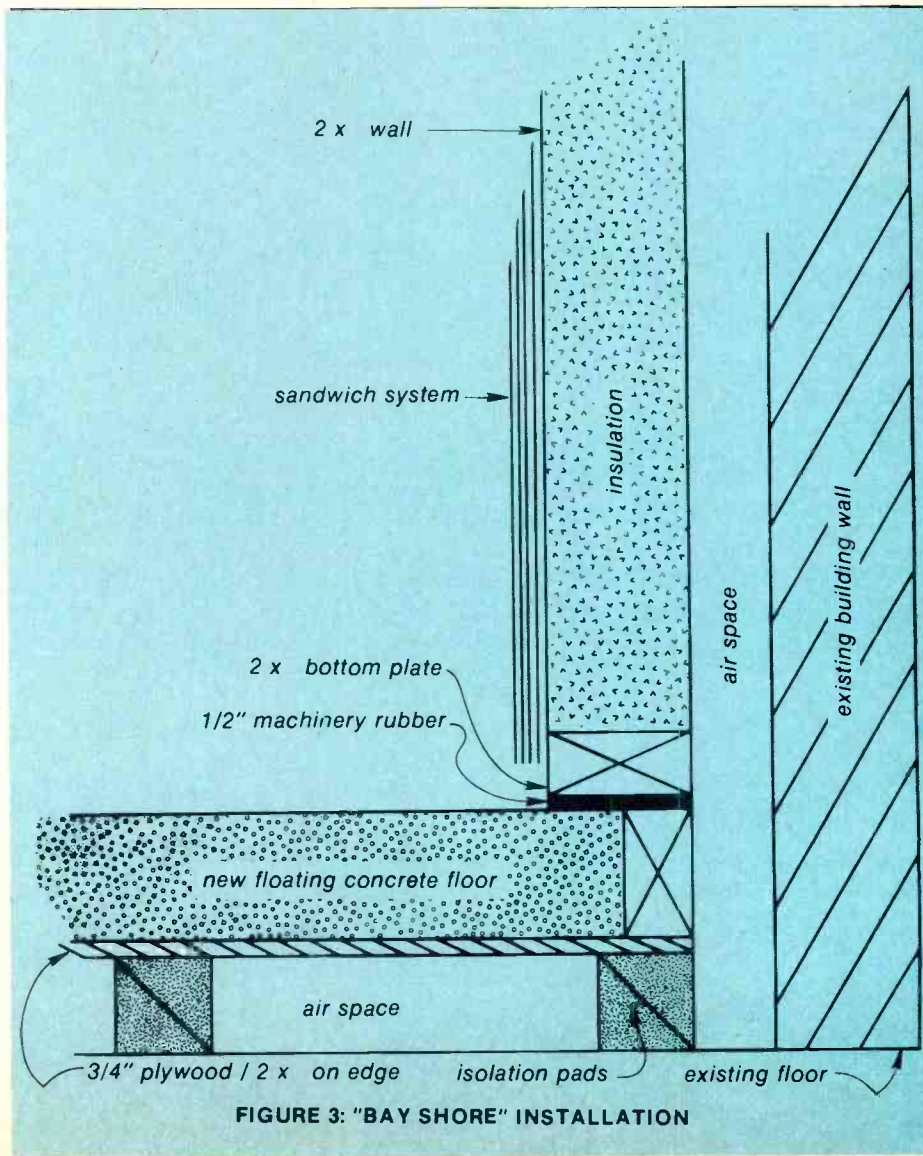
On the Bayshore job we had some structural modifications also. We had to pick up a whole section of the roof with a strongback (a steel beam to support the roof from above) because we removed a bearing wall. It had to be done to accommodate the control room. We had to call in a structural engineer to go through this whole building

and analyze it to see what was holding what. Because we were working upstairs, we took the railing out of a balcony and got a forklift. We simply brought the materials to the job and then raised them up with the forklift.

At Bayshore there were apartments behind the studio which had tenants full time, and below the studio a yacht brokerage which is a very quiet sort of business. There is also a beauty salon in the building. Naturally, the landlord was afraid that we were going to, in his words, "disturb the neighbors." I had to come up with a guarantee in writing stating that the end product would not do so. In fact, the City of Coconut Grove wanted a similar guarantee. To accomplish the isolation we again built an isolated floor on top of the existing one using isolation pads. There was no better way to do it.

We are continually running into structural problems involving studios in older buildings. They can really be headaches. I've been called to some jobs where there is no way that the building can support a studio on its upper level.

One job that did work out well in an older



continued on page 59

# edge of recording technology



**At first glance**, the Solid State Logic Master Recording Console is markedly different from all the others. This is apparent in the meticulous detail of its British craftsmanship, and in the bold yet carefully considered innovations it presents.

A closer look reveals the unparalleled completeness of the signal processing and routing possibilities. Each channel contains an instrument quality noise gate, keyable program expander, full feature compressor/limiter, totally flexible true parametric equalisation, and separate continuously variable high and low pass filters.

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It is not enough to have a collection of recording tools. They must be organised and presented in a manner which contributes to the smoothest possible flow of each session, whatever its special requirements. We believe that our SL-4000 E Series constitutes a major fulfillment of this goal.

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Earth City Studios, St. Louis, Missouri.

building was the Chicago Recording Company. In this case the building checked out fine. We got a break in that they had some sort of isolated floor from when the building had been used as a radio station.

I was called in for consultation on the KBK Earth City Studio, in St. Louis. (They already had plans drawn by an AIA, and the plans were conflicting.) The local contractor had come up with some very scary bids. When I deciphered it, all it came down to was poorly prepared plans. A heavy V-shaped block wall was suspended over the control room window by no visible means of support (skyhook theory). I eliminated all block walls and went to a conventional wall. I ended up doing the job and redesigning extensively. They now have a fantastic 24-track studio, and for a lot less than what their original plans would have cost to

construct.

### Village

One of the most beautiful rooms that I did recently was the Village Recorders Studio D. We have done several remodels on some of their rooms. It's the constant process of updating that I was referring to earlier. It's funny but (I'm going to repeat somebody's words here) "now we've entered the era of the super rooms."

Studio D was built with Fleetwood Mac in mind. They block book it for extended periods. I think Geordie Hormel, the owner, knew basically what they had wanted. The construction went smoothly and the whole decoration concept was done in antiques. Geordie went out and bought thousands of dollars worth of antiques to install into the studio. That included lead-stained windows and the like. Geordie's great on mirrors. He did an absolutely fantastic thing with mirrors in the lounge area, which is relatively small, but with mirrors it looks fantastic.

Studio D is very unique. It's very spacious. They have a live echo chamber there and it has a six-foot window and door in it. The studio has three iso-booths, including the live echo chamber. Because Village is on the corner of two busy streets, there's a lot of city noise. Just building a live echo chamber was risky.

The shape of an echo chamber is always

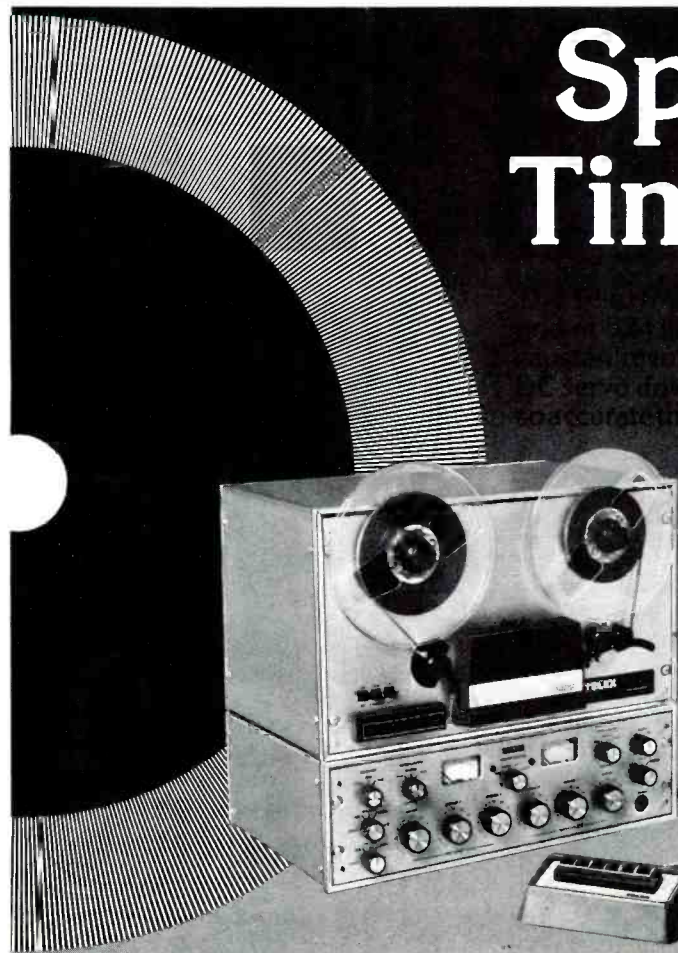
irregular. The floor, for obvious reasons, is level. The walls are pie-shaped and the ceiling is sloped. What you're trying to do is maximize the delay. The volume should be at least twelve hundred cubic feet, but the bigger the better. Being in that particular location was like committing suicide. It was the worst place you could build an echo chamber, so we floated the whole thing on concrete to get rid of all the leakage problems with low resonances. It's not the only way to do it, but it's the most feasible and economical. Coil springs should not be used for that purpose because springs have a tendency to pick up sound waves and resonate. Actually, fiberglass is really the best way to do it, so that's what we did. At Village, they don't hear anything going by in the street. And you would definitely hear it in the echo chamber if you were going to hear it at all.

The live echo chamber has an isolated concrete floor (isolated again from the other floating floors), wood studs, three layers of drywall and it's plastered from the inside. It has three coats of plaster and a plaster putty finish on it.

In Studio D echo chamber a window was included so that a picture could be projected on the wall inside and seen through the window. They often use the projector to set mood in the studio.

The Village Recorders Studio D is

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R-e/p 59



Control room window frame detail — Village Recorders, Studio D. Photo: Steve Finestone.

probably the most elaborate studio I've built. How a place feels is extremely important. If you have a room that's depressing and like a

dungeon, it's going to sound like that because there's no joy there. It's amazing the way some of these studios are designed.

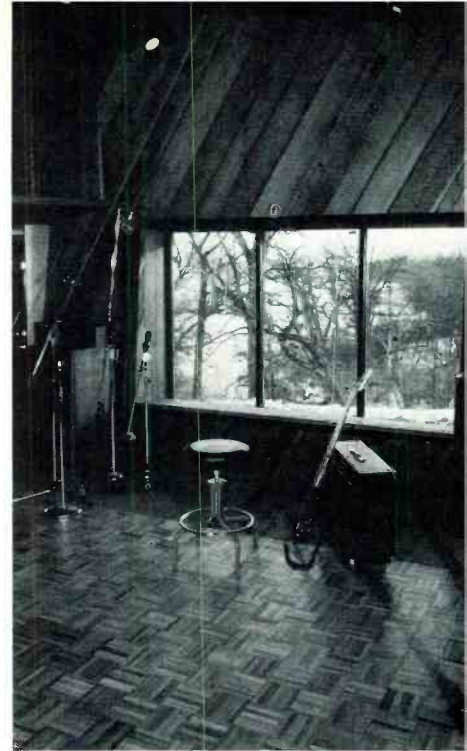
Shade Tree has an outside window. It's quite a view, and the mood created inside is very good. When we built it we had to consider condensation from the outside window, so we ran a heat strip between it and the inside. The heat strip dries up any condensation, leaving the outside window clear all the time. (Thanks, Dave.)

Shade Tree employed the new design that I gradually evolved into from the compression-type rooms. It's more of a relief-type room. I think the sound they get there is great.

When Bob Todrank called me in to help build Ronnie Milsap's studio in Nashville we had to use an upstair room for live strings and it worked out very well. We would have liked to have a little more ceiling height, but it turned out very good. It has a hardwood floor with redwood on walls and ceiling. It's really a very bright string room.

### "Some Studios Aren't What They Used To Be"

When you talk about structural problems you have to realize that some of the older studios are not what they used to be acoustically because they deteriorate. Things shift in the walls and crack, and they open up. For some control rooms the cracks may



Window to outside world, Shadetree, Lake Geneva, Wisconsin.

actually be helpful. They can act as relief, believe it or not. But, basically, this sort of movement degrades the transmission loss. In a multi-studio facility this can present a real problem because of session interference. As an example, rock and roll in one studio leaking into vocal in the other studio.

Owners who have studios built by people who don't know exactly how to build them run a high risk of having a bad room. The problem might be almost impossible to correct short of starting over.

He has the additional problem that if the word gets out that there's something wrong he'll surely lose clients. Building it right the first time will go a long way in preventing financial suicide.

I recall a facility that required going back and re-doing half the rooms because a simple fact was neglected in the coupling and de-coupling situation. You can't use just any type of would-be contractor or "wood butcher" to build a studio. It takes a lot of experience and upgrading all the time. You might have a last-minute change. There is just no way in the world that you can put everything down on paper. It's a constant process of up-dating your acoustic designs because there's so much progress being made electronically. Then, too, I think we're building a much better room, acoustically speaking, than we did a few years ago.

Studio facilities run the gamut from the smallest demo operation to multi-million dollar master studio.

The owner of a demo room might have a desire to make masters, and he'll continually be re-investing in new equipment and updating what he already has. At some point the owner has to make a really serious decision. His \$40 an hour rooms probably



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won't cut it. The next big investment has to be improvements in the room, be it modifications or outright re-location and brand new everything.

A good studio should have a good traffic pattern. It has to complement the studio. You can often use the traffic area for isolation in a multi-complex situation. Some people aren't willing to pay for an extra preliminary studies to see how things are going to go. This kind of thing can turn into a studio with no clear style or design.

The studio construction business is unique in that most cases the only time you can experiment is when you have to go for it. It's kind of a precarious position.

I've tried constructing models to work out sound problems, but they don't seem to give accurate results. There's nothing like the full-scale environment. There are plenty of statistics on what will stop what, but so much of this information is highly dependent on what environment the tests were conducted in.

A similar example is speakers. Just because a speaker functioned well in a particular testing environment doesn't mean it will react the same way in a given control room environment. I would like to see all the speaker manufacturers use the same testing environment so that accurate comparisons could be made. In the end the owner has to make a selection.

It's the same with specialty items. How do we know what kind of environment the acoustic materials are tested in? We've checked out figures which say that so much lead will equal so much of a thickness of concrete. We've tried some of these things, and in some instances it seems like a valid statement; but in some cases it's totally unrealistic. Lead is really a last chance thing — an eleventh hour solution — because "weight wise" there are a lot of drawbacks, but "space wise" it's very efficient.

A good studio contractor builds with a gut feeling and intuitiveness that is developed over the years. Of course, a substantial construction background, along with a good imagination, is essential. Don't be afraid to ask your contractor. I think that in this business it's something you have to do. Once I give the owner a completion date he's got equipment coming in and all kinds of things lined up, so I've got to come through for him. The responsibility of the owner is to have a realistic set timetable for construction. This is to his advantage when you consider such things as the inflation rate of raw material and the expense of extended construction time. With these accelerated cost increases delays can cost the owner many thousands of dollars.

The contractor, besides saving time, can also save in the purchase of the raw material. The studio owner will have to pay straight

retail for many goods and services, while the contractor will be able to get discounts.

I always feel you have got to be straight with an owner, and yet flexible. Every potential studio owner has some definite ideas. Ronnie Milsap's job was one of those. He's done so much recording that he had some good ideas to contribute. This project was a joint venture with Bob Todrank. We used some of his ideas, some of mine, and some of Milsap's.

Contracting for studios is a lot different than building houses, where you're dealing with a single designer who's got a single plan for building sixty units. It's a one-of-a-kind sort of constructing. It's dealing with the air conditioning man one minute, and the rock star the next.

Building studios requires cooperation among a great many different types of people, and being flexible with your ideas and the ideas contributed by the people who want the studio. It's also making sure that you're giving the client the best possible value for his money in building techniques, and by keeping him out of trouble design-wise and before the building begins.

It's understanding the life style and economics of around-the-clock studio operations, and at the same time being comfortable with the nine to five planning commissions, building inspectors, and elusive building material. □ □ □

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R-e/p 61

# Sound Insulation Requirements for Recording Studios

by **Michael Rettinger**  
Consultant in Acoustics  
Encino, California

In planning the construction of a new recording studio, or even in evaluating its acoustic climate after completion, a 24-hour noise exposure level survey is desirable. This may reveal unexpected rumbles during a certain hour of the day, periodic clinks and clonks of machinery near the room, and other equally objectionable acoustic disturbances.

Unfortunately, the making of such a prolonged sound recording requires over 20 miles of magnetic tape running at 15 ips, plus personnel for the three eight-hour shifts. Additionally, to secure statistical information on the project, the recordings have to be either re-recorded onto a graphic level recorder to make the temporal noise level variations visible, or else they have to be evaluated in some other time-consuming manner.

To economize the process of noise exposure level surveys, micro-sampling has come into vogue. Since very rarely the important noise peaks have a predominant frequency above 6,000 Hertz, so that high-fidelity recording is not necessary, a tape speed of 1-7/8 ips can be employed in the survey, to save both tape and to reduce the number of reel changes per hour. Also, the magnetic tape recorder does not have to operate continuously, but for only a given percentage of time. Thus, when the recorder is "on" only 10% of the time, say 1 hour and 12 minutes in 12 hours, the noise history may be recorded on only 675 feet of tape, which, when 0.001" thick, can be put on a standard 5" diameter reel. Similarly, a "one-hour" cassette operated 10% of the time can accommodate 10 hours of noise recording.

So as not to miss exceptional noise level changes in an hour's period, it is best, in the 10% recording technique, to record for six seconds continuously every minute, instead of recording continuously for six minutes every hour.

The switching device, known as intervalometer, must not deactivate the electronics of the recorder, since this would introduce a significant time lag in the six-second intervals of recording, but must apply a brake unit to the tape transport mechanism which is able to start and stop the medium instantly.

The accuracy of the micro-sampled results are remarkably good. The micro-sampled decile noise level exceeded 50% of the test period, or L<sub>50</sub>, is less than 0.5 decibels different from the L<sub>50</sub> obtained by

continuous recording, when the noise is chiefly street traffic disturbances. The accuracy would not be as good if many short-term high-level signals had to be evaluated, such as foghorn whistles, gunshots, siren blasts, thunder, etc.

In practice, when the tests are to be carried out in the open, the small reel-to-reel or cassette recorder and associated intervalometer may in the evening be hidden in a bush on the site, or if overnight parking is permitted there, the equipment may be locked in a car, with the extension microphone hanging unobtrusively on the outside. Transportation of the investigator to and from the site may be by an associate or by taxi. When the site is large, this investigator has deployed several tape recorders about the lot to obtain the temporal noise level variations at several locations.

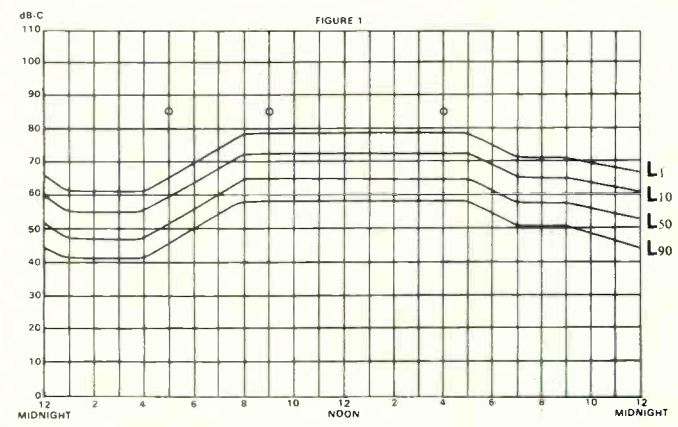


Figure 1 shows a 24-hour noise exposure level survey made at a proposed studio site. The designations L<sub>1</sub>, L<sub>10</sub>, L<sub>50</sub>, and L<sub>90</sub> stand for the C-weighted decile noise levels exceeded respectively 1, 10, 50 and 90 per cent of the time. In environmental assessment work the A-weighted sound levels are often used in such surveys, to gain a measure of the annoyance which the acoustic disturbances may produce on the dwellers of the area. This is of less importance here, since in studio work one is more interested in the amount of sound insulation required to achieve a specified interior noise level limit from a

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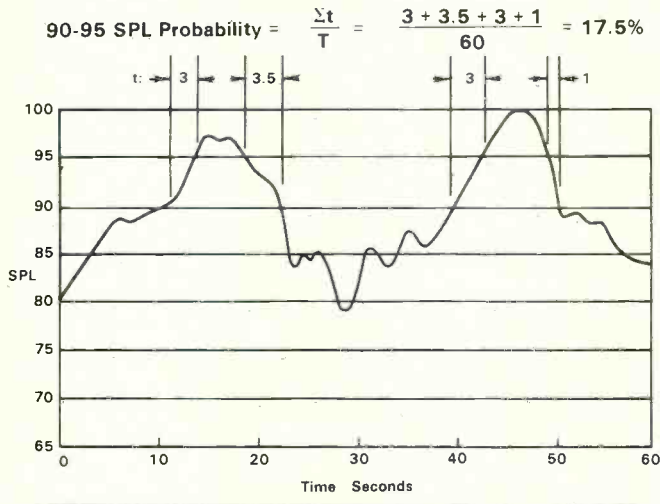
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knowledge of the exterior sound pressure level spectrum.

When a statistical distribution analyzer is not available for determining the decile noise levels, they may be obtained by adding all the time intervals between two specified noise levels, as obtained from the temporal noise level variation chart, as illustrated on Figure 2.

FIGURE 2



A noise histogram shows the percentage of time that the noise level at a given area is found between two set limits. This amplitude distribution is by means of rectangles whose widths are the noise level ranges and whose heights are the temporal percentages.

The question arises now what can be done towards calculating the required sound insulation of the exterior boundaries of the planned studio after the noise exposure level survey has been conducted at the prospective site. First, from the magnetic tape used to record the temporal noise level variation, the spectrum of the prevailing noise should be obtained. This may be done by connecting the output of the

Recommended Background Noise Criteria for Various Rooms

Type of Enclosure	PNC	A - Weighted Sound Level
Recording Studios, Concert Halls	15 - 20	25 - 30
Theatres	20 - 25	30 - 35
Homes	25 - 30	35 - 40
Offices	30 - 35	40 - 45
Stores	35 - 40	45 - 50

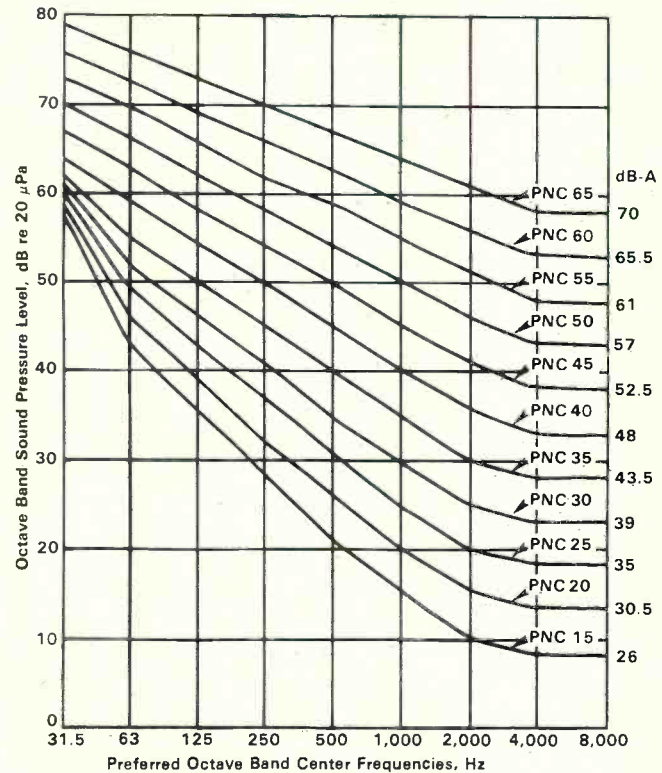


FIGURE 3: PREFERRED NOISE CRITERIA CURVES

Each curve is a code for specifying the noise level characteristic, or spectrum, of noise in rooms.

recorder, through a variable bandpass filter, to a graphic level recorder or other instrument to obtain the temporal sound pressure level variations in the various octaves or third-octaves contained in the variable bandpass filter. We obtain thus a series of charts, much like that of Figure 1, each chart

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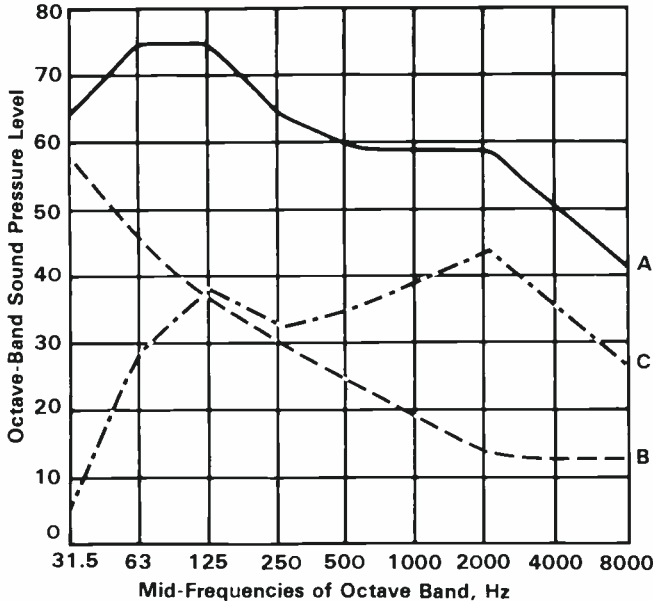
pertaining to a different frequency band. Again we must perform a statistical evaluation of the octave components, that is, decile noise levels,  $L_{11}$ ,  $L_{10}$ , etc., where the L primes pertain to the various octave sound pressure levels.

From a practical point of view, it is not necessary to consider  $L_{11}$  levels, that is, decile noise levels exceeded by .1% of the test period, because such a small percentage refers to only the noise levels in 3.6 seconds within an hour. When the standard deviation of the noise (a measure of the spread about a mean value) is 6 dB, the noise level difference between  $L_{11}$  and  $L_1$  is 4.5 dB when the normal distribution of the noise levels is near Gaussian. To use  $L_{11}$  as the criterion value for the exterior noise instead of  $L_1$  would require twice the surface density of the walls to achieve a desired interior noise level limit. This means twice as thick walls, since surface density refers to the mass per unit wall area.

Figure 3 shows the series of curves known as PNC graphs. Each curve is a code for specifying the noise level characteristic, or spectrum, of the noise in a room. In sound recording studios PNC-20 is generally desired, which is equivalent to an A-weighted sound level of 30 dB-A.

Figure 4 represents a graphic solution to the problem of how to determine the required sound insulation of the exterior walls of a planned studio. The solid line is the prevailing noise level spectrum during 1% of the time, the so-called  $L_{11}$ , as discussed previously, and is labelled Curve A. The dashed line is the PNC-20 characteristic desired for the interior of

FIGURE 4

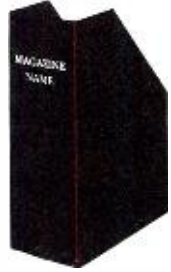


Curve A: Decile noise level spectrum existing 1% of time.  
 Curve B: Preferred noise criterion PNC-20, equal to 30 dB-A.  
 Curve C: Required sound insulation characteristic of studio (curve A minus curve B.)

the studio, and is described as Curve B. Curve C is the difference between Curve A and Curve B, and constitutes the required sound insulation characteristic of the exterior boundaries of the planned building. □ □ □

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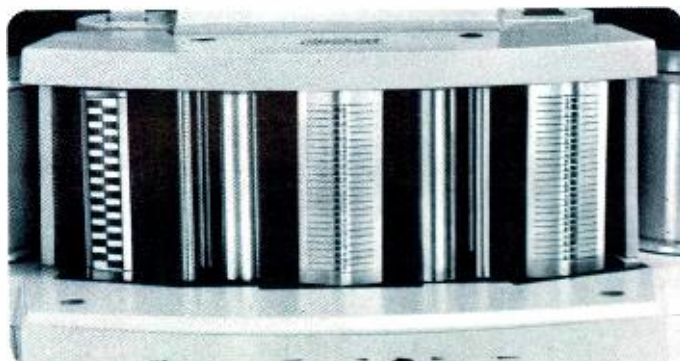
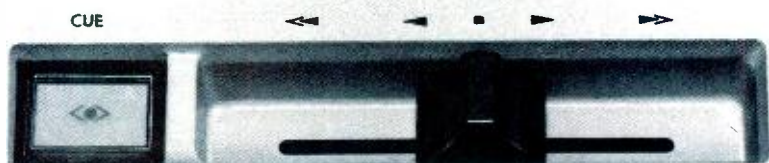
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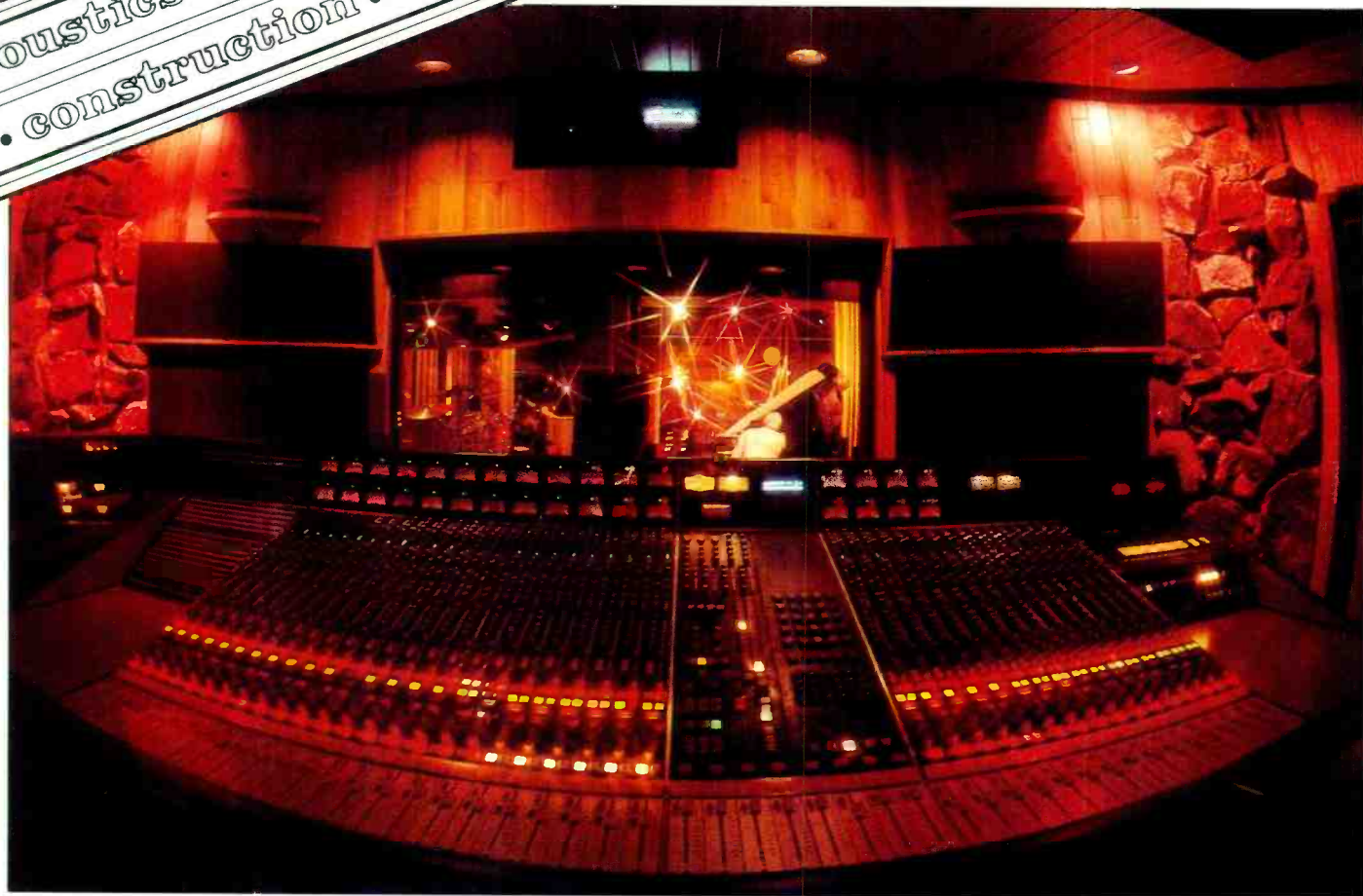
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## Studio Design Requirements For The Next Decade

by  
Kent Duncan  
Sierra Audio  
Burbank, California

In this, the infancy of the digital recording age, a significant number of manufacturers have already introduced professional audio recording systems capable of from 20 to 30 dB better signal-to-noise ratios than had been the standard up to this time. The challenge of digital technology as it relates to the modern studio acoustic environment is one that must now be addressed. The implications both to signal processing and acoustic performance of the recording studio are as clear as they are unaddressed.

Since the design and construction team of **Sierra Audio** and **Tom Hidley** is the leading turnkey builder in this industry (207 studio projects, worldwide) it falls to us, more than to any others, to face up to this timely and demanding new acoustical challenge. To illustrate the point: from

personal experience, it seems safe to observe that not one out of a hundred studios, today, has 90 dB of broadband outside interference rejection. Our own first design and construction projects that clearly address this new isolation requirement are the two studios we are presently building for Fantasy Records, Berkeley; the two studios we are building in Tokyo for Kitty Records; and, of course, the turnkey facility of twelve studios for CBS/Sony in Tokyo.

This discussion, then, will be divided into two parts. As follows, Part One will provide background focus to the subject. Part Two, authored by Tom Hidley will appear in the June issue of *R-e/p* setting the parameters and specifications required to exploit the new technology and new generations of

equipment.

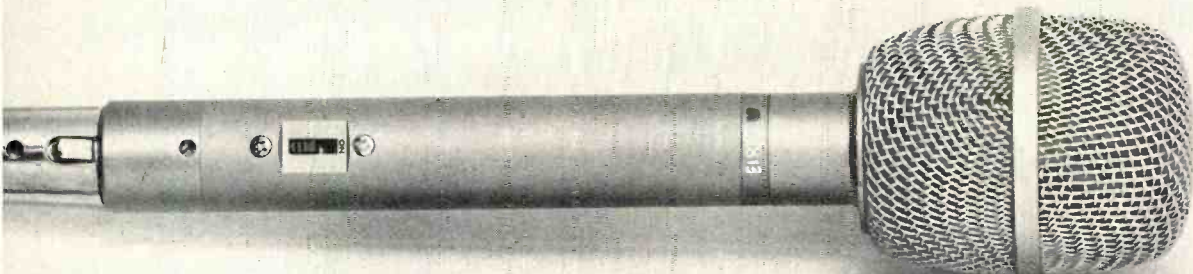
### Analysis of Requirements for Recording Studio Design for the Next Ten Years

Realizing that the bulk of audio recording in the United States, Europe and Japan today is done by the small independent recording studio, supported by major record labels, the goals of successful studio design and construction are straight forward: The studio owner desires to achieve maximum return on his investment. To do this the studio he wants designed and constructed must meet the demand for outstanding acoustical, electronic and human performance.

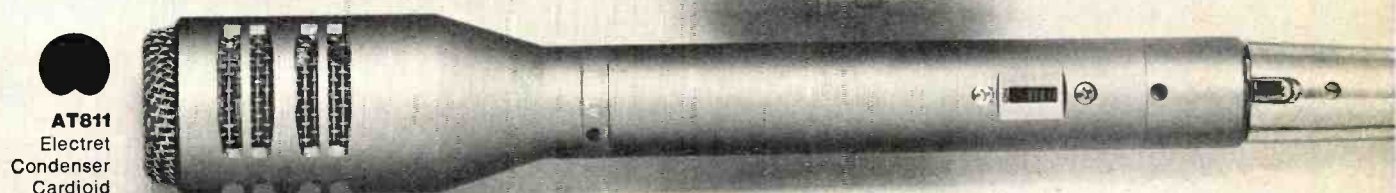
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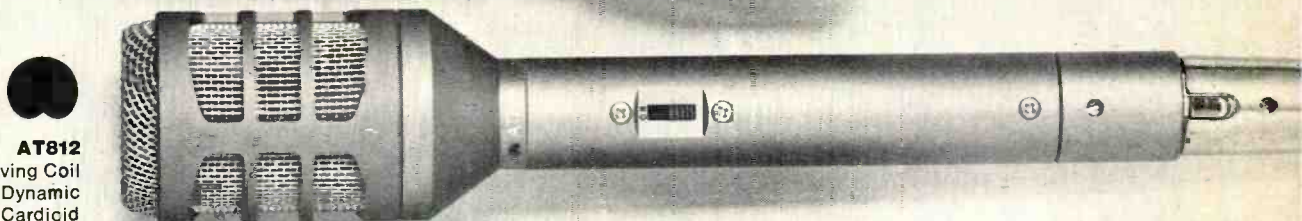
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R-e/p 69



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Acoustically the studio must provide the artist and producer with a well-defined sound, free of interference from outside sources, and providing internal separation between instruments generating very high sound pressure levels (SPL) located only a few feet apart. Additionally, the control room must provide a calibrated listening reference free of phase inversions that would impede the ability to accurately evaluate the performance in as close to true and flat reproduction as possible.

Electronically, the studio must be designed and equipped to the highest technical standards and impose no creative compromises due to lack of flexibility or reliability.

From the human performance point of view, an environment that is comfortable and conducive to creativity is extremely desirable. The human interface so vital to

the success of a project is very much a part of the design concept, and cannot ever be ignored.

The net effect of not rigidly adhering to these valid acoustical, electrical and human design basics and principles has often resulted in rooms where tinkering with the monitor system is a way of life, rather than having a monitor system as an integral unit of the studio, to be relied upon as a basis of artistic evaluation. The purpose of this article then is to direct the reader toward careful analysis of the theory of any acoustic design, and perhaps to broaden the horizon and sophistication of the reader by sharing the benefits of our worldwide consulting experience.

#### Measurement Techniques

Since the acoustic environment to be measured will itself, in turn, become the measurement tool for evaluating the recorded product, the need for exacting analytical work cannot be stressed too strongly. All Sierra/Hidley analysis is done using pink-noise and warble-tones measured by Bruel & Kjaer equipment through the calibrated B&K Model 4134 random grazing microphone. (We never cease to be amazed at those who attempt to use omni microphones of sizes many times the wavelength of the high frequency material to be plotted, to say nothing of the

fact that the random field components that must be part of the analysis procedure are ignored.) The term broadband is used to connote the frequency range 31 Hz to 16 kHz.

Pulse testing techniques which may have some accuracy in mid-range or top-end is unreliable in typical audio studio environments where dimensions of less than one full wave-length of the frequency being measured exist. [The wave-length of 40 Hz is approximately 10 meters (32 feet), and most control rooms, as we have observed, have maximum dimensions of not more than 2/3 that dimension.] Additionally, adjustments made on voicing filters when using a source other than pink-noise or warble-tones ignore the effect of alterations at the harmonics of the frequency being adjusted.

Decay time must be plotted to provide meaningful analysis of any space. Unless the analysis of decay time is tied to a frequency range meaningful measurement is lacking. It is fine to say that one wants a two-second studio, or a half-second control room, but this is meaningless without complete specification.

#### The Basic Studio Layout

To illustrate, the following is a discussion of an average studio used for pop-recording, that might accommodate 20 - 35 musicians.

Talking first of the studio (a discussion of the control room will follow), the initial work is twofold: 1) compute the primary resonant frequency of the room and design an attenuation system to remove this irregularity as it appears in the room curve.

2) Provide a large amount of low-end attenuation to achieve sufficient isolation, instrument-to-instrument. To do this effectively there must be an understanding of the sound pressure levels generated by the average band. For example, when measuring the Basie Band playing at double F, one would ordinarily experience reasonable 104 dB SPL peaks. But, a rock and roll drummer will often develop 120 dB SPL of impact energy, threatening what would ordinarily have been sufficient isolation.

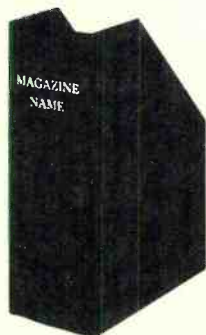
A bass guitar with 112 dB SPL centered at, maybe, 50 - 80 Hz, and kick-drum levels even higher than that dictate that in addition to having airborne (wave) challenges in the room, the walls and floors will tend to move in mechanical resonance with this low frequency energy. Properly treated with active attenuators the standing waves created by these large amounts of low-end flutter will be eliminated.

Audible mid-range and high-end flutter echoes cause additional problems which will need to be solved.

In solving these problems the acoustician must reach a balance between isolation and proximity to provide an artist the ideal

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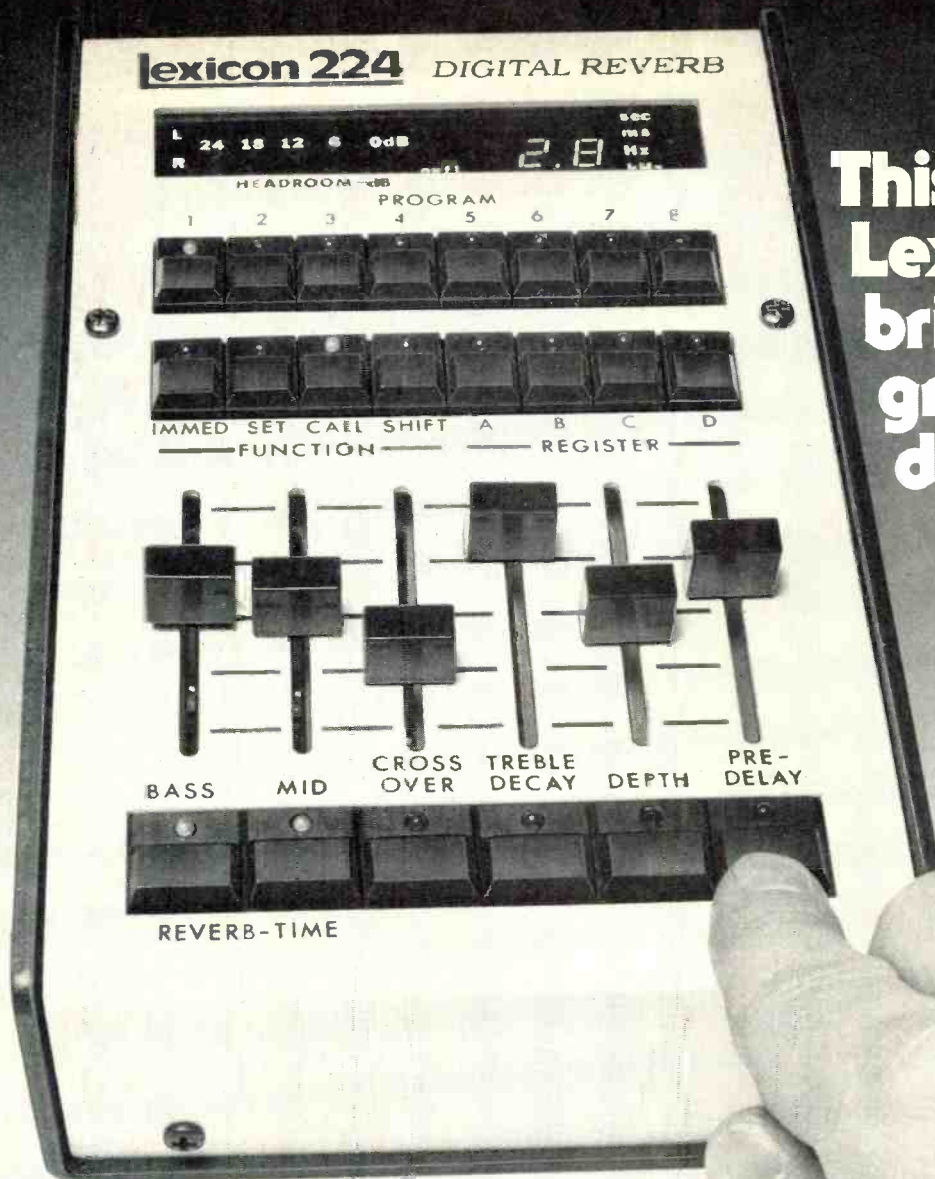
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R-e/p 71

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workable situation, meaning adequate separation of at least 20 dB, broadband, instrument-to-instrument, three meters (approximately 10 feet) apart.

The most severe requirement for isolation demands an integrated design consideration, involving floor, walls and ceiling, as will be shown. A minimum requirement now exists of 50 dB of isolation between two floor-coupled rhythm instruments: piano producing 80 - 90 dB SPL, and drums yielding in excess of 120 dB . . . which good recording practice requires to be no further than 3 meters (10 feet) from one another.

To suggest that one or the other of the instruments be placed in a separate room to achieve isolation is much too restrictive to the human performance factor, as well as being unnecessary, relative to what we know of acoustic design today.

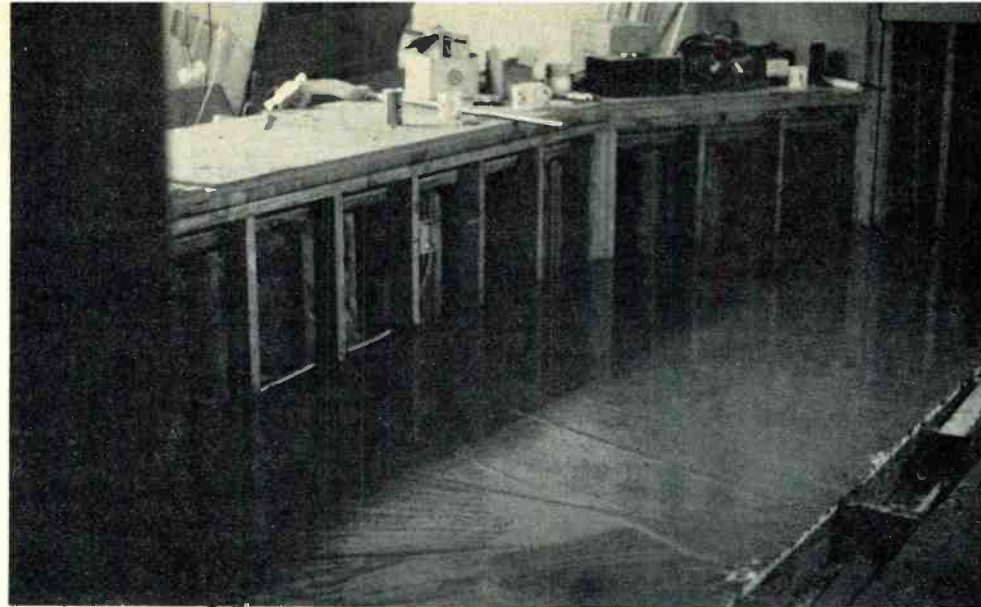
### The Rhythm Area

The integrated solution to the problem involves decoupling each instrument from a common floor, as well as providing an attenuation system and massive wall system that not only provides a lack of sympathetic resonance well below 31 Hz, but sufficient isolation to the outside as well. As designed, our drum cage provides 26 dB broadband isolation at a distance of 30 cm. The ceiling is designed with 20+ dB low-end attenuation, and the piano is faced into a broadband trap, providing an additional 6 dB rolloff. The science today can indeed achieve 50-odd dB broadband separation (26 plus 20 plus 6) with these two instruments 10 feet apart, in the same room!

However, if a studio were built inflexibly with the instruments placed as provided for by specific acoustical treatments, the producer and engineer are obviously denied alternatives and choice to augment various artistic properties of the instrument. At the other end of the alternative, far too many studios are uniform throughout. This is too confining in light of the state of the studio design art today.

Ideally, given sufficient total space for the studio an area of very short decay time would be designed for the rhythm section, a moderate decay time area for guitars and other electric instruments, a medium-to-warm area for horns and acoustic instruments, and a multiple-decay isolation area for strings and vocals.

It becomes apparent that isolation control (rejection) is a quite different matter, and must be differentiated from absorptive (attenuation) control. Generally, the primary tools used to achieve isolation are decoupled, high mass wall and floor systems, and secondarily diaphragmatic power attenuators (bass traps). Although extreme low frequency trapping is used to improve isolation, trapping and trap design is the predominant tool for controlling



Diaphragmatic Power Attenuator (bass trap) and floating concrete floor detail.

absorption.

### Floor and Wall Construction

As an almost universal specification the floor of the greatest majority of studios will probably not have to exceed 30 cm (12 inches) of high density concrete slab. Atop this, each floated off the base slab with long-life, open-cell rubber layer to form an acoustic sandwich, are a series of 20 cm (8 inch) concrete slabs linearly isolated from each other. (The control room actually sits on a third slab to further decouple the high-power monitor system from the studio space.)

Typical stud and plasterboard construction is found to be the most cost effective and flexible high mass wall technique used worldwide. With the stud plates barrier isolated from the slab, standard construction calls for 2 x 6 studs with 5 to 10 cm of high mass materials overlapped and sandwiched as individually calculated for each particular application. The surfaces are a series of membranes which will react with sympathetic vibration to frequencies in the very low ranges, typically 8 to 36 Hz. Three or four of these wall systems are used with air spaces between for both control room and studio, depending on isolation guarantee.\*

\* The fact that Sierra Audio/Hidley designs offer an acoustic guarantee has interested clients and designers around the world. As far as we are aware, we are the only firm which offers any sort of guarantee attached to the performance of the studio. This specifically guarantees that from a point in the center of the control room, an area 12 to 18 feet wide, 6 feet front-to-back, and from 6 inches above the console to the ceiling will measure precisely flat, plus or minus 1 dB broadband. This includes sufficient flexibility to vary the finish materials to achieve a mid-range decay time up to 0.7 seconds, as the user prefers.

### The Active Trap

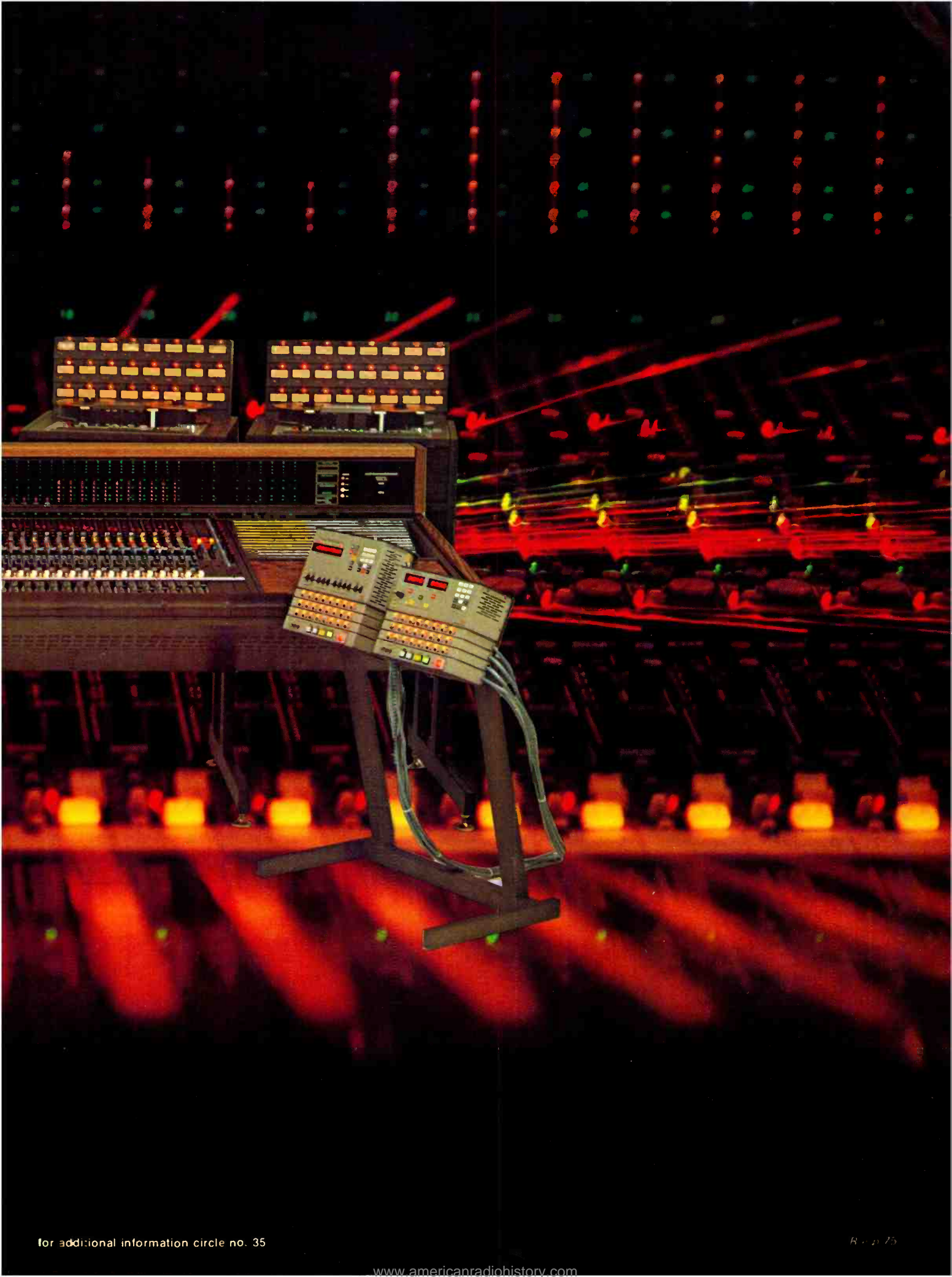
Obviously, energy cannot be created or destroyed. The energy of unwanted soundwaves must be converted into motion by attenuation through membranes vibrating in sympathetic resonance, thereby reducing the energy to a level that provides sufficient isolation, instrument-to-instrument. While there are other methods to accomplish this, such as slot resonators and tuned wedges, Tom Hidley developed the active trap as the method upon which the Sierra/Hidley acoustic design is based. The active trap is an acoustic sandwich of materials suspended to move freely in a cavity designed specifically to attenuate a particular range of frequencies. Physically the blankets are suspended to allow free motion as the trap converts sound waves into physical motion. The specifications that determine the amount of attenuation and the center frequency of a particular trap are the trap length, spacing between traps, volume of the cavity, the angle of the trap in relation to the base line of the trap opening, and the ratio of cavity opening to cavity volume.

The advantage of this approach is that more attenuation across a given floor surface area is provided from a decidedly smaller area and volume of material than would otherwise be possible. The active trap has been found to be significantly more efficient for recording studio application.

Through the integrated use of these design and construction techniques the studio will now have been cleared of resonating anomalies, and further has been provided with low-end roll-off of up to 40 dB at 40 Hz in the rhythm area.

### Designing For Creativity

The highest order of challenge for the acoustic designer is to produce an environment where recording will take



place with as little correction as possible; that is without equalization! Since equalization is a form of phase shift, it must be assumed that whatever EQ or limiting is added in the control room is a statement of either poor acoustics or deficient technique by the engineer. Certainly all of us have been reminded by the recent direct-to-disk and digital work that has been done around the world that the amount of EQ and limiting in pop music is by and large unnecessary and counterproductive to the accurate creating of the illusion we call a disk. It certainly is pleasing for us to walk into a studio of our design and observe that only a couple of the tracks require just a taste of EQ, no more than 2 to 4 dB, reflecting the producers taste to accent a particular instrument, not his need to compensate for inferior acoustic design.

### Main Studio Floor

Moving out of the rhythm area (which requires the highest order of low frequency control), the following discusses the moderate area where other electric instruments are placed. Usually one end of this section has a large volume room trap in front of which a hard surface floor for percussion is layed. This room trap adjacent to the percussion area is tuned for wider range bass frequencies attendant to percussion, while presence is enhanced by the hardwood floor upon which the instruments sit. This is located no more than four meters away from the basic rhythm area, and meaning that all rhythm instruments are centered in a small radius.

In the center of the studio, between the live and dead ends of the room, is a medium area that is most often designed with

hardwood walls surrounding a carpeted floor to provide warmth to enhance moderate level instruments, such as horns and acoustics. Obviously, the variation of finish materials determines decay time of mid and top frequencies, and considerable creative input is necessary to determine the shape and geometric plan of these spaces.

A word about "live" and "dead" rooms. It must be remembered when we stress low-end roll-off we are working 400 Hz down, with maximum attenuation centered at 40 Hz. We allow 400 Hz to 5 kHz to be longer (in decay time) as there is considerably better isolation due to low-end control. Indeed, the goal is not to make a studio dead, but just the opposite. A very long decay time is desirable throughout the midband to enhance the presence and transients inherent in the music. All we are saying is that to preserve good clean transients (a snappy snare, a funky piano, a string section you can reach out and touch) the low end must be kept under control. Then the drum sound stays tight when you open the piano, percussion and ambient microphones.

### Multiple Decay Isolation Room

The live end of the room, today, is really the outgrowth of what formerly was the vocal booth. As our design has progressed more space was needed in the vocal booth, and as we enlarged it, it became more useful. The multiple decay isolation room now typically occupies a third of the floor space in the pop recording environment and basically has reflective materials with low absorption coefficients, providing dual purpose hard wall surfaces (reflective in the mid-band and ported to trapping to attenuate a moderate amount of low-end). This provides a very useful treatment to imitate the environment of a concert hall for acoustic string instruments. It also helps good engineers to build a finished mix at the time of initial tracking.

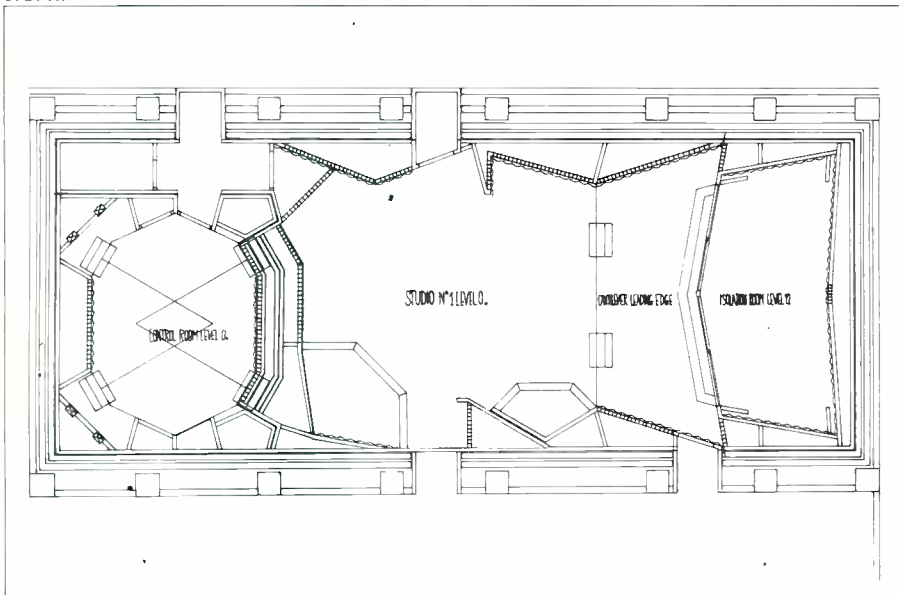
### Mechanical Tools to Alter Decay Times

Now that four areas have been provided in the studio, each with optimized surface materials to enhance individual characteristics of particular instruments, further flexibility can be built into the room to give the producer and engineer unlimited freedom and flexibility of choice. Hard surfaces can have pull drapes to shorten mid-band decay time. Glass ceilings can have louvers ported to mid-band traps above. Carpets can be rolled back to reveal slate, marble or hardwood floors. Entire sections of the studio can be divided to provide acoustic cavities that become very bright as glass doors contain small areas to increase decay times. All of this may be done as part of a well engineered approach to a flexible environment. It is no longer

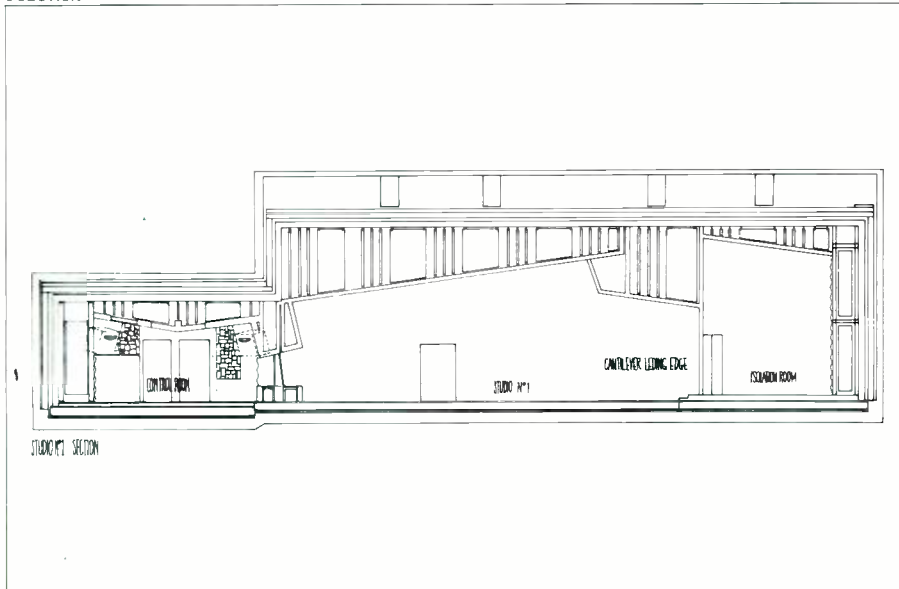
## Studio 1 Drawing

CBS SONY STUDIO

### FLOOR PLAN



### SECTION



necessary to instinctively reach for the EQ or the echo send. Instead the engineer or producer engages the remote drapery control or the louvre gears to tune the studio for ideal reverb times. The psychoacoustic effect of good lighting and attractive design hasn't been forgotten either.

**CONTROL ROOM**

The control room is the point of reference where the decisions are made relating the live band to the consumer listening environments. It is the point where all audio analysis is done. The control room must be an accurate mirror of precisely what is happening in the studio, without coloration. It cannot be separated from the monitor system for which it was designed. The monitor must be capable of generating very high power in a clean and accurate way to satisfy the client.

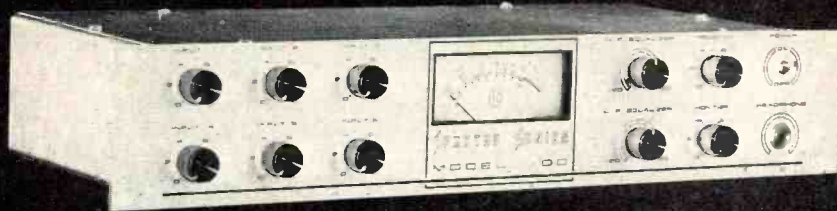
More specifically, from an acoustic point of view, there is a requirement for being able to move across the entire width of the mixing console (as well as forward and back) without hearing any apparent change in timbre or balance (and not encountering acoustic phase distortion). Acoustically the room should be two-dimensional and symmetrical in a way that the stereo and quad image stays in balance. Too, there must be low-end and primary resonance frequency control. The room must be accurate, which is to say that every frequency must be very clearly defined. The image must be precise, meaning that ear fatigue will be low. Proper geometry is critical, to provide a lack of acoustic phase distortion.

**Acoustic Phase Distortion**

One of the major benefits of having achieved room linearity, as the curves have improved over the years, is the reduction of ear fatigue. In the past articles have been written attributing improvements in this condition to better sum-add measurements. Without question the reduction of acoustic phase distortion has improved the accuracy of the room and thereby reduced the harshness of the mid-band, as well as having minimized the need for phase alignment in the monitor system.

But the real reduction in ear fatigue was the result of the improved geometry, smoothing the room further as measurement became more precise. As an example, a well known Hollywood Studio was measured third octave, a few years ago. It read plus or minus 2 dB from 60 Hz to 10 kHz, third octave. When read tenth octave, several spikes over 22 dB were discovered. (What might it have been measured fifteenth?) Sierra/Hidley rooms when read in this more precise way consistently deliver no more than a 6 dB peak, as well as being

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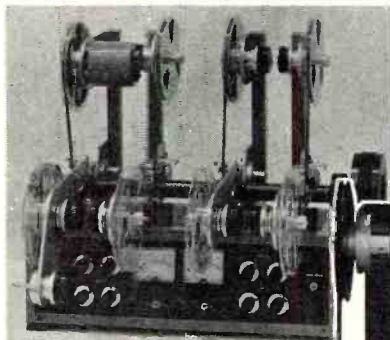
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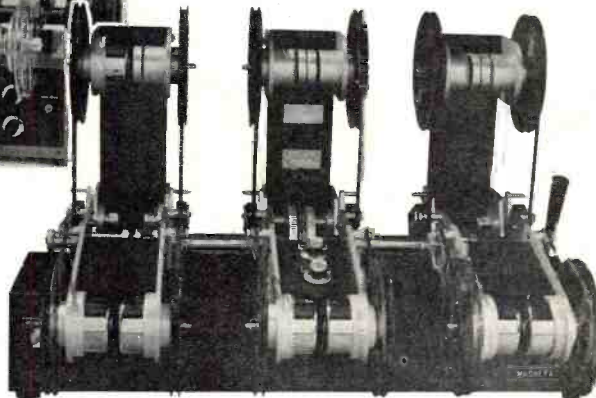
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flat over a much broader range. These narrow band measurements, of course, average when analyzed third octave. But it is these spikes that are causing ear fatigue, and what that means to the studio owner is shorter sessions and less revenue.

### Sum-Add Measurements

If a monitor is placed in a free field and sufficient power is fed to deliver, say 110 dB SPL broadband, and a second identical monitor is fed an equal amount of power, theoretically a 6 dB power increase will result acoustically. It is not uncommon to measure rooms, which are up for redesign, to find measurements with as *low* as 3 dB add. We have actually seen rooms that had a 0 dB add. What this indicates is that the room had so much cancellation introduced by random signal, that there was as much out-of-phase energy as there was in-phase energy.

Ideally, a design should achieve as close to the theoretical 6 dB summing maximum as possible. By experiments with altered geometry, and research into the absorption coefficients of various finish materials the Sierra/Hidley guarantee\* now includes a minimum 5 dB broadband sum-add requirement. (A full 6 dB with reverb times as low as .35 seconds at 40 Hz, and .25 in mid and high frequencies has been achieved in several recent rooms.) With this

improvement the acoustic third dimension of the control room has been minimized by not only providing proper attenuation via active trapping, but by designing the interface of the trap ports to the room in such a way as to provide a completely symmetrical room with no chatter causing phase cancellation.

By tailoring the room for the monitor a completely phase coherent room has been effected.

Using the supposition of a relatively small control room, and attempting to correct the design of a standard monitor with electronic time alignment is, we think, an obtuse approach when contrasted with a selected monitor system and a room of compatible design.

Supposedly dead rooms have been observed where the low frequency decay time was amazingly long. There are reams of data on absorption coefficients, but very little complete information, especially through the lower frequency bands. (What is the effect of an upholstered pad at 30 Hz?) Basic premises of control room design indicate that the listening position (and that is not just the center of the console) should be uniform in frequency response and somewhat semi-reverberant in decay time. We achieve this by using many interlocking design criteria. For example, tape machines are moved to angles where mid or high

frequency information will not be reflected back into the listening area. Low-end is controlled, then balanced in the control room front-to-back. The listening area is ported to a ceiling trap. Then, in the final analysis, before release, the room is tuned acoustically by sizing the appropriate trap ports . . . rather than brute force electronic voicing using a filter system.

Another trap is provided in front of the room below the window system, and the inside window pane is aimed off the console back into this trap. Decay time predictability is achieved by the finish materials used in the room, and can be modified to the client's personal taste.

Mid-range dispersion is achieved by the geometry of walls and ceiling together with the monitors providing an optimum ratio of direct versus reflected sound at the listening point.

### Recent Projects

A number of recent projects have increased our experience in areas other than in recording studios. Projects including a cabaret disco in London for Virgin Records, re-design of the sound reinforcement system of the London Palladium, and other non-studio projects applying our principles have provided useful references for new design projects. Additionally, recent renovation projects such as the Soundmixers complex, in New York City, have provided interesting information as to misconceptions prevalent in the area of studio building. We have found many such studios built with low-mass, low-cost wall and floor systems that were used to economize in the studio construction. This turns out to be a vast disservice to the client when his clients discover the results of sympathetic vibration at relatively low levels. Substandard geometric design introduces acoustic phase distortion and contributes to non-linear frequency response. Standing waves in control rooms which manifest as unbalanced and boomy bass commonly use attenuation systems other than active trapping. (Ah!, but to have done it right the first time.)

### Your Checklist

Some of the questions that should be asked in the early stage of planning the studio and a key to selecting a good designer should involve comprehensive discussions of design theory, long before discussion of finishing details, materials, colors, decor, and layout. The following will be an aid to making your decisions:

Is the space large enough to develop into a studio area that will accommodate the number of players needed for the type of music to be recorded?

Is there sufficient space to develop an

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acoustically correct control room?

Is there ample space and suitable building layout for office, support and traffic areas?

Is there audio interference from adjacent levels of the building?

What is the composition and height of the ceiling? Is there any mechanical equipment mounted adjacent?

What is the level of ambient noise, both airborne and ground conducted vibration? At what frequency? Is its impact energy?

What is the construction and transmission factor of the internal walls? Are they common to a neighbor?

Is the floor slab solid? What is its thickness? Do cracks go through to the ground? Is it transmitting external noise? Will it carry the load of the proposed facility?

Are the proposed studio spaces interrupted by structural supports?

What is the composition of the soil under the building? What is the size and location of subterranean pipes? Subways?

What is the relative height of the water

table? High and low levels throughout the year?

What is the proximity and power of the nearest broadcast transmitter?

What is the humidity and temperature range?

What is the voltage, frequency and phase of the electrical power available? What is its capacity? Its reliability?

Are there unusual local building codes or zoning restrictions? Are there historic preservation laws affecting the area?

What is the proximity to airports, railroads, or heavy traffic?

What are the local labor rates? Are there potential union problems?

What is the local tax situation? Is there any sort of investment credit?

What is the availability of building materials in the area?

How costly is any required demolition?

Whether you have chosen an existing building or a vacant piece of land, on-site

measurements are an indispensable part of the total design process. An attitude of thoroughness can save a good deal of time and money.

### Conclusion

It is more than reasonable to expect that the studio of the 1980s will vary in character from one area of the room to another, providing a variety of decay times essential to versatility. Any room lacking third dimensional control from 30 Hz up and not addressing the problem of instrument leakage must be rejected out of hand. Any room that has a totally reflective surface behind the listening point, a monitor angle exceeding 60 degrees to the listening point, or low mass walls and ceiling systems, must be suspect. If the studio is to be a tool where one makes subjective decisions based on engineering criteria then we must achieve an accurate environment without compromise.

Either the room is flat throughout the audible range, has minimal acoustic phase distortion, is symmetrical, and has greater than a 5 dB sum; or there is imperfection resulting in coloration, sympathetic vibration, variations in frequency response by level and listening position, and ear fatigue.

Specifics from Tom Hidley in June.

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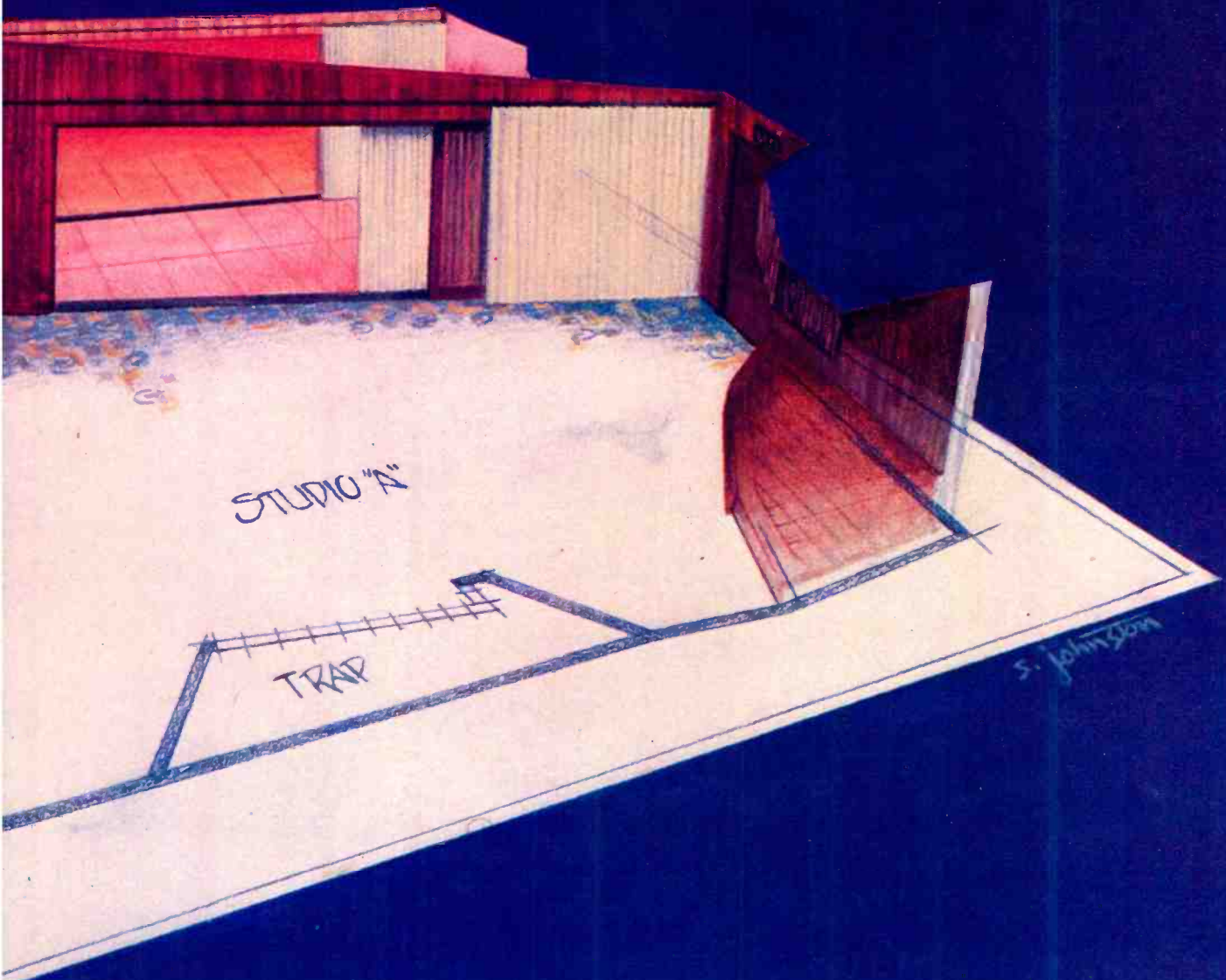
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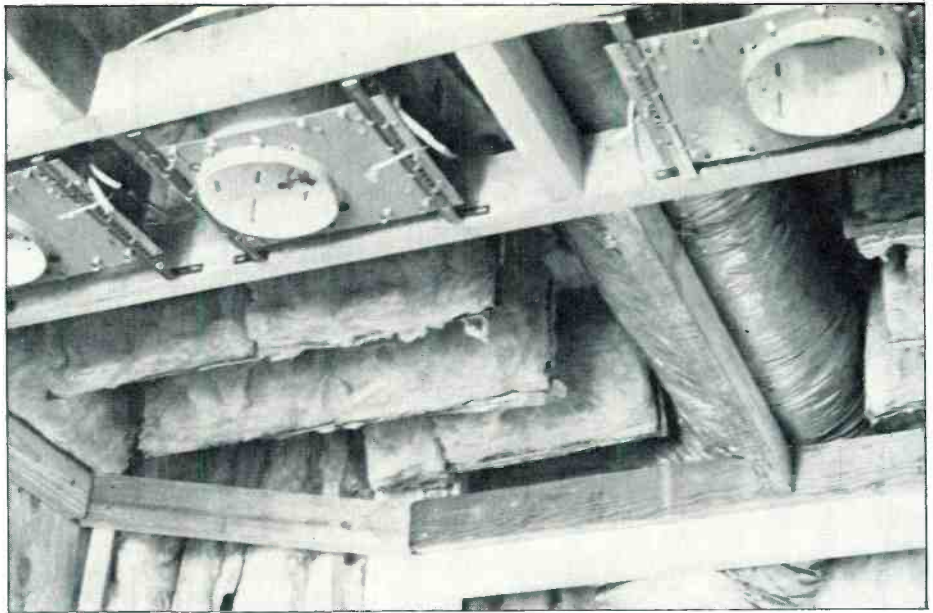
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hand he wanted to avoid a box size that would be impractical for remote applications. A happy medium was an 18' x 8' x 8½' box, which with the efficient use of available space, afforded a more spacious feeling in a very mobile configuration. The larger space alone wasn't enough to end that difficult and bothersome problem common to all remote trucks and small control rooms, "bass build-up" and inaccurate monitoring. The solution was the extra height of the new box which provided space enough for an active ceiling trap. The trap in itself is a revolutionary concept in remote recording, it was but the first important step to a studio quality monitoring system.

**"The System" Realized**

The rationale behind the feeling that remote truck acoustics didn't need to be perfect has been that mobile recording was used only to capture the on-location performance (usually on multitrack tape), which was then taken to a conventional studio where it was critically evaluated and mixed. However, other applications for remote recording in the last few years have approached those of the permanent studio. Although live performances are still big, the video industry is seeing an increasing need for location mixing. The present majority of work is audio for video productions. When you add to this television simulcasts, live



Detail of ceiling construction showing trapping and air conditioner ducting.

radio broadcasts, album projects at client's choice of location, etc., it is readily apparent that an accurate monitoring environment for critical mixing is a must!

Anyone who has attempted to design a small control room knows that many of the problems of acoustics are magnified and increased with decreasing room size. Bass

build-up, room overload, and poor stereo imaging were all popular demons with the first Houston truck.

**The Problems**

It is well known that standing waves occur at specific frequencies and locations or modes within a room. Equalization provides

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no cure because the modes will still exist in the same locations. Low frequencies are particularly hard to handle. Although soft surfaces and other wall treatments can tailor the high and mid bands, they have little effect on the low end, which will still roll around the room creating peaks and nulls. The highest bass energy concentration will be at the junctions of walls, ceiling and corners.

Acoustic overload is particularly acute in a small enclosure. As the monitoring level is increased, a point is reached where direct, reflected and reverberant signals are bounced around the room at nearly equal amplitudes. Since the boundaries of the small enclosure are so close, the time interval between direct and reflected sound is very short, resulting in mass aural confusion. (Mixing in the first truck was done with the rear door open whenever practical to help alleviate this problem and decrease bass build-up.) [Perhaps the first Live End - Dead End mobile studio.] Not only does this affect clarity and intelligibility, it also degrades the perceived stereo image.

Special consideration must be given to stereo monitoring when designing the small control room. Not only will stereo imaging suffer due to acoustic overload and necessary close placement of speakers, any wall surface irregularities and asymmetry will also compound the problem.

Practically all of the acoustical shortcomings of the first truck were a result of size. Since there were physical restrictions on how large the new truck could be (especially the 8-foot legal maximum width), and still remain as mobile as possible, it was necessary to enlarge the interior by acoustical means. The single most effective change was the addition of an active ceiling trap. The entire ceiling was done in the standard "swinging baffle" configuration which also provided space for such mechanical requirements as air conditioning ducts and lighting. In addition to the ceiling treatment, two tape machine soffits with active trapping were placed along either side wall. These served to break up the low frequency concentration at the junction of the ceiling and walls. All of the traps prevent the typical bass build-up while increasing the apparent size of the room.

Symetry was carefully preserved throughout the control room. The front wall between the two monitor speakers was finished with a hardwood surface to facilitate precision panning across the stereo spectrum, while the front side walls were treated for improved dispersion. A "deck" was constructed from the front wall to the back of the console meter panel to prevent sound from bouncing around in this otherwise wasted area. All other wall surfaces were finished with velvet acoustic "pillows" or carpet.

The net result of these efforts is that of a

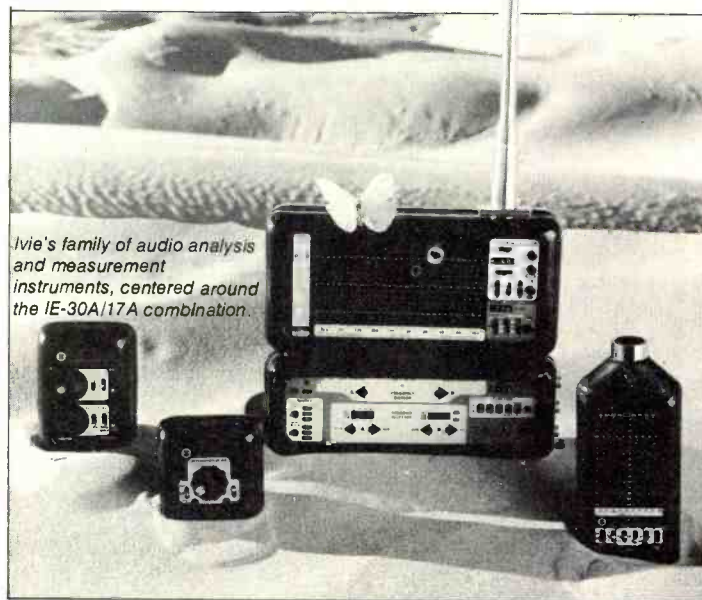
smoother response without equalization, lower susceptibility to acoustic overload, improved stereo imaging and more effective soundproofing. The basic soundproofing is typical lead-laminated plywood and a raised sub-floor.

#### Comfort

As mentioned earlier, the new Houston truck was designed to "feel" larger. That "cramped" feeling evident in many remote trucks has been reduced. There is an effective use of earth tones, plush carpeting and strategically placed mirrors that combine to make the new truck an aesthetically

pleasing environment to work in. Added amenities include air conditioning/heating, dimmable lighting and a refrigerator. These are all-important factors considering engineers may spend 18 to 20 hours in the truck at remote jobs. The interior comfort can make quite a difference in the results achieved in a remote application just as it does in ground-based control rooms. Houston's clients often comment that they forget they are in a truck. Considering the resulting sound quality, monitoring accuracy and comfort of the new truck, Rich Houston's new concepts in remote recording really work. □ □ □

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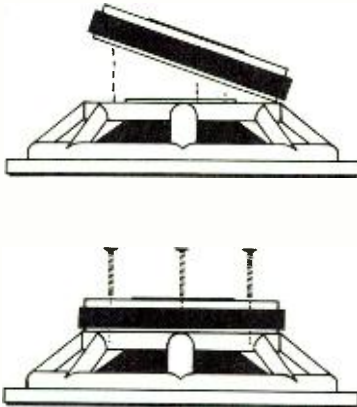
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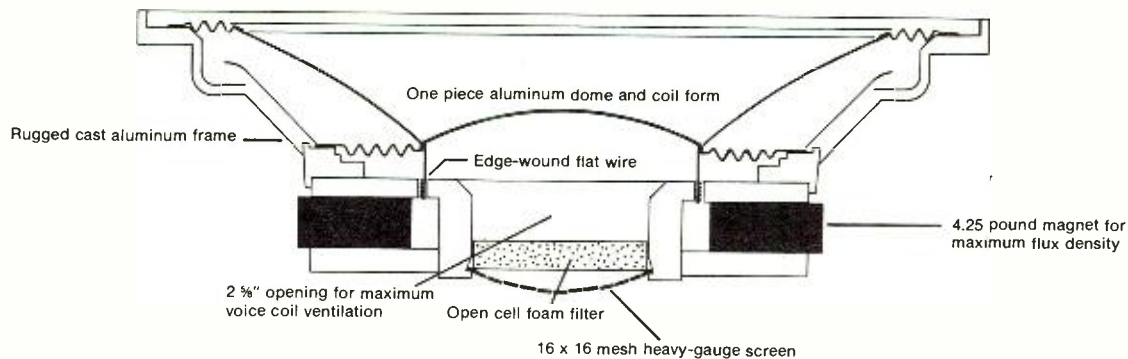
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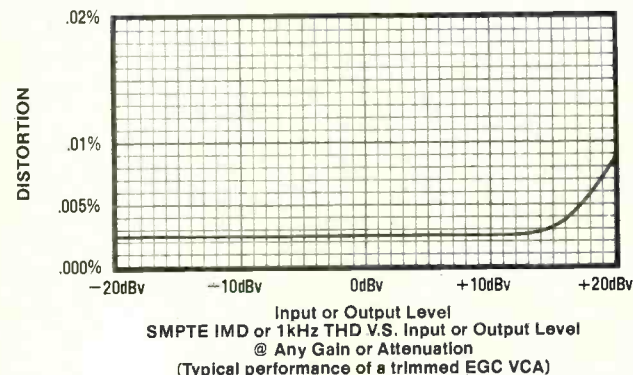
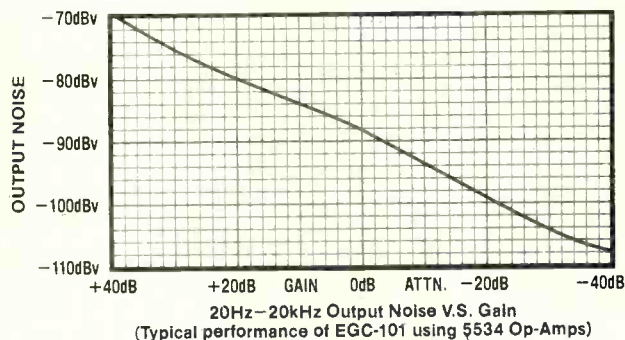
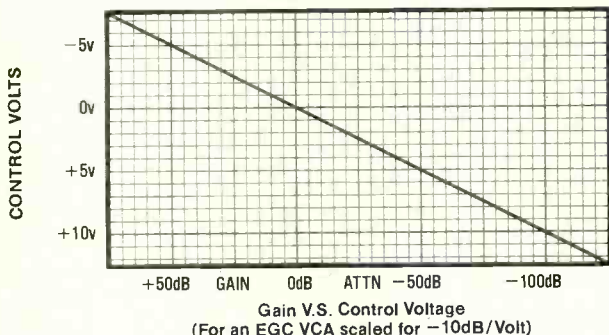
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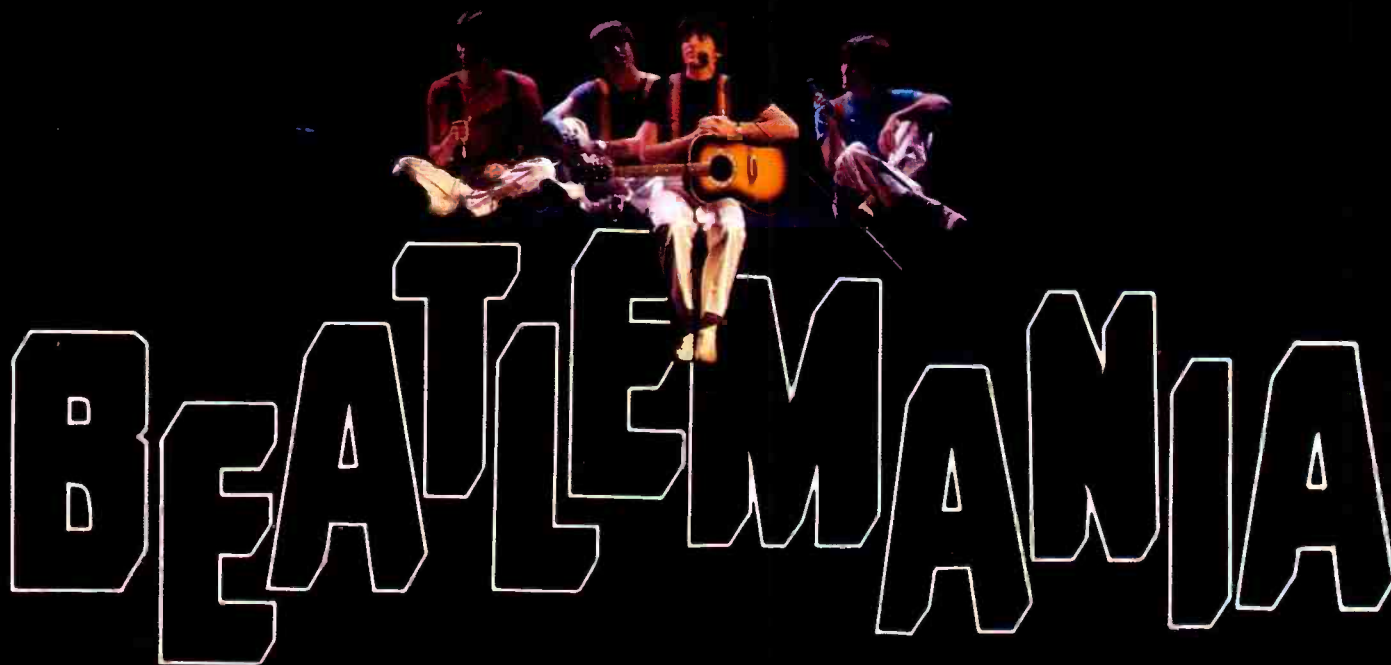
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## A Live Performance Audio Experience

by

Patrick Maloney

Beatlemania did not end in the early 1970's when John Paul, George and Ringo decided to bring to a conclusion one of the

**Patrick Maloney is a sound mixer based in San Francisco who specializes in live performance. Beside doing extensive work in the Bay Area through his own company, Conscious Audio, he also mixes direct-to-disk project for Crystal Clear Records. He has gained national recognition for his road show work with such artists as Liza Minnelli (1974 [Mexico], 1975 [European Tour], 1976, 1977), Andy Williams (1977 American Tour - Caesar's Palace; Monterey Jazz Festival 1976, 1977), Herb Alpert and the TJB (1973, 1974 [European Tour], 1975 [Canadian-USA Tour]), Burt Bacharach (1975, 1976 [American Tour], 1977), and many other acts of equal stature.**

**He has a degree from San Francisco State in broadcast communication and has taught many aspects of the recording, sound reinforcement business.**

most significant musical forces of our time. It continues today in the form of a well produced, fast paced technical achievement in sight and sound called — what else — “BEATLEMANIA.”

The show is presently being performed in three locations simultaneously across the country by separate East Coast and West Coast touring companies, as well as a New York Broadway cast. Each company is made up of two complete casts who act in alternate shows, so in fact there are twenty-four Beatle look-alikes and sing-alikes in all!

I had seen the show in Los Angeles at the Pantages Theater last year, and then again just recently at the Orpheum Theater in San Francisco. Each time the production basically blew me away. It is literally a sound engineer's paradise — or nightmare, depending on your point of view and/or level of proficiency.

The sound was designed by Abe Jacob, who has in the past designed and supervised the sound for such hit shows as *Hair*, *Jesus Christ Superstar*, *Chicago*, *A Chorus Line*, and others. The sound equipment for the show is on rental from Harry McCune Sound Service, Inc., based in San Francisco and Anaheim, California.

### The Concept

According to Abe, the underlying point of *Beatlemania* was to recreate the sound of the Beatles' albums as faithfully as possible, night after night. Since the albums were done in the studio with much overdubbing and various studio tricks, a way had to be found to duplicate these sounds live, in real time. Fortunately, the technical equipment exists today to do this quite well — the digital delays, flangers, etc. About the only things that couldn't be done live were all the tape loop effects — a song like “Number 9” was out of the question, for instance!

All the singing, playing, special effects and orchestral sounds are performed live by the group on-stage as well as by off-stage session musicians and the second group of “Beatles.” For the following performance this second group trades places with the first group, which then comes backstage to sing background vocals and play various percussion instruments.

Very well and good you say, but whose job was it to figure out just which parts all these people were supposed to play each night? That lot fell, for the most part, on one

— continued overleaf

photos by  
Dennis Minnick

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Andy Dorfman. Andy, who was also the conductor and keyboard magician backstage in San Francisco, arranged and orchestrated all the tunes and also figured out how to produce most of the strange and innovative effects the Beatles used. He did this the same way countless bands have done before — namely by sitting in front of an electric piano and listening to a cassette of the Beatles' music over and over again until he had all the tunes worked out, note for note. Both David Eskenazi, the sound mixer in San Francisco, also known as "Doc," and Abe consider Andy to be primarily responsible for accurately reproducing the sound of the Beatles live. Andy's charts and special effects ideas were then taken by Abe, the various casts and sound engineers for each show, and worked with until *Beatlemania* was created.



Sound mixers are instructed to do the show the way it was originally set up and designed but are allowed to vary from the format if the situation dictates; as when a singer's voice may be a bit weak one night or a trumpet player might be blowing slightly off mike. As with any theater piece, however, there are definite cues that have to be followed throughout the show.

For example, the quadraphonic pan of the piccolo trumpet in "Penny Lane" — although certainly not on the record, it was an effect which Abe felt enhanced the show.

Some of the effects they came up with to duplicate the vocal effects on the records; i.e., the doubling and pitch changes in tunes like "Lady Madonna" and "Strawberry Fields," got a little difficult for the musicians to sing along with, so they had to be tempered somewhat.

Many of the Beatles' backward sounds and effects that we all know and love have been worked out by Andy and are played live quite effectively on the synthesizer. One sound that I particularly liked was the "Sssshuucka-ka-ka-ka" at the beginning of "Come Together." It was produced by an Eventide Harmonizer set for maximum delay with about 90% regeneration. The return signal's slider is brought up as the regeneration decays in order to keep the effect loud in the mix. The initial sound which generates the effect is the musician playing John saying "Shucka" into the mike. Doc credits this and several other effects to Larry Sprugeon, the mixer who did the show in Los Angeles.

New innovations and improvements are made all the time and Abe credits the continued success of the show to the various sound mixers, past and present: namely, Doc Eskenazi, in San Francisco; Mike Welch, in Chicago; Larry Sprugeon, in Los Angeles; Jesse Heimlich, in New York and Dave Martin with the East Coast touring company. This recognition is well deserved because, as every live mix engineer knows, when the lights go down

and the curtain goes up, the guy behind the console is the *producer*, not just an engineer taking instructions from someone else. He's the guy responsible for the sound and success of the show every night.

### The Equipment

The other hero of this show is the sound system itself. Abe had used McCune Sound's JM-3 speakers before and knew that they would provide the dynamic range as well as the quality required by this show. The packaging of amplifiers and associated processing equipment made it easy to put the show up in a short amount of time. McCune was able to provide a complete service with regard to the console and processing equipment as well. Because this show was going into legitimate theaters and not large auditoriums or coliseums, the size of the equipment was a prime concern. The JM-3, which is a fully integrated three-way system housed in a natural wood-stained cabinet, stands less than four feet tall and fit the bill perfectly. Four JM-3s are placed on a single scaffold off each side of the stage. Pioneering the movement away from separate black bass bins and stacked multicell horns, the system was originally designed by John Meyer for McCune Sound in the early 1970s. It has since undergone a few modifications and in its present form is about the best thing I've heard to date. (With the exception of McCune's JM-10 coliseum-capable system which would necessitate another article to describe!) I sat through two loud performances without once cringing, gritting my teeth, rolling my eyes or plugging my ears! When the show was over and I noticed that I could still hear soft sounds, high frequencies and talk in a normal voice, I decided to get together with Doc to go over the details of the equipment being used as well as the operation of the system.

Doc is mixing the show in stereo with

quadraphonic effects coming from speakers in the rear of the theater. The sound in the house is extremely even in level and frequency all the way to the top of the second balcony. Vocals are centered except in a few instances when they are slowly panned for effect. Guitars are split left and right with the bass guitar centered. Rack and floor toms are split left and right, kick center and snare slightly right of center. Off-stage strings are in mono except during "Yesterday" and "Eleanor Rigby," when they switch to stereo. Horns are always stereo.

The stage set itself is basically a version of what the set looked like when The Beatles first appeared on the Ed Sullivan Show. In fact, the first time we see the group live on-stage is through a huge projection of a TV set following the original footage of Ed Sullivan introducing the *real* Beatles. The set is not the only thing authentic: the stage instruments consist of Ludwig drums, Rickenbacher guitars and Hofner bass, all plugged into actual Vox Beatle amplifiers! Abe drew the line at authenticity, however, wherever he felt that sound quality would suffer. For instance, the Shure 555A "Birdcage" mikes that the Beatles used at one time were bypassed in favor of Electro-Voice EV-1776s, specially modified by McCune's chief engineer, Bob Cavin. Bob rebiased the FET preamp and changed the output coupling capacitor from 10 microfarads to 100 microfarads to decrease distortion. Shure SM-58s were originally used but these modified EV-1776s were found to have a bit crisper sound, more level and better rejection. The New York cast have now switched to EV-DS35s which have a still tighter pattern, in order to combat the reverberation and general sound bounce on the stage there.

The vocal mike at the foot of the stage is an AKG-451 equipped with a long VR-2 extension tube and a CK-1 unidirectional

— continued on page 95

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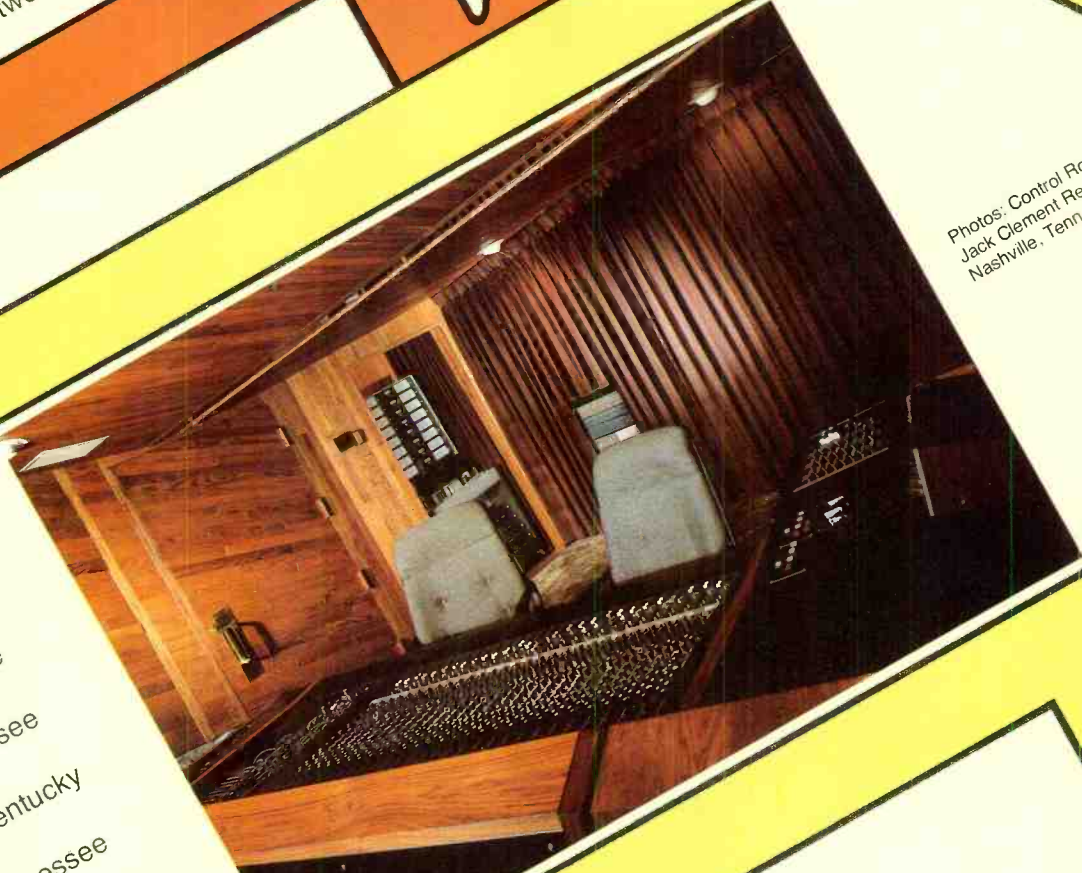
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show only to end up like butter in the sun because the mix wasn't "happening" and he didn't know why. God knows he'd mixed the tunes enough times in the studio. The problem is that we're dealing with more than one dimension now and the additional visual element must be taken into account. Good television sound mixers have known this all along.

*Beatlemania* is a prime example of this concept being used correctly and the effect is very powerful and authentic. The brass, strings, and keyboard parts are mixed in with the sound of the group on-stage at a slightly lower level than on the original record, so as to not take focus away from the group. The resultant effect — applause and cheers from the audience at the beginning and, more importantly, at the end of each of the 29 tunes in the show — speaks for itself.

### The House Mix

The MC-8 mixing board, custom built by McCune, is the heart of the main mix console in two of the three *Beatlemania* shows. It's a twenty-two in, four-out board — eight of the inputs being switchable to submaster modules if need be. The console differs from most other boards in that it incorporates a double matrix assignment system. Each input can be assigned to any or all of the eight mixbusses which can then be grouped through the submasters if need be and then routed to any one of four outputs via eight pushbuttons on each output strip. Any output therefore can control any number of individual inputs or subs irrespective of what the other three outputs are doing. In a show like this, where Doc's hands aren't in any one place longer than 3.4 seconds, and where whole groups

or individual mikes are punched into and out of quad pan pots frequently, flexibility in a console is essential and the MC-8 seems to be up to the job.

Each console input strip contains a continuously variable gain control; three section switchable EQ; two echo or effects sends, selectable pre or post; pan control; eight buss assign buttons; cue button; input overload light and long throw fader. The two effects channels return via their own fully EQ'd and pannable input strips. Each return channel is then routed through each of the four outputs for maximum flexibility and control of effects. This console even has full EQ on the cue output channel!

Sitting next to the MC-8 is a Yamaha PM-1000 which has been modified by removing the power supply to improve signal-to-noise, adding internal structural bracing, and by connecting all its busses to the MC-8 via multipin connectors. The PM-1000 is used as a submixer for the orchestra, background vocals, and piano.

Two racks of auxiliary processing equipment flank the mix position and are connected to the MC-8 and PM-1000 via ADC mini-patch panels in the racks. These racks contain two Eventide H-910 Harmonizers with dual delay outputs, an Eventide Flanger model FL-210, two Orban 622B parametric equalizers, two UREI LA-4 limiters, one UREI 1176LN limiter, four Penny and Giles quad pan pots, the control electronics for the Master Room CSREQ-23 stereo reverb unit, and a dual channel Aphex Aural Exciter.

Exactly how all the microphones and other signals get mixed, grouped, processed and eventually routed to their respective speakers could easily take several days to describe, so I will limit myself to a few choice

highlights. For instance, the piano mike and pickup come into the PM-1000 but are not assigned to an output. Instead they are combined on an echo buss, the output of which feeds one channel of the Aphex at line level. The echo buss is thereby used as a piano submixer — a typically novel and resourceful technique thought up by Larry Spurgeon. The blend control on the Aphex is then set to produce just the right amount of Aphex to dry sound and this mixed output is sent to a single input on the MC-8.

The other channel of the Aphex is set to the full Aphex mode and is fed from the vocal submaster module on the MC-8. This signal is then routed back to the console where it is mixed in with the "dry" vocals. (For a description of Aphex and its effects refer to Howard Cummings article in the August, 1977 issue of *R-e/p*, Volume 8, Number 4.)

Vocals are fed into the UREI 1176LN at an 8:1 or 12:1 ratio utilizing fairly fast attack and release times. Bass guitar and kick drum are each compressed 4:1 on separate LA-4s. Incidentally, the Harmonizers are used in delay mode only and *not* for harmony! That particular effect would definitely be out of place among true Beatle harmonies.

Overall the system sounds extremely quiet and noise free. According to Bob Cavin, the equivalent input noise of the MC-8 is -130.5 dBv! This is referenced to the noise generated by a perfect 150 ohm resistor which is -131 dBv re .775 V.

In order to preserve this kind of quality once all the peripheral processing equipment was patched in (and we all know what that can sound like!) McCune sought to eliminate any possibility of ground loops, hums or buzzes. They therefore had Deane Jensen manufacture several different types of double shielded high quality transformers to their specs so that no ground connection would exist between the microphones, the processing equipment, the consoles, or the amps. When they first discussed these transformers with Deane, he thought they were a bit off the wall but he went ahead and built them anyway. Other transformer manufacturers wouldn't even discuss the idea. The mike transformer is now available as a stock Jensen Transformer, model JE-MB-D.

The one thing that Abe and all the mixing engineers would like to have, but don't, is some sort of automation at the console. All the effects and assignment changes which come into play during the show could then be programmed through a series of presets. This show is especially challenging for the operator since many songs are segued into each other and are not interrupted by dialogue as they would be in most musicals. I have a feeling that they need not wait too much longer, as automation is just around the corner and is steadily advancing, byte by byte. (Sorry.)

Doc Eskinazi at house position. McCune MC-8 on left, Yamaha PM-1000 on right.



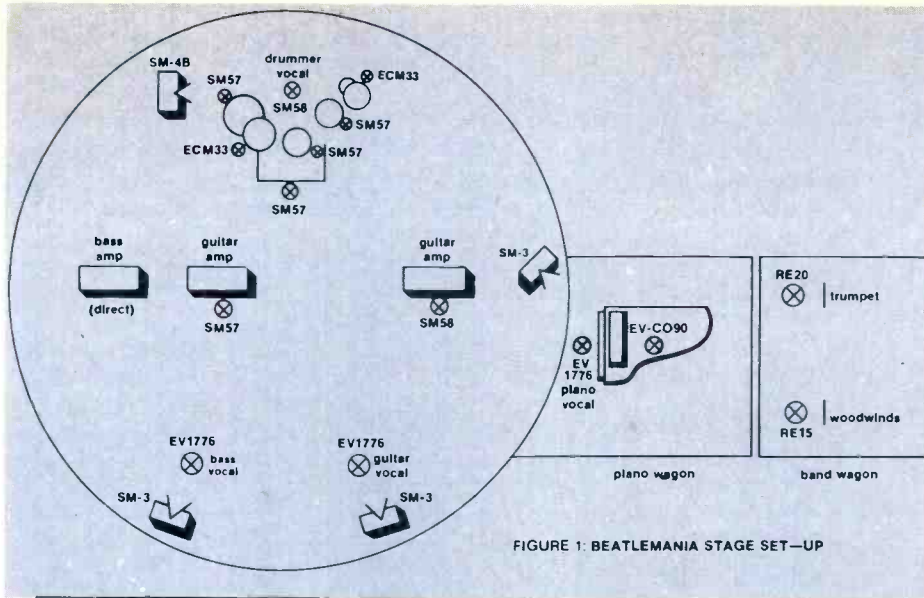


FIGURE 1: BEATLEMANIA STAGE SET-UP

capsule. The extension tube enables "Paul" to swing the mike into position when he sits on the edge of the stage and sings a few numbers solo.

The bass guitar is taken direct via a SESCOM direct box whereas the lead rhythm amps are miked with Shure SM-57 and 58s respectively. The drum kit gets Sony ECM-33s on hi-hat and cymbals and SM-57s on toms and snare. The front head of the kickdrum was left on so that the word *Beatlemania* could be painted on it; a decision which necessitated cutting a nice four-inch hole at the bottom of the skin and inserting an SM-57 through it to get a tighter sound.

At various points in the show a motorized band wagon containing a Yamaha grand piano is moved out on stage. The piano is picked up by a Helpinstill Model 110 which feeds the console at mike level. In addition there is also an EV-CO90 omni electret condenser mike suspended over the third hole of the Yamaha. This mike is combined with the Helpinstill to give an extremely smooth and natural piano sound. Sitting atop the piano is a rather scarce old Gibson organ brought in by Andy Dorfman. This organ is much prized for one particularly unique setting which produces the metallic sounding opening notes of "Lucy In The Sky With Diamonds." The output of the organ feeds an MXR Phase 90 which is then cleaned up by an MXR Noise Gate which feeds the console directly via its balanced output.

During a recording studio sequence on stage, yet another band cart comes out which is miked with an RE-20 on the trumpet and an EV-RE15 on the woodwinds (see Figure 1).

Located backstage is a small booth which has been constructed to house the orchestra and background singers. The orchestra miking consists of Sony ECM-33s on the viola and violin; an Electro-Voice RE-

20 on the trumpet; a Shure SM-54 on the woodwinds; EV-RE15 on percussion and two SM-58s on background vocals. If you are thinking that one cello and one violin do not a string section make, you are quite correct. Beefing up the string and horn sections is the keyboard player who has at his disposal a Mellotron, taken direct; An Arp 2600, also direct; as well as a Yamaha electronic organ and Fender Rhodes, both of which feed a Fender amp miked with an

SM-58. When the Mellotron is programmed for strings and the Arp for horn ensemble and then mixed with the live instruments — well, the sound is very close to a full orchestra (see Figure 2).

Sound isolation within the booth is done with perforated metal baffles manufactured by Nexus, which are very rugged and work extremely well. However, the magnetized rubber strips that are designed to link the baffles together in groups seem to be another example of "it seemed like a good idea at the time." What I saw linking the baffles together was the sound engineer's best friend — gaffer's tape!

At this point I'd like to mention something which Abe was aware of and which I feel is a subtle but important factor in the success of this show. It all has to do with *focus*. When you listen to a record at home you are basically dealing with one dimension — sound. This sound is created for the ears, not the eyes, and is mixed accordingly. At a live concert, however, you have an artist on stage who is now a visual focal point and the mix should reflect and support this. For this reason, trying to make a group sound "exactly like the record" on stage can often have an unsettling effect on the audience and result in an unsatisfactory show for all concerned — especially the engineer! It's not uncommon for a studio engineer, with little live experience, to attempt mixing a live

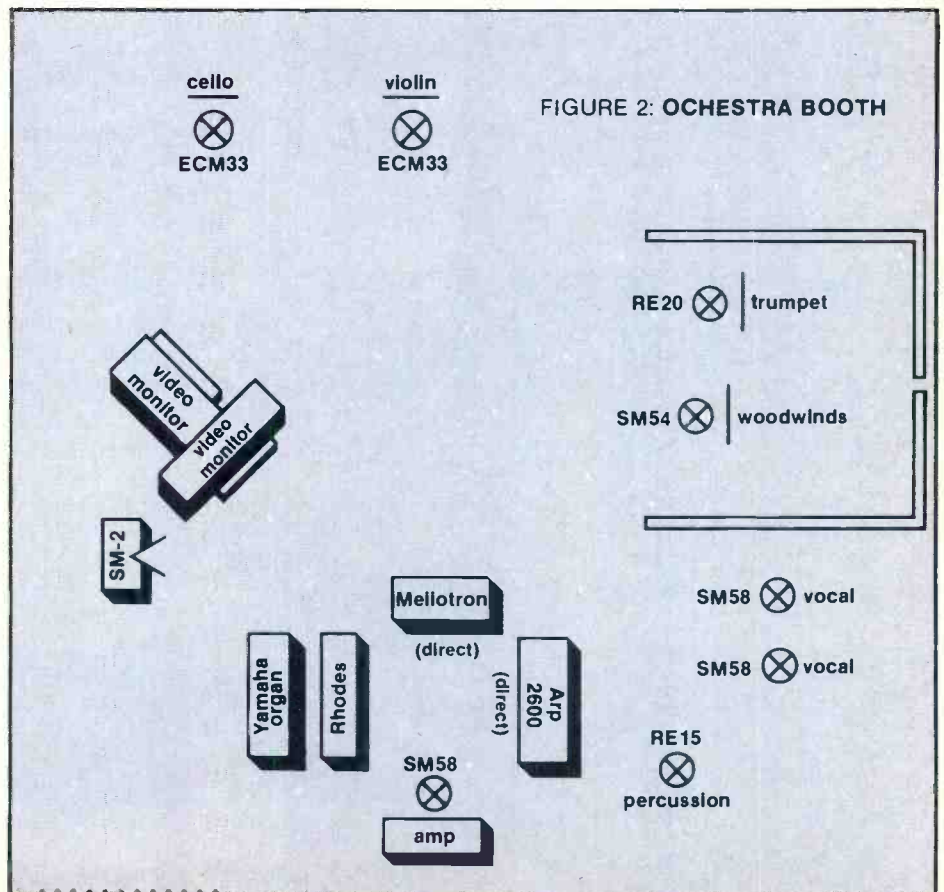


FIGURE 2: ORCHESTRA BOOTH



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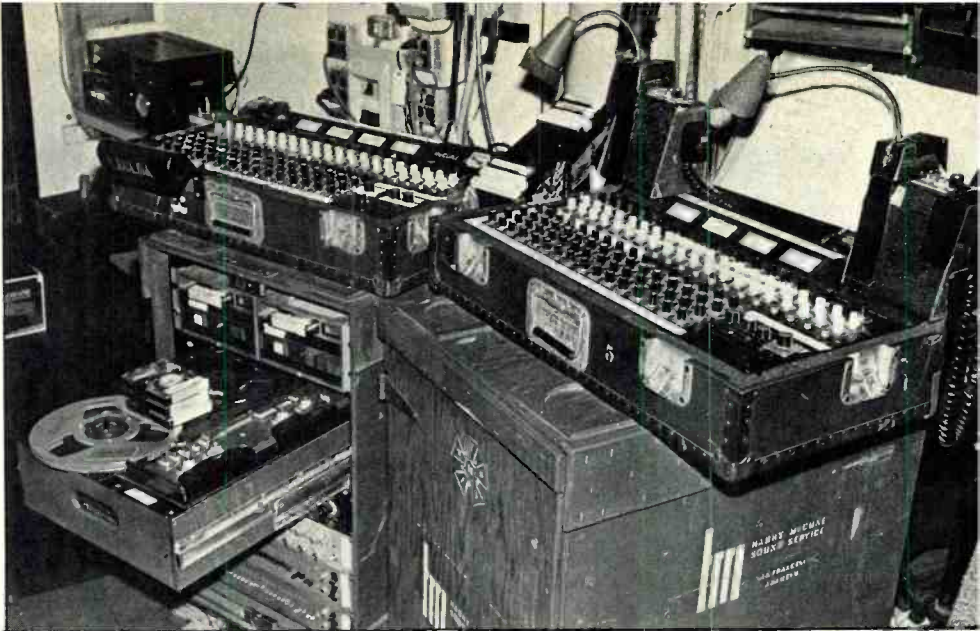
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## Monitors

The monitor mix equipment and requirements are every bit as complicated and demanding as the main mix in the show. Tom Bartless, the monitor mixer in San Francisco, must not only control the four main monitor mixes but is also responsible for the operation of two ITC broadcast tape cartridge machines and a ReVox A-77 which are used throughout the show. These tape decks supply announcements, voiceovers, and songs performed by groups other than the Beatles; i.e., "Let's Twist Again" by Chubby Checker which opens the show. Incidentally, the pre-show announcement asking the audience to "refrain from smoking . . . anything!" is the voice of Abe Jacob himself.

Previously, Doc had been the monitor mixer when the show was in Los Angeles and had developed a set of large index card notes so that subsequent monitor mixers would have some starting point for each of the 29 songs in the show. These "cue cards"



Monitor mix position.

vary slightly depending on which of the two groups is on stage that night.

The monitors are controlled by two

McCune MM-4 consoles which each contain sixteen inputs and four outputs. Each input has a continuously variable gain control, overload indicator, high and low EQ, cue button and four independent rotary volume controls. These volume controls feed the four separate outputs, thus providing four discrete mixes. One of these boards controls the sound levels from the tape decks and the on-stage instruments as well as the sound from the film projectors. The film sound is brought into the board via special McCune projector bridges which are essentially transformer and padding devices which convert the speaker level signals from the projectors to balanced mike level signals.

The film sound and tape signals are then premixed and sent out to the house console via two of the MM-4's line outputs. A third output feeds an input on the second MM-4 and is mixed with the balance of the vocal and orchestra mikes, all of which are then assigned to the four separate outputs. The four output channels feed:

- A) Front two vocal monitors — Model SM-3
- B) Keyboard monitor — Model SM-3
- C) Drum monitor — Model SM-4B
- D) Orchestra headphones — Sennheiser 414 and orchestra monitor — Model SM-2.

The SM-3 speaker is a bi-amped full range speaker which was originally designed for high quality playback in studio applications. Built by McCune Sound in conjunction with John Meyer, the speaker incorporates phase correcting delay circuitry and is about the flattest, most natural sounding monitor I've heard.

There is no midrange boost built into the speaker itself, as is the case with several other monitor systems on the market. As with all their speakers, McCune prefers to start with the flattest response possible and only introduce EQ at the console when

## JOHN MEYER & THE JM-3

The highlight of the February AES meeting in the Bay Area recently was a talk by John Meyer dealing with "An Amplitude and Phase Corrected Speaker System" which he recently developed with ACD Electronics, in Lausanne, Switzerland, and which he demonstrated at the meeting. Intended for critical applications where extremely flat and accurate response is desired (when isn't it?) the speakers caused quite a commotion at the meeting and are now available from John at (415) 569-2866.

An earlier creation of John Meyer is his namesake — the JM-3 loudspeaker — which he developed in conjunction with McCune Sound. Presently being used in *Beatlemania*, the JM-3 system consists of a three-way self-contained speaker powered by a companion amplifier with built-in active crossovers. These crossovers, designed by McCune chief engineer Bob Cavin, are of a zero phase shift type which to my knowledge are not otherwise available on the market today. Crossover points are in the 400 Hz and 4,000 Hz areas. The amplifier is an integral part of the loudspeaker system and its electronics are extensively modified to precisely complement the characteristics of the speakers.

Both John and McCune Sound's philosophy in building the JM-3 was to first build a speaker that was as smooth as possible, determine where any remaining peaks or dips in the response might be, and then equalize the system within the amplifier package to make it as flat as possible, while minimizing the phase shift at the same time.

With the exception of the midrange horn itself, which was designed by John and built by McCune, the speaker components are standard factory units which are then drastically altered and modified. These modifications include, but are not limited to, almost entirely eliminating the mechanical compliance of the speakers to an extent that the compliance is a function of air load. The speaker therefore behaves more like an infinite baffle system than a horn loaded one.

John informed me that the first version of the JM-3 was designed to be used with a sub-woofer, so its range was from about 70 Hz to 14 kHz, which in the early '70s was pretty wide range. Most systems John measured were rolling off around 10-12 kHz, and pretty hard at that. What was interesting though, was that these other systems were creating additional highs through high power amplification. These highs were produced by harmonic distortion that occurred when the horns were driven beyond their limits. His idea was to build a speaker where this was under control rather than have to generate a high level to get it.

Altec compression drivers, Electro-Voice tweeters and Altec musical instrument woofers were used in the first version of these speakers. These were protected by three separate speaker protection circuits which come into effect on continuous average or heating power signals only, and do not react to the transient peaks so necessary for quality music reproduction. In the worst case the

May 15, 1979

### NEW VCA WELCOMED BY AUDIO INDUSTRY LEADERS

Los Angeles, CA – Many of the world's premier audio manufacturers have announced current or future use of the new B&B Audio VCA from Aphex Systems, Ltd., claiming they have found it the best available. Among those exhibiting products using the new VCA at the 63rd AES Convention in Los Angeles are Automated Processes, L. J. Scully, and Amber Electro Design. Many others, including Orange County Electronics, Studer France, Televic, S.A.G.E. and Midas have indicated they are soon to follow.

The new VCA, or Voltage Controlled Attenuator, invented by Dave Baskind and Harvey Rubens, uses innovative, proprietary techniques to achieve new levels of performance. This new class A circuit has none of the faults of older log-antilog multiplier designs. Annoying crossover notch distortion is eliminated, while modulation noise, I.M. and harmonic distortion are greatly reduced, resulting in a cleaner, smoother sound, like no VCA at all. The device has found wide acceptance in the audio, video, broadcast and instrumentation fields. It can be used in all types of automation systems, video effects generators, distortion analyzers, voltage controlled filters and equalizers, just to name a few of the countless applications.

The B&B 1537A VCA is available in a 14-pin DIP Package. Typical specifications are: Bandwidth - DC-50 MHz, T.H.D. - .004%, I.M.D. - .03%, Dynamic Range - 110dB.

While at Los Angeles AES, be sure to visit Aphex Systems at Booth No. 115, and demonstration rooms 482 & 484.

system may go a little out of balance if one or more sections is pushed into limiting, but this was felt to be preferable to the system shutting down due to a tripped circuit breaker in the speaker line. There are also indicator lamps located on the amps to inform the operator if any section is going into limiting.

A sub-woofer, the JM-5, was built to go with the JM-3s for those situations that required more bass response. However, the speaker was so big and bulky that it was impractical to transport it to many shows out of the area. A few years later when John went to work in Switzerland for the Institute of Advanced Musical Studies, he re-worked the JM-3 design. Returning to McCune Sound, he introduced modifications to the system based on patents he received and which McCune is now licensed to use. A modification to the driver dropped distortion by a factor of 10. The bass response was extended down to the 30-40 Hz region so they could be used without sub-woofers.

The driver modification deals with the distortion created by the non-linear compression and rarification of a waveform generated by a speaker or any other system that moves air. If the device which is moving air is moving linearly then the compression and rarification will be different and will result in distortion of the waveform. The problem has been that manufacturers have been building very

nice linear drivers which need to be modified to move in a non-linear way in order to match what is actually happening to the air under compression. The tweeters (which were originally designed for hi-fi applications) have also been modified to lessen distortion as well as to increase power and ruggedness.

Once modified the JM-3 system achieved two tone IM distortion of less than 0.5% at 110 SPL at one meter. It's around 1% at 120 SPL.

One of John's prime considerations all along was to make the system as phase coherent as possible. When the JM-3 was first being designed over 10 years ago, phase was not taken too seriously by most people. John, however, felt very strongly about keeping phase distortion to a minimum and the system holds a differential time delay of about plus or minus 0.5 ms from 50 to 15,000 Hz.

Another major design criterion for the JM-3 system was that its size be small enough to fit into the luggage compartment of a small commercial passenger jet — a concept that proved to be an important factor on national and international tours with groups like Herb Alpert and the TJB, King Crimson, Burt Bacharach and Liza Minnelli.

Even the stagehands smile whenever a show comes in with JM-3s instead of a multitude of unwieldy bass bins and horns. Now that's somethin'. □ □ □

necessary.

The high frequency horn, developed by McCune engineer Steve Kadar, does not sound like a horn at all yet it provides all the power and efficiency of a horn system. According to Doc, the musicians are quite impressed with the quality and power of these monitors and I never once heard a note of feedback throughout the show. The SM-3 is also used in the rear of the theater for the quad effects.

The SM-4B is another bi-amped speaker and was designed as a slant monitor with three sides at asymmetrical angles so that the speaker could be tilted to three different positions. The SM-4B starts out as a stripped Altec 604-8G frame which is fitted with a special cone and extensively modified high frequency diaphragm by ace speaker modifier, Dennis Minnick.

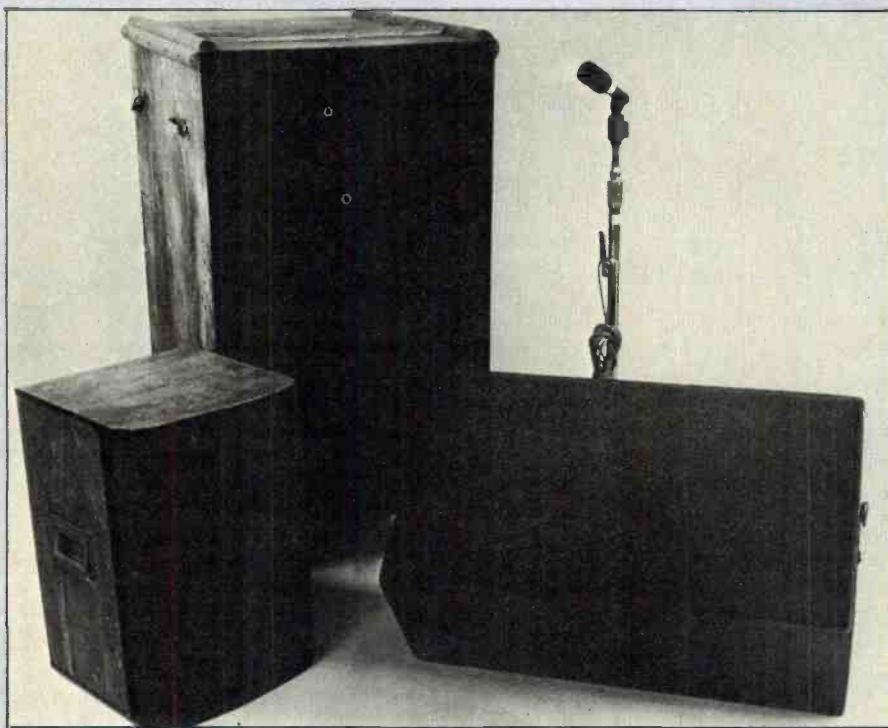
The SM-2 is a small, two-way passive crossover loudspeaker utilizing the horizontal Motorola piezo-electric tweeter. Mainly used for cueing purposes, it also serves to augment the headphones in the orchestra booth, should any of the musicians choose not to use the headphones. All SM series speakers are powered by identical SM-2-3-4B amplifiers which can be switched to choose the appropriate EQ and phase correction circuitry necessary for each speaker.

I was happy to see that there were no side fill monitors used. I've always felt that they smear the sound by getting into all the mikes as well as contribute to the performers playing slightly out of time and tune. This latter problem is due to the different arrival times of the same signal coming from both his floor monitor as well as from the side monitors further away.

According to Tom, the musicians on stage (with the exception of the drummer who is located behind the guitar amps) don't want much of their instruments through the monitors, as a rule; they prefer to hear them through their amps. The Gibson organ, which is taken direct into the house system, also feeds a Fender amp under the piano which is aimed on-stage and serves as the organ monitor. This setup helps keep the IM distortion (caused by too many voices and instruments fighting to come out of a speaker at the same time) to a minimum.

Another authentic touch to the setup is that the "Paul" and "George" characters both share a mike, as did the original Beatles. Now we all know they could have afforded another microphone, so I suspect they did it to facilitate intonation and harmony. This technique is still quite valid today, despite the fact that monitor speakers have improved tremendously.

One thing that is not so evident in *Beatlemania* but was something I recall the Beatles doing quite frequently was their habit of singing into a microphone which was positioned a little higher than their



	JM-3 Tri-amped	SM-3 Bi-amped	SM-4/4B Bi-amped Coaxial
Continuous Power Input	925 watts	150 watts	150 watts
Horizontal Beam Width	90°	90°	100°
SPL @ 1 meter	135 dB	121 dB	122 dB
Response (±3 dB)	60 Hz - 16 kHz	40 Hz - 18 kHz	50 Hz - 16 kHz
Weight	245 lbs.	60 lbs.	90 lbs.
Dimensions	43Hx26Wx32D	28Hx13Wx14D	20Hx34Wx18D

mouths. Watch "A Hard Day's Night" again if you doubt me. I've always felt this was intentional, not because Paul was shorter than George (his boot heels were higher, anyway) but because he could sing with less effort and more intensity this way. Try exhaling through your mouth with your head level or tilted slightly downward and then tilt your head up while continuing to exhale. You will feel and hear a marked difference in the sound of the air issuing forth. The air passage is less constricted and more controllable. There is also the benefit of slightly more level before feedback as the mike is not staring into the resonant cavity of the open mouth all the time.

In addition to the audio monitor, there are also closed circuit video monitors set up in the orchestra booth. A camera is aimed at the drummer so that the orchestra can have a visual as well as audible cue of what is happening on stage.

Communication between the monitor mixer and the house mixer is provided by a Clear-Com system consisting of a King Biscuit speaker/mike combo at the monitor position off-stage and a telephone handset out at the house console. The handset is preferable to a headset since it only requires one hand and ear to operate, leaving the others free to stay in touch with the show. The monitor mixer has a second King Biscuit station in front of him which is on another channel to the stage manager, who uses it to give the various tape cues during the show. There is no stage manager communication to the house mixer, but messages can be relayed through the monitor mixer if necessary.

Loudspeakers, not headphones, are connected to the monitor consoles' cue

outputs and can be selected to monitor any input or output of the two MM-4 boards. The speakers leave Tom's hands free to react instantly to a potential problem. The time necessary to put on a pair of headphones could be all the time it takes to go from the onset of feedback to the real thing.

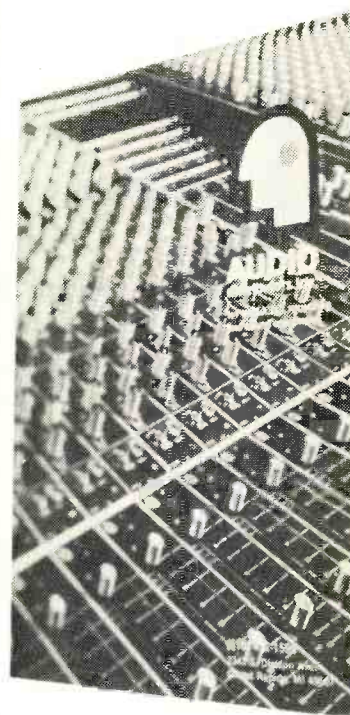
Also located at the monitor mix position are, in addition to the tape machines: 2 UREI LA-4 limiters, an Orban 622B parametric equalizer, and two UREI-639 graphic equalizers; all neatly packaged in a rack which serves as a base for one of the MM-4 consoles.

### Mike Splitter System

Most of the mikes are patched into a 27 pair mike splitter system composed of two 27-pair stage boxes and a splitter box which provides for one direct output and two double shielded transformer isolated outputs. This system is connected together with AMP gold plated multipin connectors wired to Belden 27-pair multicable and terminates at both mixing positions with AMP to 3-pin XLR pigtail assemblies. A separate 9-pair splitter handles the balance of the mikes and is connected to a second 27-pair cable which goes out to the house console. Numbers 14 through 27 on this cable have had their connectors reversed to that there are 14 send lines available at the console that terminates backstage (see Figure 3).

### Protection

Sometimes power turn on and turn off can be a very frightening event. Any of you who have ever turned on the console power supply after the amps had been turned on



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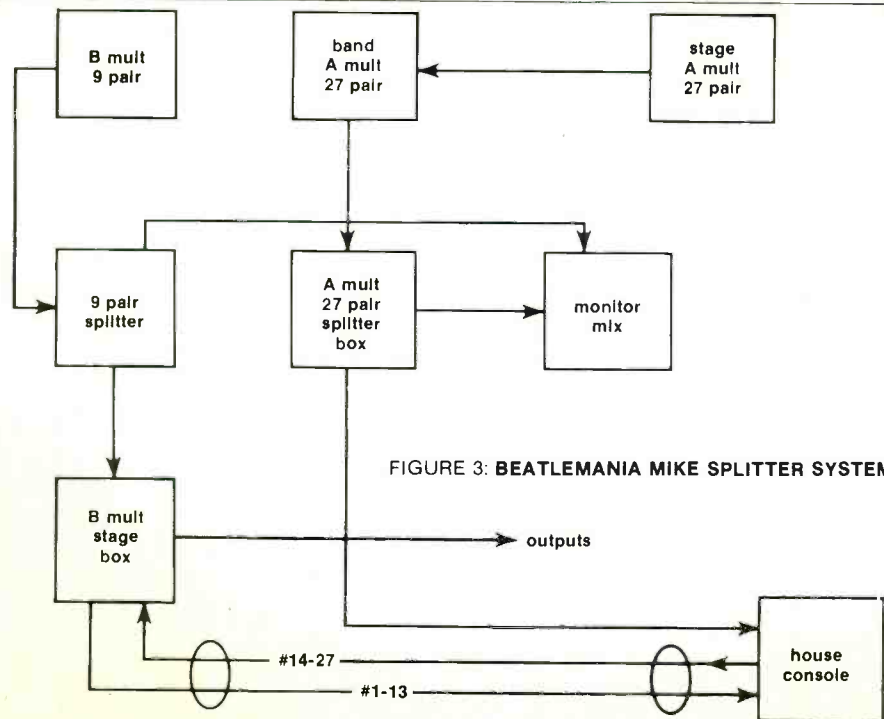


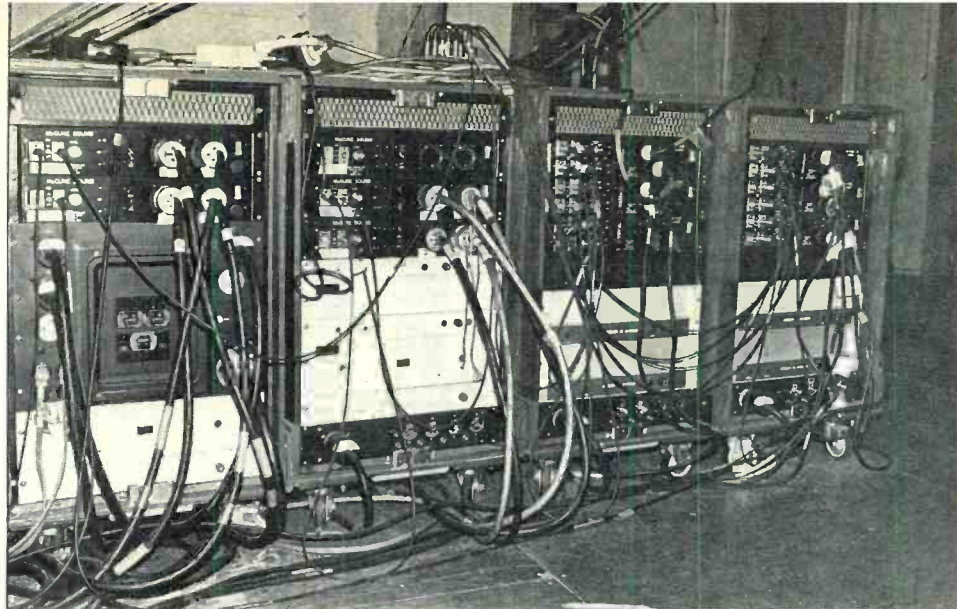
FIGURE 3: BEATLEMANIA MIKE SPLITTER SYSTEM

and listened to your speakers vent their disapproval know what I mean. Fortunately, all the speakers in this system have been designed to wait awhile before they come on so the old rule of "amps on last and off first" is not as imperative anymore. The entire system is also self-protected so that if an amp suddenly decides to turn into a battery it first disconnects the speaker so that the cones don't flame out. Indicator lights on the amp rack will also inform the operator that a speaker has been disconnected.

According to Abe, there has never been a show cancellation due to sound problems. And that's with a show that's been running for over three years and includes three complete companies. One reason for this admirable record has to be the self-contained power distribution system.

### Power Distribution

All audio AC power comes from a single breaker box which is wired directly into the 220 volt power panel in the theater. Two 220 volt cables come out of this box; one of which is wired into a power panel consisting of 12 sets of 110 VAC grounded outlets. These outlets are all on separate circuits and supply power to the monitor mix equipment as well as to the musicians' stage amps and effects boxes. The other 220 volt feed plugs directly into a power distribution panel in one of the amp racks which is



Amp racks, backstage, far left rack contains power distribution panel.

connected to the remaining amp racks via heavy duty twist-lock connectors. Lights on this power panel rack indicate any errors in the wiring. In the event that 220 V is unavailable, the amp racks can be powered directly from separate 110 volt outlets backstage by the use of twist-lock to three wire u-ground adapters.

### Packaging

Doc has been, to use his own words, "wonderfully and happily spoiled by the

McCune package. It's easy to move and install — you plug it in and it works right off the bat. Bob Cavin, Steve Kadar, and especially Thorny, have my deepest respect and gratitude."

Thorny, sometimes known as Alexander Yuill-Thornton, II — but not often — is the man chiefly responsible for designing a package that satisfied Abe's requirements. Abe wanted a compact system, one that weighed under a certain amount per piece, and that would load into a truck in a rational fashion. The case dimensions were picked two ways. First, the widths were chosen as sub-multiples of a standard tractor-trailer width which is about 91 inches. Therefore, when the truck is packed there aren't any leftover cubby holes or odd size spaces that need filling to protect the load from shifting. Secondly, the height of all the cases was picked to be the same as the height of a JM-3 speaker after it's strapped to a rolling aluminum transport dolly. As a result, when the whole load is in the truck the height is uniform and plywood sheets are then laid on top to create another flat level for additional equipment.

Most of the decisions regarding the design and use of these cases were made with the operator in mind. As Thorny put it: "My objective in all that I'm doing is to make it easier for the operator. The less time the operator spends screwing around with his equipment, the more time he can spend doing a good show."

Each amp case contains two amp racks positioned back-to-back and was designed by Thorny under the assumption that it will, in most cases, be pushed up against a wall backstage. Therefore, all patching, power cable connections and controls are located on the front rack. The rear rack contains only power amps which have had all their controls removed and which don't normally require access. Also located in each amp rack is a fan and air filter panel (!) which make for very quiet air circulation.

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The intention of the system was that it could be easily customized for a particular show. The amp racks were built to contain either JM-3 or SM-2-3-4B amps or any combination of the two, and therefore components within the system were made as interchangeable as possible. For example, an SM-2-3-4B amplifier consists of two modified Crown D-150 (150 watt) stereo amplifiers and a separate controller panel containing all the SM-2-3-4B electronics. Should one of these amplifiers malfunction, it can be exchanged for any other 150 watt amp in the rack, including the one that powers the midrange in the JM-3 speaker. (The highs and lows of the JM-3 are powered by modified Crown D-75 and DC-300A amps, respectively.) This flexibility reduces the number of spare amps that normally would be carried on the job.

The wiring from the amps to the various control electronics panels within the racks are terminated in multipin Pyle connectors and BNC video connectors, utilizing coaxial cable to minimize hum, buzz and RF interference. There are no banana plugs, phone jacks, or even three pin XLR connectors within the amp racks. Each control electronics panel contains the speaker protection circuits, volume controls, and all the limiting, EQ and phase correcting circuits necessary for its application. There is also a microprocessor

interface connection which will automate the testing of all processing electronics and amplifiers as well as measure the speaker's active impedance to see if any speaker has failed, and if so, which cabinet it is in.

The entire amp rack system for this show sits backstage in a 4 x 8 foot space; and yet, even with the close proximity of all the control electronics, amplifiers and power cables, the noise level is such that you can barely hear it in a quiet theater with your ear to the foam speaker grill!

This packaging system was developed for the specific needs of *Beatlemania* and has proven to be so successful that McCune Sound is building all subsequent road equipment in a similar manner.

#### Full Circle, Sort Of . . .

In talking to Mort Field, vice president and general manager of McCune Sound, I learned that this was not McCune's first involvement with the music of the Beatles. It seems McCune did the sound for the last live Beatles' concert at Candlestick Park [San Francisco]. According to Mort, the Beatles had totally given up on sound — they really didn't think it was possible to do it right. They just hired the local sound company wherever they went with instructions to just make it loud. So McCune Sound took every modified A-7 they had at the time along with everything

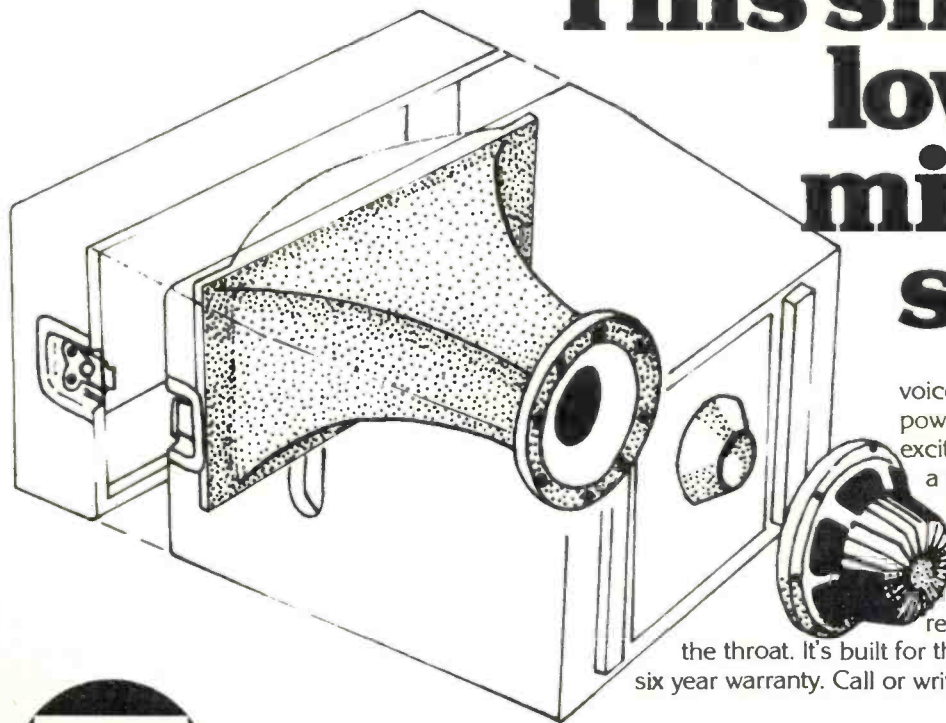
else that wasn't nailed down at the shop. They stacked them on top of each other on either side of the stage and surrounded them with barbed wire so the kids wouldn't get too close and get "fried" by the sound — a major concern at that point in time! Mort mixed the show from a dugout on a bunch of Altec 1567 tube mixers bussed together. Monitors were Altec 9844s placed here and there around the stage and fed off the main program buss.

As a good example of how much the Beatles were concerned about the quality of the sound, Ringo actually sang into the counterweight of the mike boom for two songs! He had previously shoved the mike out of the way and it swung around so that the counterweight was in front of him — so he sang into it instead. He thought that it was all very funny, of course! Evidently the McCune crew weren't quite as amused however, and shortly thereafter launched into the design and manufacture of the JM-3 system, a system they hoped would make groups like the Beatles change their minds about the quality of sound available for live concerts.

Unfortunately, "The Beatles" are a memory at this point and not likely to play another concert requiring a sound system.

*Beatlemania*, however, will let you experience just what that concert could have sounded like. □ □ □

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## RECOGNITION 1978

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Producer	—	Gary Katz
Studio	—	Village Recorders
Disk Mastering	—	Gary Katz, Warners
	—	<b>FM (No Static At All)</b> <b>Steely Dan</b>

### Best Engineered Recording (*Classical*)

Engineers	—	<b>BUD GRAHAM, ARTHUR KENDY, and RAY MOORE</b>
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Studios	—	Recorded at Manhattan Center
	—	<b>"VARESE": AMERIQUES-ARCANA-IONISATION</b>

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Asst. Engineers	—	Nuls Eric Lund, Ollie Cotton, Anthony D'Amigo, Cheech D'Amigo	Asst. Engineers	—	Jack Rouben, Warren Dewey
Studio	—	Cherokee, Westlake II, A&R Recording	Producer	—	Maurice White
Disk Mastering	—	Bernie Grundman	Studio	—	Hollywood Sound, Sunset Bowl, Burbank Studios
	—	<b>SOUNDS AND STUFF LIFE THAT</b> Quincy Jones		—	<b>ALL 'N ALL</b> Earth, Wind and Fire
Engineer	—	<b>ALLEN SIDES</b>	Engineer	—	<b>ALLAN PARSONS</b>
Asst. Engineer	—	John Neal	Asst. Engineer	—	Chris Desmond
Producer	—	Michael Robert Phillips	Producer	—	Allan Parsons
Studio	—	Filmways/Wally Heider	Studio	—	Davlen Studio
Disk Mastering	—	Stan Ricker, Phil Cross		—	<b>PYRAMID</b> Alan Parsons
	—	<b>A TRIBUTE TO ETHEL WATERS</b> Diahann Carroll			
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3. What makes a microphone sound like a microphone?
4. What passes 100khz (full power) with its leads tied behind its back?

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# RECOGNITION 1978

## Record Of The Year

- |           |   |   |
|-----------|---|---|
| Engineers | — | <b>JIM BOYER, PHIL RAMONE</b>             |
| Producer  | — | Phil Ramone                               |
| Studio    | — | A&R Recording                             |
|           | — | <b>JUST THE WAY YOU ARE</b><br>Billy Joel |

## Album Of The Year

- |                 |   |  |
|-----------------|---|--|
| Engineers       | — | <b>KARL RICHARDSON, LARRY MILES, STEVE POULIOT, DANNY WALLIN, RAY THOMPSON</b>   |
| Asst. Engineers | — | Michel Marie, Tyrone Williams, Jim Nau, Jerry Crawford, John Blanch, Ed Marshall, Nick Bacona  |
| Producers       | — | The Bee Gees, Carl Richardson, Albhy Galuten, Freddie Perren, Thomas J. Valentino, Bill Oaks, David Shire, Ralph MacDonald, W. Salter, KG Productions, H. W. Casey, Richard Finch, Bobbie Martin, Broadway Eddie, Ron Kersey |
| Studios         | — | Criteria, Le Studio, Chateau D'Herouville, Wally Heider, The Mon and Pops Company Store, Burbank Studios, Cherokee   |
|                 | — | <b>SATURDAY NIGHT FEVER</b><br>The Bee Gees  |

### Best Country Vocal, Male

- |                |   |   |
|----------------|---|---|
| Engineers      | — | <b>BRADLEY HARTMAN, DONIVAN COWART</b>    |
| Producer       | — | Booker T. Jones                           |
| Disk Mastering | — | Bernie Grundman                           |
|                | — | <b>GEORGIA ON MY MIND — Willie Nelson</b> |

### Best Country Vocal, Female

- |                 |   |   |
|-----------------|---|---|
| Engineer        | — | <b>ARMIN STEINER</b>                      |
| Asst. Engineers | — | Linda Tyler, Don Henderson                |
| Producer        | — | Gary Klein                                |
| Studio          | — | Sound Lab                                 |
| Disk Mastering  | — | Lynn Morse, The Mastering Lab             |
|                 | — | <b>HERE YOU COME AGAIN — Dolly Parton</b> |

### Best Pop Instrumental Performance

- |                 |   |  |
|-----------------|---|--|
| Engineer        | — | <b>MICK GUZAUSKI</b>                               |
| Asst. Engineers | — | Larry Swift, Michael Frondelli, Stillman Kelly     |
| Producer        | — | Chuck Mangione                                     |
| Studio          | — | Kendun Recorders                                   |
| Disk Mastering  | — | Bob Ludwig, Masterdisk                             |
|                 | — | <b>CHILDREN OF SANCHEZ</b><br>Chuck Mangione Group |

### Best Pop Vocal, Female

- |                |   |                                    |
|----------------|---|------------------------------------|
| Engineer       | — | <b>KEN FRIESEN</b>                 |
| Producer       | — | Jim Ed Norman                      |
| Studio         | — | Eastern Sound                      |
| Disk Mastering | — | Jim Ed Norman, Capitol             |
|                | — | <b>YOU NEEDED ME — Anne Murray</b> |

### Best Pop Vocal, Male

- |          |   |                                   |
|----------|---|-----------------------------------|
| Engineer | — | <b>MICHAEL DELUGG</b>             |
| Producer | — | Ron Dante                         |
|          | — | <b>COPACABANA — Barry Manilow</b> |

### Best R&B Vocal, Female

- |                |   |                                  |
|----------------|---|----------------------------------|
| Engineer       | — | <b>JUERGEN KOPPERS</b>           |
| Asst. Engineer | — | Steve Smith                      |
| Producer       | — | Georgio Moroder, Pete Bellotti   |
| Studio         | — | Rusk Sound                       |
| Disk Mastering | — | Allen Zentz, Mastering Lab       |
|                | — | <b>LAST DANCE — Donna Summer</b> |

### Best R&B Vocal, Male

- |                |   |   |
|----------------|---|---|
| Engineer       | — | <b>AL SCHMITT</b>   |
| Asst. Engineer | — | Don Henderson   |
| Producer       | — | Tommy LiPuma  |
| Studio         | — | Taped live at the Roxy by Wally Heider, additional recording at House of Music, mixed at Capitol Recording Studios. |
|                | — | <b>ON BROADWAY — George Benson</b>  |

### Best Jazz Instrumental Group

- |                 |   |   |
|-----------------|---|---|
| Engineer        | — | <b>BERNIE KIRSH</b>                             |
| Asst. Engineers | — | Stillman Kelly, Geoff Sykes                     |
| Producer        | — | Chick Corea                                     |
| Studio          | — | Kendun Recorders                                |
| Disk Mastering  | — | Davlon Sound, Crystal Sound, by Bernie Grundman |
|                 | — | <b>FRIENDS — Chick Corea</b>                    |

### Best Jazz Instrumental Soloist

- |          |   |   |
|----------|---|---|
| Engineer | — | <b>VAL VALENTIN</b>   |
| Producer | — | Norman Granz  |
| Studio   | — | Mountain Recording Studio                                   |
|          | — | <b>MONTREUX 77 AND OSCAR PETERSON JAM</b><br>Oscar Peterson |

### Best Jazz Instrumental Big Band

- |                |   |   |
|----------------|---|---|
| Engineers      | — | <b>SCHOLZEN HANS PETER, HEINER FRIESZ</b>         |
| Producer       | — | Jon Snyder  |
| Studio         | — | Domicile Club, Dieter Dierks Studio               |
| Disk Mastering | — | Bernie Grundman                                   |
|                | — | <b>LIVE IN MUNICH</b><br>Thad Jones and Mel Lewis |

### Best Comedy Recording

- |                |   |  |
|----------------|---|--|
| Engineer       | — | <b>RICHIE CICERO, WILLIAM McEUEEN</b>                |
| Producer       | — | William E. McEuen                                    |
| Studio         | — | Aspen Studios, The Boarding House, Red Rocks Theater |
| Disk Mastering | — | Jeff Sykes, Kendun                                   |
|                | — | <b>A WILD AND CRAZY GUY</b><br>Steve Martin          |

# RECOGNITION 1978

## Best Engineered Album Nominees (Classical)

Engineers	— DOUG SAX, BUD WYATT	Engineer	— GUNTER HERMANN
Producer	— Doug Sax, Lincoln Mayorga	Producer	— Dr. Hans Hirsch, Magdeline Padberg
Studios	— MGM Studios	Studio	— Berlin Philharmonic Hall
Disk Mastering	— Mastering Lab, Doug Sax		— <b>BEETHOVEN: SYMPHONIES (9) COMPLETE</b>
	— <b>WAGNER: DIE WALKURE: RIDE OF VALKYRIES/TRISTAN: PRELUDE ACT I/GOTTERDAMMERUNG SIEGFRIED'S FUNERAL MUSIC/SIEGFRIED: FOREST MURMURS</b>	Engineer	— GUNTER HERMANN
		Supervising Engineers	— Michel Glotz, Cord Garben
Engineer	— JACK RENNER	Producer	— Dr. Hans Hirsch, Magdeline Padberg
Producer	— Bob Woods		— <b>BRUCKNER: SYMPHONY #5 IN B FLAT MAJOR</b>
Studio	— Severance Hall		
Disk Mastering	— Stan Ricker, JVC	Engineer	— PAUL GOODMAN
	— <b>FREDRICK FENNELL — CLEVELAND SYMPHONIC WINDS</b>	Producer	— Jay David Saks
		Studio	— Scottish Rite Cathedral
Engineer	— MARC AUBORT	Disk Mastering	— Paul Goodman, RCA
Producer	— Joanna Nickrenz, Elite Recordings		— <b>BERLIOZ: SYMPHONIE FANTASTIQUE</b>
Studio	— Concert Hall St. Louis		
Disk Mastering	— Masterdisk	Engineer	— VITTORIO NEGRI
	— <b>PROKOFIEV ALEXANDER NEVSKY</b>	Producer	— Vittorio Negri
			— <b>BACH: MASS IN B MINOR</b>
Engineer	— CHRIS PARKER		
Producer	— Christopher Bishop	Engineer	— VITTORIO NEGRI
Disk Mastering	— Abbey Road	Producer	— Vittorio Negri
	— <b>MESSIAEN: TURAGALIA SYMPHONY</b>		— <b>HOLST: THE PLANETS</b>

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— Richard Cromelin  
Los Angeles Times Calendar

■ "Violent images of alienation — the photographic (plus symbolic) negative of the American night — there are some unforgettable lines — or rather — lines I wish I could forget."

— Lawrence Ferlinghetti

■ "... music critic John Rockwell raised some questions about the propriety of releasing albums by deceased artists who, in their lifetime, had not approved the finished product or, indeed, had no finished product to approve. The issues raised ... demand some soul searching on the part of the music industry ...

"One posthumous recording in particular works grandly, though, and its success ought to be an indicator of the proper course to take in these matters. 'An American Prayer,' by Jim Morrison and the Doors, works so well because it is done by the artists who would have been involved from the outset."

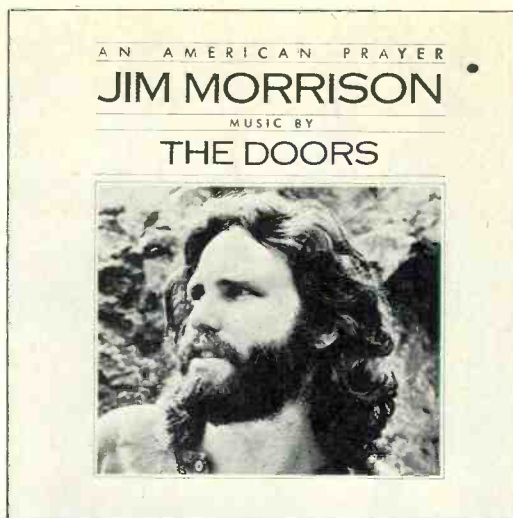
— David McGee & Barry Taylor  
Record World

*Jim Morrison and the Doors emerged during a wild and charismatic era in the history of rock. By the end of the sixties reaction to them had run the gamut — they were adored and despised, praised and panned, emulated and denounced.*

*Still, for Morrison, one very important personal goal had yet to be realized. He wanted recognition as a poet and early in 1969 he and producer/engineer John Haeny began recording Jim's poetry. The circumstances of Morrison's death in Paris were widely reported and sensationalized. Despite speculation as to what really happened one fact persisted — Jim was gone. The rest of the Doors went their ways, collectively and separately; as did Haeny, who maintained hopes of eventually seeing Morrison's aborted project completed.*

*Finally, ten years after it was begun, Jim Morrison's poetry album is a reality. The format and content of An American Prayer defies comparison. It is a unique blend of elements that add up to an "aural cinema," a panorama of images and sensations. The following is John Haeny's account of how it came to be.*

— John Weaver



## An American Prayer

by the  
PRODUCER/ENGINEER  
**JOHN HAENY**

with the assistance of John Weaver

The history of *An American Prayer* begins when Jim and I did the Elektra recording (March, 1969), the first of two sessions which produced the dialogue masters used on the record. Jim was still with the Doors. This was one of those things a record company does. "Can I have a couple of hours in the studio?" "Sure, Jim." At that time I was chief engineer of Elektra and had been on the periphery of the recording of a number of Doors' albums and, as it happened, I ended up engineering for Jim.

I believe Jim looked at that session as a test. He had reached a point in his life where he had done all he could do and wanted to do as a rock and roll entertainer, he was looking for new directions. His preoccupation at that point was his poetry. He had grown this great, long, luxuriant beard and he walked everywhere. He led a very simple, an amazingly spartan existence.

That first session lasted about an hour-and-a-half; two hours at the most. Jim read his poetry and also made spoken commentary. By the second time we went

into the studio together (December 8, 1970), Jim had left the Doors and had negotiated a contract for a poetry album which we were co-producing. We had started meeting and had an idea of the direction that we were going in, what we were going to try to accomplish. Then I got a call on his birthday. He wanted to go into the recording studio and get a good start on the poetry album. So I hustled around, and I got Village Studio 'B.'

I just set up one microphone in the middle of the studio, and I tried to encourage Jim to move around. At Elektra, the voice had been recorded with a U-67 (it was probably sans windscreen or any of those kinds of devices), with echo and in stereo. (Jim center; returns left and right, along with stereo piano which Jim played for effect, as used in the beginning of side two). At Village we recorded in mono with a Norelco C-12A at some distance and dry, although it was a little difficult to keep Jim away from the microphone. He would always try to gobble it up, like he did on stage.

That session produced some of the most beautiful performances on the album.



December 8, 1970 at Village (left to right) Kathy Lisciandro, John Haeny, Jim Morrison, Frank Lisciandro

Excerpts of Jim Morrison poetry courtesy of James Douglas Morrison Publishing, and Doors Music Co.  
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After we did the Village recordings, Jim felt, as do most creative people, a need to organize his thoughts. He didn't feel he could do it in Los Angeles and wanted to go to Paris. His plan was to go there, and then after he had settled down a bit, organize his thoughts. Then I was to go to Paris and do some more recording. It was about three weeks before I was to travel to Paris that Jim passed away.

**Gently they stir, gently rise  
The dead are newborn awakening  
With ravaged limbs and wet souls,  
Gently they sigh in rapt  
funeral amazement.  
Who called these dead to dance?**

I never had any doubts that what has happened with this album was eventually going to happen. There was some very thin ice, but I always believed that, if it did happen, it would happen right. With that confidence, you get pretty stubborn.

There was a very long legal hassle that ensued after Jim's death which made it impossible for the project to proceed. There was a passage of some five years before I received a phone call from Robbie Kreiger, the Doors' guitarist. He told me that he and the rest of the group were interested in the same thing that I was interested in: to pick up Jim's original project and carry it through to completion.

We decided that it was worth us getting together and going over some tapes. I had a rough concept for the album; it was very

#### The Author

**Beginning as a photographer, John Haeny became intrigued with sound and recording well over twenty years ago. He worked for several established studios before being appointed as the first staff engineer at Elektra Records, later becoming its first chief engineer. During that period he helped build the still operational facility in Los Angeles. He left Elektra in the late 60's, and has since worked as an independent engineer/producer in most of the top studios in this country. During the 60's he recorded the Beau Brummels, (the first American band to capture the English sound). The legendary jazz great John Coltrane and many of Judy Collin's most classic recordings.**

**In recent years he has engineered and/or produced records with Sanford & Townsend, Gary Wright, Linda Ronstadt and Jackson Brown, to mention only a few. While recording these artists he was also planning and creating *An American Prayer*, a tribute to his friend, Jim Morrison.**

sketchy. But, I carried it with me from the time that Jim and I had started on it. Jim was a passionate filmmaker, I had been a filmmaker. So film was very important to both of us. In those early discussions, Jim and I were working on the idea of using film techniques to paint poetic images on the record. After Jim's death what remained was an incredibly strong feeling on my part as to how it was that Jim would have wanted the record to be done.

So there was that rough shell of an outline of what the record had to accomplish. The three Doors (Robbie Kreiger, Ray Manzarek and John Densmore) came up and listened to the dialogue tapes with me. Virtually all the initial meetings on the album, for the first year-and-a-half or two years, were at my home, with a very low profile regarding any publicity pertaining to the project. We listened and I told them some of what I knew that Jim wanted.

We started discussing some of the other areas where we might find more material on Jim. I had known Frank Lisciandro and of his involvement with Jim for a long time; he was one of Jim's strongest creative confidants. He essentially co-directed, co-produced and edited not only Jim's movie, *Highway*, but, the Doors' film *Feast of Friends*. He was very close to Jim, and knew him on a completely different level than anyone else did; plus he comprehended the techniques and language of film. He was the missing element that was necessary for this project. So I suggested that we bring Frank in. We all wanted to go further, so we decided to review and see what materials we had.

At this point I had started getting computer runs from Elektra on what they had in their vaults. They had savagely trashed, as most corporations do, rolls upon rolls of tapes; not the masters, but all the outtakes, all the good stuff. So that wasn't exactly a great pool of information. The Doors had done a live album and that was the next place to look. We had a lot of outtakes, seven cities, eleven shows in all; quite a few rolls of tape. That turned into a most valuable source.

Also, in the course of making the films (*Highway* and *Feast of Friends*), all the film sound was recorded on a Nagra at 7½ ips, full track. They used that Nagra sometimes just to sit up and brainstorm all night long, Jim and his friends, just talking. Some of these tapes were called the "Endless Night" tapes. When we started counting it up, it turned out that we had 90 five-inch reels to go through. Among those tapes was the Indians story ("Dawn's Highway") which follows "Ghost Song" on the record. That was essentially our pool of pre-recorded materials.

So once we had gathered all the materials together, we sat down for almost six months and reviewed all the elements — every

single inch of every single tape that we could find. I kept longhand notes on everything we heard, everything people responded to and where it was located. We just wanted to see what we had, to make sure that there was enough good material to create the kind of album we all knew we must produce. After we approached Elektra it took about ten-and-a-half months of negotiation before we resumed work on the project.

Once we went back to work we started having pieces transcribed, everything we could. If we couldn't transcribe it, we put it on 3 x 5 index cards until we had essentially catalogued and annotated or transcribed every viable piece of material we could find. At the same time, Paul Black, my assistant throughout the project, gave me cross-references. He was the librarian for this project all the way through and of immense help to us all.

We needed a great deal of creative flexibility in the assembly stages of the project. I knew it was going to be very filmic and Frank was a filmmaker. Up in Santa Barbara he had a Movieola three-table editing machine with three magnetic playback heads on it, so he could interlock or juxtapose sync with three cutting reels, as they do in film. We transferred all of the elements we wanted to work with to magnetic film (mag), having pre-edge numbered it. As it was transferred, it was notated which edge numbers related to what particular work. Then from there on out, Frank would always have easy access without having to listen through everything. It was all cut up in pieces and put onto editing cores, or hung up in film editing bins.

Simultaneously, we were taking all of the 3 x 5 cards and the transcripts and quite literally with scissors chopping them up in pieces.

We then took all of these elements and tried to sort them out into the sections we felt they belonged in, because Jim didn't date any of his poetry, so there was no sense of chronology to any of the written works. We had to look at it and essentially speculate as to where it applied itself, or what it was related to.

We pushed all the furniture back and started laying the pieces of paper on the floor and on the tables, shifting them around; trying to tie the poems together; trying to get some idea of a story line.

So after we would thrash out an approximate idea of a section Frank would then trudge up to Santa Barbara, where he would assemble it as we had worked it out. Sometimes it would take one, two, three weeks of editing. Then he would have it put together roughly, sometimes interjecting sound effects and ideas of his own.

Some of the juxtapositions of lyrics with music was done when the Doors and Frank worked together in Santa Barbara for a three-day period of time over some



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especially ticklish matters. But most of it Frank did in solitude. The script went through major changes from what he did in solitude to when it went to the studio, and then went through major changes from the studio to the finished record. Yet, there is no estimating the extent of his creative contribution during the period of time that he was cutting up in Santa Barbara. But, what he did was right. It must have been, or we wouldn't have what we have.

After he put a section together, he would then transfer it to Nagra, and bring it down and we would all listen to it, tear it apart, reconstruct it, then jump into laying out the next section. Frank would go back up to Santa Barbara to re-do the first section and do the first rough cut on the second section. We went through this until we had assembled all the sections together. For all intents and purposes, we may have rough cut each section as many as four or five times. Mind you, this is still not the end of the scripting process. We then moved the editing table to Los Angeles and began three months of fine cutting and working out our differences with everyone present.

Since the album was being made much like a movie it was essential that we develop a script. We had to know every word and where it was to go and what it was to relate to. We couldn't begin to sit down and turn it into an album until we had a comprehensively detailed script, or as comprehensively detailed as we could make it. We always had to build in that factor for creative change in the studio, and there was plenty of that.

We had a great big pinboard, and for certain sections, we just took each one of the various scenes and pieces that comprise that section and identified them in big colored letters on large cards. One guy would organize all the cards, and somebody else would get up and swap three cards with each other, and someone else would get up and move the front card to the last card. Eventually something would fall together and Frank would start cutting again (I think he logged a total of 700 to 900 hours at the mag table). Shortly we would be able to listen to the re-cut — it was a great way to get immediate feedback on how we were doing.

We finally got to the point where we had done all we could do short of going into the recording studio. Some rough mixes had been made off of the mag onto a Nagra and that, along with a production script I prepared, had become our Bible. These mixes consisted of mostly spoken word and sound effects, and were our earliest overviews.

We were always listening to elements in sequence — it was a total that couldn't be separated. There were a lot of ideas, sections, scenes and works that we had to carry all the way through to completion, to see them in relation to the overall, before we

were able to make a decision. If they didn't belong, then we had to throw them out. The time required to do this was substantial as was the cost. Most of the material that went on the floor went there not because it wasn't good enough, but because there was something about it that prevented the record from making the point that it seemed destined to make for itself.

---

**The program for this evening  
is not new,  
You've seen this entertainment  
through and through.**

---

Now came the time to go into the recording studio. Three to four months were involved in matching, transferring and pulling all the original dialogue pieces. Everything was originally recorded no faster than 15 ips, so in order to make editing the dialogue easier I stepped everything up to 30 ips. Jim was notorious for very long pauses. He had little or no concern about when he coughed or sneezed, or licked his lips, or when he turned pages. So there was a great deal of cleaning up and fine razor blading involved in the dialogue tapes. During this time the Doors were off composing and rehearsing the original music score for the album.

The next stage was to record a demo of the score. Once this was completed I put together what we designated as "Overview One." Although we had been listening to various overview forms during the entire editing process, this was the first to include the music. Once we knew that the score was working, we went into Hollywood Sound and started recording.

The Doors worked beautifully in putting the music together. We had demoed it, so we had a very clear idea of where the words were and what poetry was to be laid in over the six major works — "The Ghost Song," "Black Polished Chrome," "Latino Chrome," "Curses and Invocations," "The Ghost Song Reprise," "The End" and the "Albinoni Adagio." Ray Manzarek had a script on his keyboards and a mike in front of him. On the runthroughs he would read the poetry as he was playing. Ray had a great sense for Jim's phrasing. So what they did in preparation and in actual recording was wonderful.

Basically, cutting the score wasn't too different from what we know as contemporary music recording. I had decided that there was nothing to be gained from going back and trying to duplicate the original Doors sound. I had a pretty good idea of Bruce Botnick's mike techniques and some of his concepts in engineering, and I have great admiration for what Paul Rothchild (the Doors' original producer) and Bruce did with the group. But, this was a

different time and place. I knew we would have the Doors, but we would have the Doors quite a few years older. When they started playing, it was magical.

There were other moments of original music, such as Ray and Robbie playing behind "Lament" on the second side. Those sections were best done using the most straight-ahead method: the dialogue was first put on the multi-track and they played to Jim's words.

We must have spent at least a couple of months just concentrating on getting the new music recorded. Then we came to the matter of laying Jim's words in. It was necessary to do it with the feeling and the intent of Jim being there, natural, breathing and flowing properly. They were sel-synced in, and because we were making so many changes, and doing so much by trial and error, I did not want to involve the original master tapes in that kind of rough treatment. So we worked off of Nagra 7½ copies that we made off of the edited mag. The sound was horrid, but sync was solid as a rock and at this point content and flow was of primary importance. The music was recorded on 24-track, and the guide dialogue was all laid in on one track, or sometimes various tracks, and then composited to one to establish some final Bible of "this is the phrasing of things." Everything was synced up to that guide track that involved sync.

What I had to do then was, on another track, end up with the original recordings of Jim's voice in absolute sync with the words that had been so patiently and carefully laid-in over months and months. The only way to do that was to solo the guide track and hear by my punch-ins whether or not I had punched the lines individually or whether they were continuous rolls off of the dialogue work tape. And if they were a continuous roll, I would then sit down with the original and conform it to the edited version. In the end it all had to match, no matter what I had done to arrive at the guide tracks.

I could have resorted to SMPTE time-based codes for sync, but then some of the dialogue would have had to end up on four-track because it was stereo already. With rental costs, we probably would have spent twice as much on the production by having to rent all the equipment necessary to have treated it that way. So I had to use some very brutal straight-ahead, old-fashioned, "lay it on the floor and measure it" methods.

I would mix the music down just enough so that I could take whatever cues I needed from it and then I would locate the guide vocal on one speaker and the original vocal on the other. I would just start rolling the tape and punching like mad, and rolling and punching and rolling and punching . . . until I would get a line (or lines) to lay in so they would sound like I had unison overdub

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**THE DOORS**



coming at me focused down the center, in mono. When that happened, fine; on to the next line(s).

In a case like the "Riders on the Storm" section the guide track was laid in first. Next the music would be cued in. Whenever previously recorded Doors' music was called for, as in this instance, I used the actual final mixes from the original album masters and I transferred them very carefully to two-inch tape. Then the master of Jim's phone booth conversation was edited to conform to the mag. I did this by, starting with the first line of dialogue, putting the entire story together in correct order. Then I'd record it on an open track, trying to sync it in. The first line would go by, and the next, and the next, and then all of a sudden I would be out of sync. I had to figure out what was wrong, then correct it and start from the top and run the whole section again. And then I'd get by that fifth line, and then the sixth, and then the seventh would drop out of sync.

In that particular story, more than others, I couldn't lay it in line-by-line because the perspective that was required put the voice so far up front that I couldn't use any kind of blank spacer to fill in the holes. Instead, I put in ambience from other sections of that same recording of poems that we weren't using; if there was a long pregnant pause and it was quiet enough, it was saved and used later as spacer. The dialogue was eventually laid in in its entire length. At that point on this particular work, I turned off the guide track; it wasn't really that necessary any longer.

---

**All hail the American night!  
What was that?  
I don't know.  
Sounds like guns . . . thunder.**

---

I had to find one good rainstorm sound effect, which is one of the harder ones to find. Recorded rain can be a real can of worms, because it's hard to record it

without also picking up the sound of whatever you're protecting the microphone with. Eventually I found a piece that was good, an active storm with a lot of thunder. The first thing I had to do was lay down a blanket of rain. This was done by taking the rainstorm and going through and editing out all of the thunder. I threw every piece of thunder out and turned it into as much of a rainstorm as possible.

I then made a number of copies and edited them together since the original sound effect was not long enough. The multiple copy was then recorded on four separate tracks, essentially two stereo pairs. The speed of the multi-track machine was slightly varied for each one of the tracks, and the rain cue was started at a different point each time. What resulted was a nice blanket of rain. Later on, while mixing, I introduced a small amount of phasing to get the effect of wet city streets and cars going by in the rain. There already was some rain and thunder on "Riders," but the perspective we needed was of Jim up front, the rainstorm outside of the phone booth, and the music filling in the remaining space. Every time I lifted the music I also raised the level of the rainstorm on the original mix, so I had to create a rainstorm of my own that sort of floated someplace between Jim and the music and ran continuously from one end of the piece to the other. We wild-tracked onto various other tracks thunder cues which punctuated the poetry. Finally, the piece was mixed very much like a short section of a film.

Because we were trying to establish a filmic flow throughout the album, I ran into problems with vocal matches in going back and forth between the various sources we drew from. I knew that was probably going to be one of my biggest problems in engineering the project. Continuity in Jim's voice was going to be absolutely essential. For the most part, when it came time to lay in all of the original dialogue masters, I laid them in with the greatest amount of integrity possible. In the course of making the different overviews that we used, I trained myself by trial and error to find out just what the differences were. I developed an instinct, almost on a line-to-line basis, from one end of the album to the other, as to how Jim should sound.

The possibility occurred to me that by taking the different material and putting it through a chain of equipment that had very specific tonal characteristics, the result would tend to make the different pieces all sound the same. That was the solution. I used a Trident parametric equalizer in conjunction with an Orban DSer and an EMT-PDM limiter-compressor-expander on the dialogue throughout the entire album.

I knew that some compression as

opposed to limiting was going to be necessary on Jim's voice, because on vocal dialogue it's the best thing in the world for increasing apparent loudness, bringing it seemingly closer to you. On the other hand, compression is also an evil beast in terms of bringing up the tape noise when there is no signal present at its input. Because the tapes were a variety of generations away, I also needed a good expander (noise gate), and there weren't any that really quite satisfied me. I had had experience with the PDM limiter by EMT. There is a characteristic about the PDM that gives it a slight tonal color of its own, yet it's very muscular as a compressor, and has a beautiful expansion circuit in it. Its' automated attack time is so very fast that it is a bit veiling on music. On spoken word, however, it does not create any problems; as a matter of fact, there was a quality of silkiness added to Jim's voice. Used properly, the PDM can create an incredible impression of apparent level. It struck me that the PDM might really save me; that it might increase the presence of Jim's voice and, at the same time, eliminate the noise without creating an unpleasant pumping effect.

It was a bit of luck that the dynamics fell together so well on the record. I had doubts that it would happen so well; it was a struggle. But, when the various sections were mixed and segued together, it all matched. I really don't know if anyone else was amazed, but I certainly was.

The Village tapes were recorded dry and the Elektra tapes were recorded with echo. Hard as I tried I was never able to get the echo off those recordings. So, at Cherokee, where I mixed the album, I combined their left and right channels to mono (taking care that we had no head alignment problems that would phase the voice). This reduced the left and right information (i.e.: the echo) while building up the center channel (which, of course, was Jim's dialogue) . . . primitive, but effective. I then devised something very close to that original echo using a DDL for delay, equalization on send and return lines, and an AKG BX20 (which can be a very flexible device with a lot of fiddling around). Eventually I got that BX20 to sound very much like the live chamber that Jim's voice had originally been recorded with (one I had designed when I built the Elektra facility). This reverberation was then used to varying degrees on virtually all the readings.

I don't usually want to compress the equalization so I generally change the envelope of the signal first. I simply want to alter the ballistics of the information coming off the tape. That's where the noise gating and the limiting go in. Next thing in the chain is the equalization. Lastly, I want to control any sibilancy from equalization or the limiting/compression process, hence the DSer goes in last.

Sometimes there was a transposition of

this sequence, and I would equalize first and limit second, being especially careful to use the expander in the circuit. That decision would depend on what frequencies were being equalized and how much tape noise was involved in the raw program material. If I had fairly noisy information and had to add a bit of high end — 6,000 or 7,000 Hertz — I would start picking up some noise immediately; even as low as 3,000 Hertz you're going to pick up audible tape hiss. In these cases I put the equalizer in front of the compressor and let the expansion circuit help quiet things down. The DSer at all times remained at the end of the chain. As far as the equalization used throughout the

record — if other people want to include that kind of information in their articles, fine. However, I'm not interested. To each reader: turn your own knobs, make your own music.

**Words dissemble  
Words be quick  
Words resemble walking sticks.  
Plant them they will grow  
Watch them waver so.**

Along with these methods I had to go to even greater lengths to upgrade the sound

of some of the Nagra tapes. After we had been through all the tapes the only three elements that survived were the "Dawn's Highway" story, the phone conversation used in the "Riders on the Storm" sequence, and the blues behind the "Angels and Sailors" section (which was recorded during a benefit for Norman Mailer at the old Cinematique Sixteen Theater on Sunset Boulevard). That much was fairly well recorded and, within the limits of very powerful equalization, could be saved with conventional restoration techniques. But, "Dawn's Highway," which virtually gave me no meter readings whatsoever, was recorded on Scotch 111, at the old "0"



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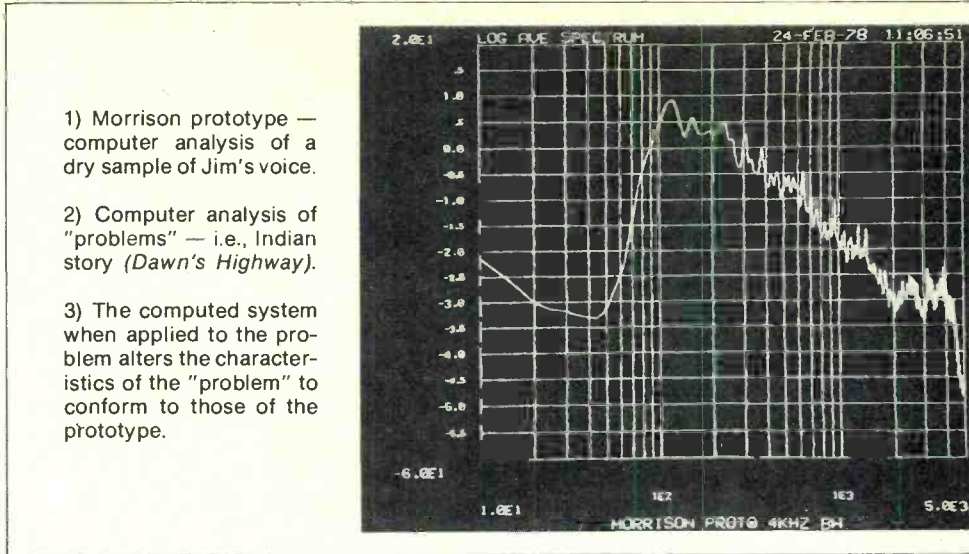


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levels, and was covered with tape hiss and air conditioning noise. The phone booth conversation was slightly better recorded. It had, however, an uncomfortable hollowness about it and a lot of tape hiss and residual noise from the street. There was also some very bad pops and clipping, along with crosstalk from the other end of the conversation. Regardless of the kind of problems that existed on these tapes, we had to save them.

I have been following digital recording developments for years and Gordon Rudd, a designing engineer in Los Angeles (whom I neglected to give special thanks to on the album — he deserves one) introduced me to Dr. Thomas Stockham and the Soundstream facility. Dr. Stockham was able to process an old acoustical recording of Enrico Caruso and totally separate Caruso's voice from the orchestra. In reality the vocal was really a computer synthesization. That was quite an amazing program, but one that was left behind, more-or-less, when Dr. Stockham left the University of Utah to form Soundstream. It was a program that I could have used and wanted to use to eliminate the echo on the Elektra tapes, but it was no longer resident in Dr. Stockham's computer. To get that program re-written, it would have taken three to four full professors in computer sciences eight hours a day for as long as two to three weeks. It would have been an




- 1) Morrison prototype — computer analysis of a dry sample of Jim's voice.
- 2) Computer analysis of "problems" — i.e., Indian story (*Dawn's Highway*).
- 3) The computed system when applied to the problem alters the characteristics of the "problem" to conform to those of the prototype.

expense that I couldn't begin to consider.

When we took our problem tapes up to the Soundstream facilities in Salt Lake City we did find one resident program, the "basic" blind deconvolution program which was originally designed to restore the sound of the Caruso and John McCormack recordings. With this process, first we would convert from analog to digital (digitalizing at a sampling rate of 50,000 Hertz per second) a short sample of each of the problem recordings. The "we" is

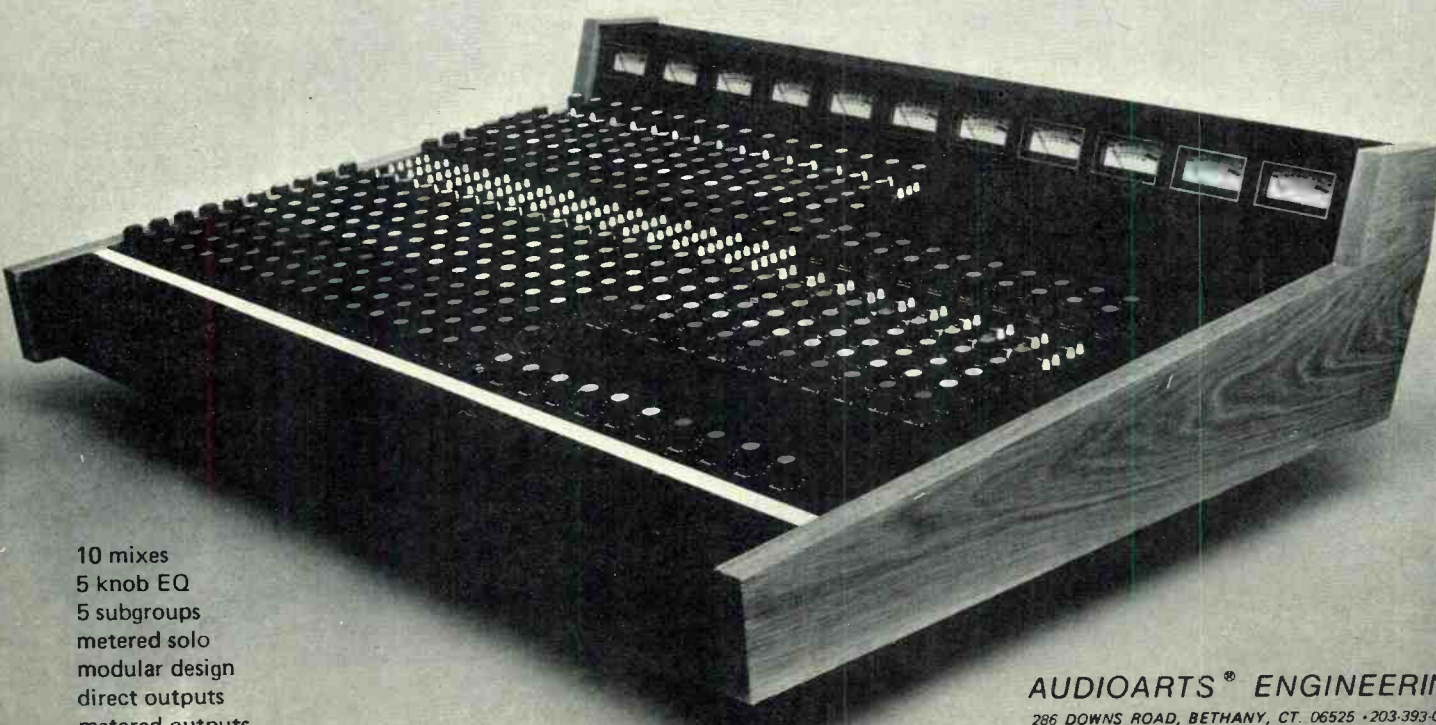
figurative, since I did not touch the computer. We also had to have a well-recorded, dry sample of Jim's voice, which we did. The computer would then analyze both the dry sample and the problem, drawing the parallels necessary to cause the problem to sound as close to the dry sample as possible. Basically, in this application the computer becomes a very sophisticated equalizer.

Once analyzed the computer is directed to act on its conclusions. Then we would



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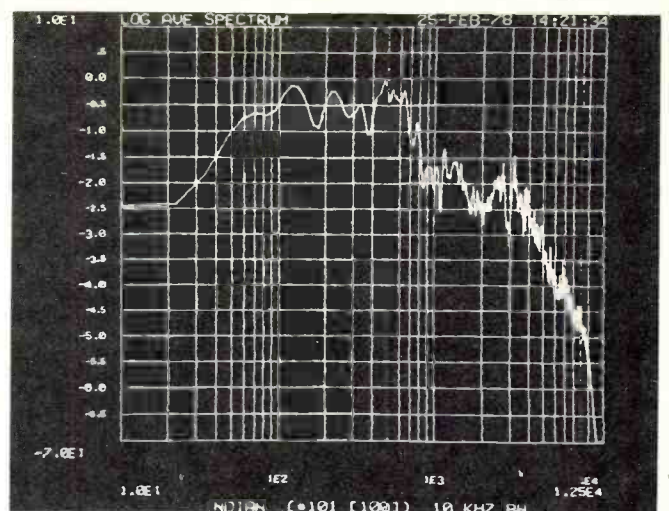
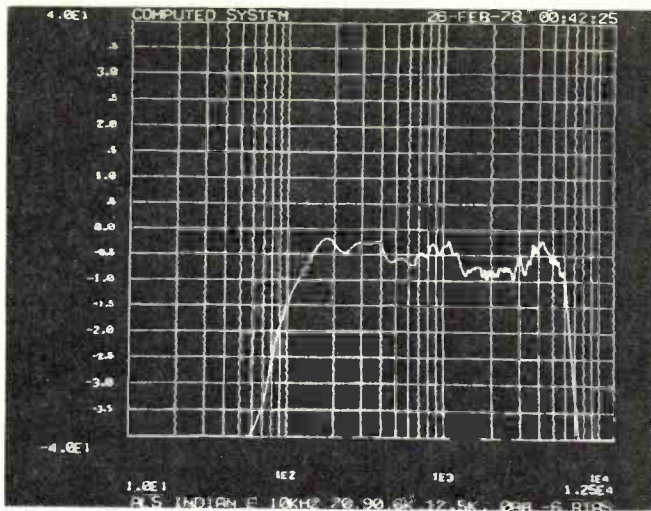
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listen, making subjective adjustments here and there. I would say, "That's very good," or "It's deficient here," or "It's become more hollow," or whatever the subjective comment was. Then Bob Ingebretsen, who handled the computer operation and the programming for us, would request the computer to do different things at different frequencies and in different manners. We would then take a second run.

It took us quite a few runs on some of our problems. With a few of them we came to

the conclusion that the computer wasn't going to help us. For instance, the Elektra tapes had originally been recorded with echo and I really wanted to get rid of it because I wanted to put consistent reverberation on the voice throughout the entire album. As it turns out that's something that's very, very sophisticated, even for these gentlemen. It was possible for a program to be written, but here again, it might have taken a week or two to write it, and then there was no guarantee it would

work.

I also wanted to see what convolution would do to the "Angels and Sailors" music. It came down to a very close trade-off. It wasn't really any better than the original; as a matter of fact, it removed some of the documentary character from the original and forced me to retreat to more conventional methods. However, through a lot of very careful maneuvering it did do a rather remarkable job salvaging the "Dawn's Highway" and "Riders" dialogue.

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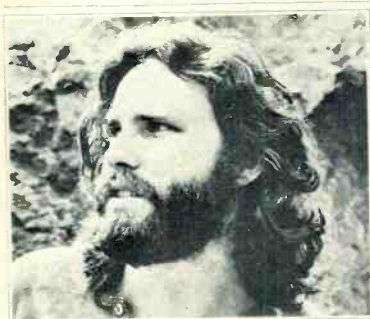


AN AMERICAN PRAYER

JIM MORRISON

MUSIC BY

THE DOORS



Without the Soundstream solution they would be so marred that the medium would have gotten in the way.

After the convolutions were completed we then reconverted back from digital to analog and transferring the dialogue directly from the computer to a Dolby'd ATR-100 at 30 ips, "0" level. That equipment (including a Nagra for playback) had been taken to Utah for us to make the transfers with. We spent three full days working, 12 hours a day. Between days 2 and 3, the computer worked all night long without supervision because by the time we got to the end of day 2, we were ready to digitize all the materials

and send the computer off on the convolution process. We put something like 12 minutes through convolution with a bandwidth of 10 kHz. Twelve minutes is twelve hours in convolution. (If the bandwidth were 5 kHz then it would have only taken 6 hours.) Once the computer is ready to go it simply sits there and munches and chews and convolves until the job is completed.

Word for word, these were probably the most expensive moments on the record. It's not an inordinately expensive process, though on the other hand, it's also not one where you just run up to Utah and "get convolved." The deconvolution process has moderately limited application within the recording industry today, but Dr. Stockham has, parallel to the development of blind deconvolution, devised (in my opinion) the most amazing digital sound recording and editing technology that exists at present. Much of that development and all its editing functions employ this same computer. The names Dr. Tom Stockham and Bob Ingebretsen, at Soundstream, are going to be in the forefront of our dialogue regarding digital signal processing for years to come. These kinds of accomplishments are only a precursor of what will happen as the interrelationship between computer sciences and the recording arts evolves. It's inevitable, the handwriting is all over the

wall. Most people see it, and they're trying to figure out what the hell to do with it.

---

**Can we resolve the past,  
Lurking jaws, joints of time?  
The Base  
To come of age in a dry place,  
Holes and caves.**

---

In constructing the short vignettes found prefacing various pieces of poetry we used a combination of pre-recorded and original sound effects. For example, the opening of the "Newborn Awakening" section, the line, "A military station in the desert," is used as a voiceover narrative to set the scene. We had poems of varying lengths, sometimes only one, two, maybe three or four lines, and that was their poetic form. We were using the voiceover to give the listener the location, similar to what you would do in a film. For the background we used the foot-stomping, marching and the "Ready, aim, fire" sound effects exactly as they were presented in the "Unknown Soldier." In place of gunshots, we cut in the new sound effects of a car peel-out. Cruising in automobiles was a poetic fetish of Jim's.

Then we went to the Elektra recordings for the lines, "can we resolve the past, the lurking joints of times, the base to come of age in a dry place, holes and caves." That sets the scene for the story to follow. Three to four pairs of automobile sound effects were segued together to give the effect of one moving camera shot.

With me supplying the direction, most of the work on the recording of original sound effects was done by Frank Lisciandro and Paul Black. At first I was, frankly, horrified when I saw that they had placed the microphones up the exhaust pipe of the automobile. They were AKG MKH-815 condenser shotguns with windscreens. We had a beautiful Nagra IV-2 which was run at 15 ips. In many ways this remote equipment was superior to much of our studio gear. The fidelity and signal-to-noise ratio of the equipment is quite outstanding. The result of that miking technique was an amazing Doppler effect. First you hear an exhaust pipe in one ear, and another exhaust pipe in the other ear, then the car peels out into imaginary infinity. To give the car a throatier quality a Harmonizer was used in mixing to add a sub-octave to the glass-packs.

We recorded the street scene effects which introduces the "Angels and Sailors" section on a Friday night. Paul and Frank took Frank's station wagon and that same equipment and placed the mikes in the back of the station wagon in an X-Y configuration. Just the microphone snouts were sticking out the window of the car so they wouldn't be noticed. Frank drove, Paul got in the back, laid down and operated the

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machine as they spent about an hour cruising the streets of Hollywood Boulevard at its maddest hours. The various sounds you hear are the real street sounds of "angels and sailors." Here again there were multiple tracks of sound effects used to accomplish a very simple effect.

There was some faking of stereo done, but I'd say the majority of the important sound effects, even including crowds, if you choose to call them sound effects, were recorded in stereo. Most of the audience effects were located by going through endless hours of live Doors' concert tapes, and listening to just the two audience tracks until we found the necessary audience reactions.

We also needed the effect of some girls screaming as they go by in a car. This was one of our rowdier accomplishments. Paul and I enlisted a bunch of teenage girls from my neighborhood and tried a number of trial runs at various speeds and mike placements to get it to sound right. We finally got the car speed and everything correct, but the girls' lacked enthusiasm. So, the next time the car came by and was in the right position, we simply did a 180°, pulled our pants down and, mooning the young ladies, got the reaction that we wanted. Obviously, every time Paul and I hear the girls' scream, we think of a very different picture than the public does.

---

**You've seen your birth, your  
life and death,  
You might recall all of the rest.  
Did you have a good world  
when you died?  
Enough to base a movie on?**

---

Although Jim's poetry deals with a variety of themes and concepts, two are treated in great depth: death and sex. Anyone who's enormously preoccupied with life must also be enormously preoccupied with how life came to be and how life, as we know it, ceases to exist. There was never any question about our treatment of these subjects because we dealt with what Jim had left the world. If that involved using expletives or controversial language, or suggestive stories that could be controversial, well so be it. That was part of his art and it was our responsibility to preserve it. We didn't make the controversy, neither did Jim, he simply had the thoughts and wrote them down. Others created the controversy. All he did was comment and if anybody else felt that he was controversial, then that was perceived in their minds only, not in Jim's or in ours.

As for Elektra, they showed heroism by putting an immense amount of money in

the hands of some talented but crazy people and for a very long period of time they had no idea of what they were going to get. Elektra Records deserves all the accolades one can give. Because of the nature of the record there was a tentativeness on Elektra's part since the release of the record coincided with the Supreme Court ruling on the George Carlin case. The Carlin record contained the seven dirty words that cannot be broadcast over the public airwaves. There are at least five out of those seven words on this album. So, the record company was a bit concerned. Much to their surprise, after they debuted the album around the country for retailers, wholesalers, promotion men and DJs, they found that there were a lot more DJs willing to give it airplay. And many more people than they had anticipated were willing to sell it.

I did not consider myself a word man when I met Jim. One of the reasons I got involved with him was because it immersed me in an area of art that I had wanted to expand my understanding of. That's how I've grown in my life — by always looking for a challenge that was bigger than I was. Now, in retrospect, there's no measuring what kind of a role it will play in my life. I sometimes doubt if I'll ever be able to measure the relationship that Jim and I had, at least not in this lifetime. □ □ □

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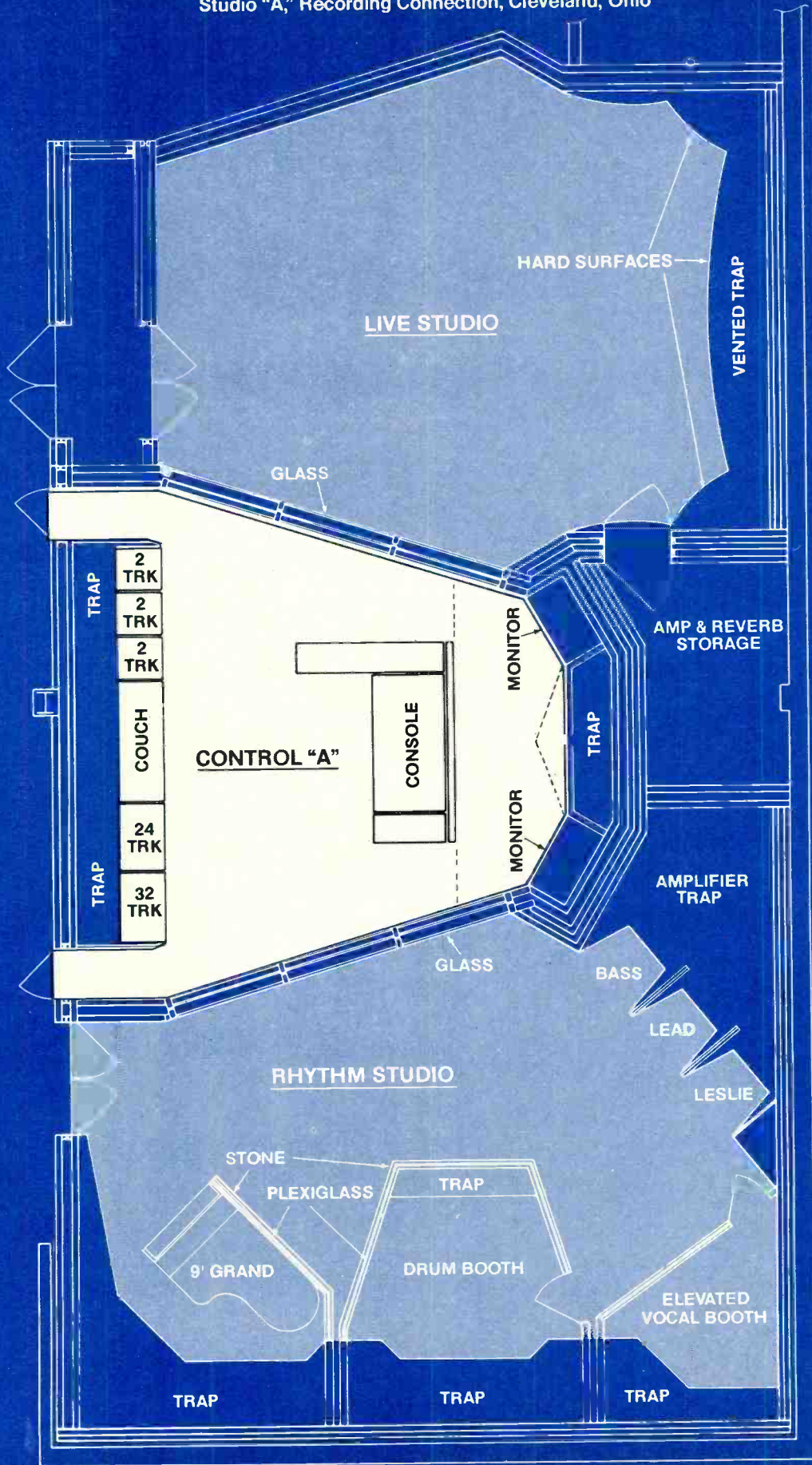
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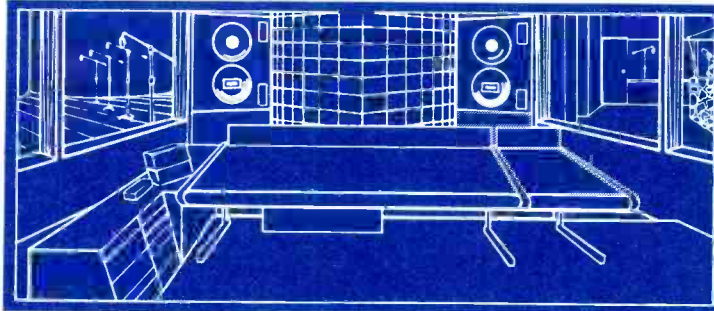
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# Microphone Applications for Classical Recording

by Carson C. Taylor

It is interesting to me that so many pop artists and engineers truly envy those of us fortunate enough to have a career in classical recording. During my twenty years at Capitol/Angel/EMI Records, I did all types of music but have become best known for my recordings of classical orchestras, soloists, and choruses in every conceivable combination. Also for big bands such as the Stan Kenton band. It is inevitable that every engineer develops techniques built around certain microphones which become his favorites. However, it is basic to state that a good engineer can make a good recording with any variety of high quality microphones by applying them to the situation properly.

Before discussing microphone applications, it would be well to explore the philosophy of classical versus pop music recording today. Almost everyone is familiar with multitrack pop recording and the reasons for it. Pop techniques today are built around creative building of the music by highly advanced technology. Frequently, the impact of the finished product is the direct result of skillful use of all the sophisticated processing equipment available in a modern studio. The microphone technique used is invariably overdubs. This is the basic manner in which all pop music is recorded today.

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This approach is diametrically opposed to the philosophical and musical requirements of classical music whether it be a soloist or the largest symphony orchestra. Classical music is composed, organized and has specific forms which the composer intended it should follow and therefore has sound requirements which are at once specific and traditional. Pop music now, whether live or recorded, depends entirely upon electronic technology for its existence. Classical music does not. Classical instruments and voices were enjoyed by countless numbers of listeners before microphones, amplifiers and the like were ever invented. It, therefore, exists outside the electronic medium into which we endeavor to confine it. It is essential to establish this difference between the two music forms if we are to intelligently and successfully approach the task of recording classical music. The audience is used to hearing the sound of their favorite artists face-to-face with no electronics involved. The seating arrangement of a symphony is, to a large degree, dictated by tradition and by the need for uniformity as conductors appear with various groups throughout the world. An example is the concert master and first violins are always to the conductor's left. All the strings follow quite uniform patterns in order that the conductor always finds the players in the same position as he directs their performance. These facts all add up to the microphone approach the engineer must take. He must preserve as nearly as possible the integrity of the performance and the original sound as the audience would hear it. If he does not, he will not sell records. It is as simple and as complex as that. All his creative talent and technical skill must be subordinated to the integrity of the performance. This implies then that he shall have an excellent working knowledge and understanding of the music being performed and further a sensitive

appreciation of the artists performing it. In classical recording it may be truly stated that, "Ninety per cent of the engineer's work will have been done before he approaches the recording session." He must transport what is being played to the ears of the ultimate listener. We have written a great many words and still not mentioned microphones per se. This approach is necessary to the understanding of microphone use for classical music recording.

In general, the highest quality condenser microphones are to be preferred for overall orchestral pick-up, for strings, woodwinds, brasses, pianos, etc. For percussion, tympani, drums and xylophones I usually use dynamics for reasons I will explain later. A few of the desirable condenser types are as follows:

- Neumann (large diaphragm) —  
KM-86, U-87
- Neumann (small diaphragm) —  
KM-88, KM-84
- AKG —  
414-EB, 452, 451-EB
- Sennheiser —  
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If you'd like to know what else Herb Friedman thinks about the B77, please circle reader service number or write to us for complete information including a reprint of his article and a list of professional audio dealers where you may see and hear the ReVox B77 demonstrated.

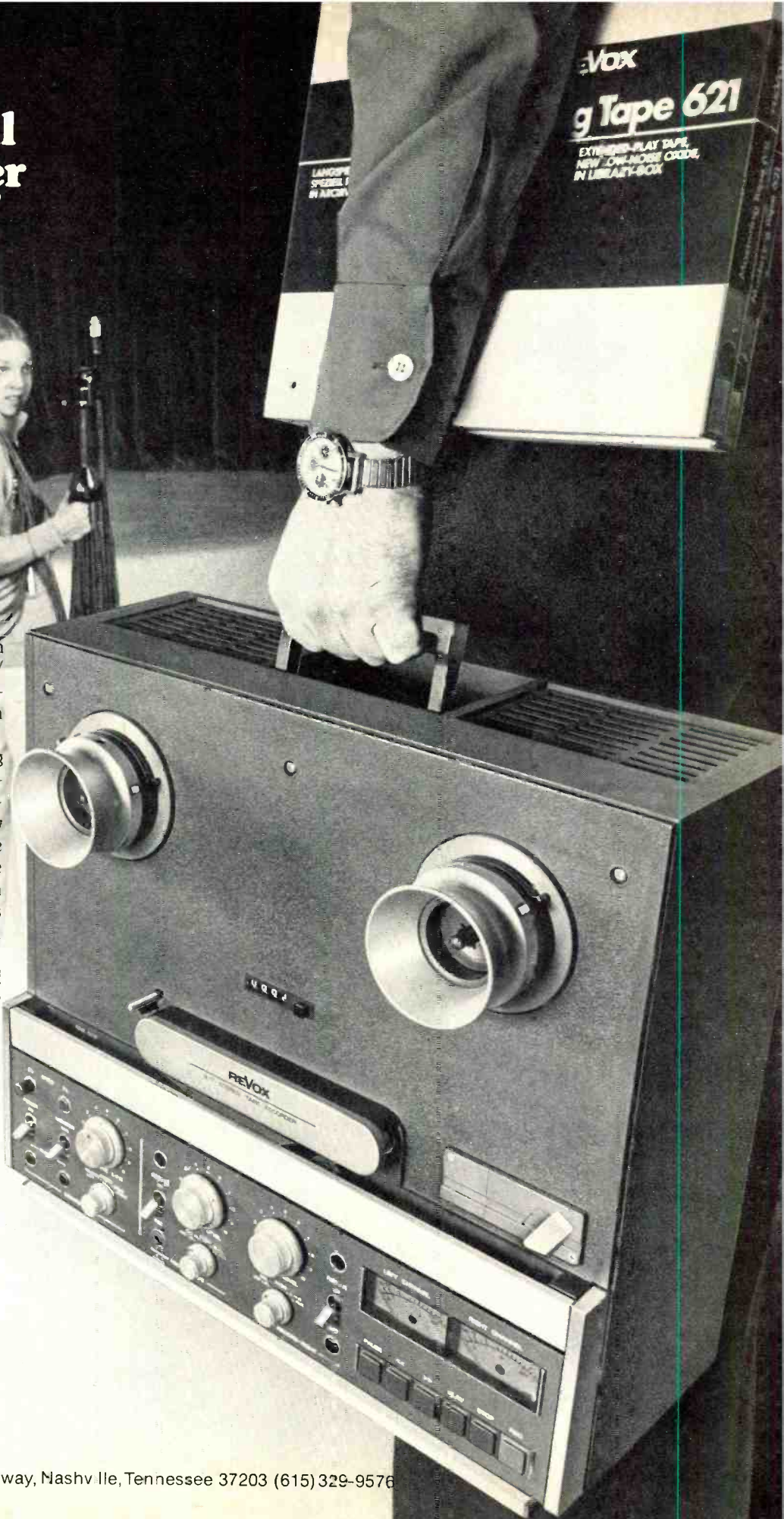
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R-e/p 125



## Coincident Techniques

I personally am a strong advocate of the coincident stereo microphone either in X-Y or M-S technique. My favorites are the Neumann SM-69, QM-69, AKG C-34 and 422.

My experience over many years proves the coincident microphone to be the most versatile tool available for picking up all forms of classical music and, incidentally, highly useful in many pop situations.

Whatever microphones are used they must be placed at sufficient distance to present a good aural perspective with good room ambience. There are three approaches to true stereo pick-up:

1) A-B stereo uses two like microphones spaced a number of inches or feet apart.

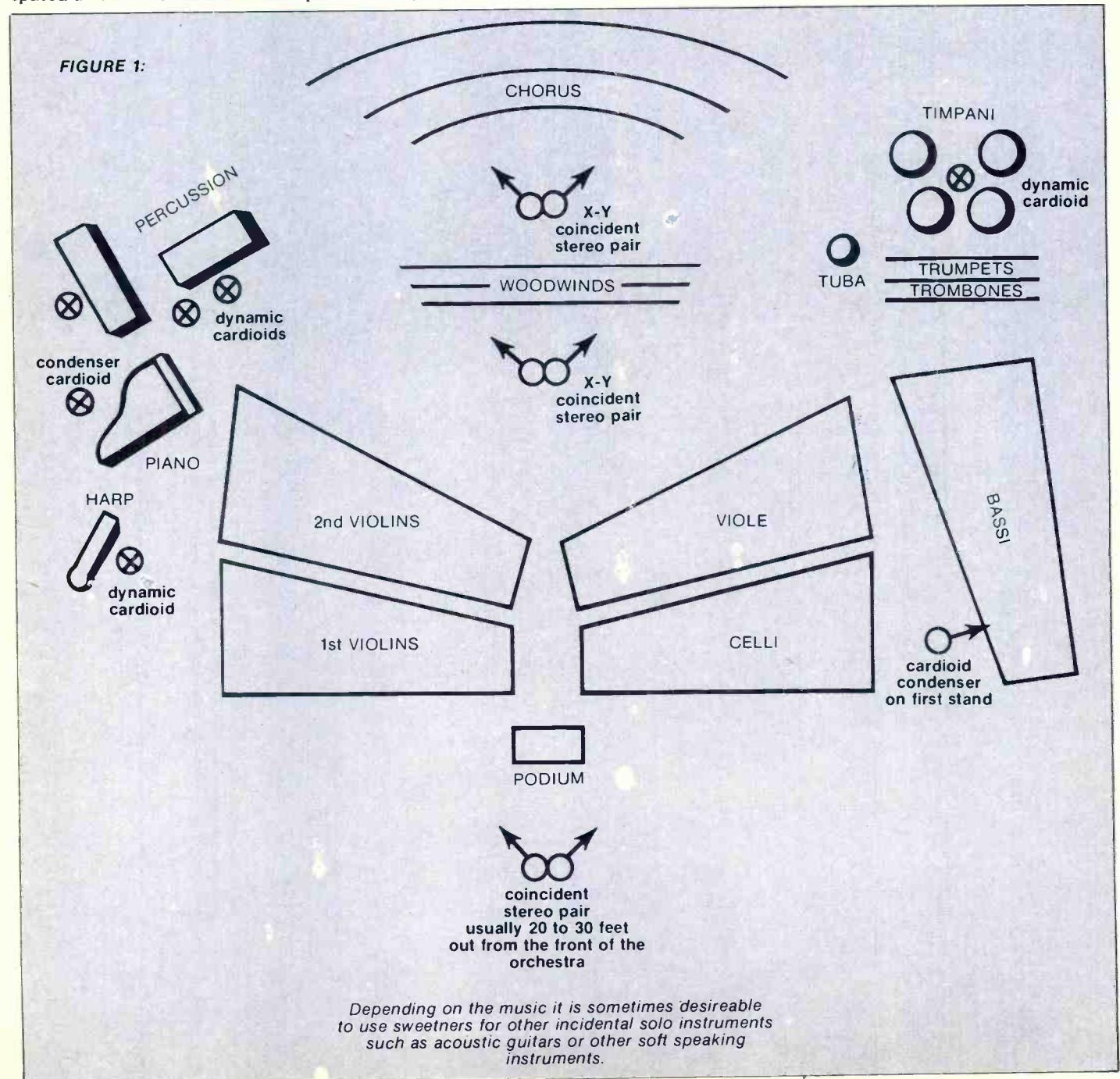
2) X-Y stereo uses a two-head coincident microphone with both capsules usually cardioid or figure 8 patterns. Coincident, of course, means mounted on the same axis as close together as possible.

3) M-S stereo uses the same stereo microphone with the fixed capsule, a cardioid, facing the sound source. The output of these two heads is fed into a sum and difference matrix which produces a beautiful stereo sound.

In evaluating these three approaches here are some facts to keep in mind. A-B stereo (spaced mikes) can sound very good, but remember the stereo effect occurs due to phase differences between the two microphones. Certain frequencies will be subject to cancellation while others will be

boosted. When heard in mono the results may be disastrous. X-Y stereo using a coincident pair (mounted on same axis) is also termed "Intensity Stereo." This nomenclature comes from the fact that the stereo spread is heard due to intensity differences between the two capsules and there is no phase differential. This works very well indeed and when combined to mono no phase cancellations due to microphone placement occur. M-S stereo is also an intensity stereo technique with coaxially mounted capsules; but here we introduce a deliberately controlled electronic phase shift of the proper amount to achieve beautiful stereo spread. This also will combine to mono with no phase cancellations in excess of those present

continued on page 131



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acoustically in the room. I use X-Y and M-S for all types of true stereo pickup. X-Y is not as subject to room ambience as M-S, so if the room is extremely live this frequently is the better.

When I especially wish to include the ambient sound of the hall I use M-S with the matrix. One point to understand clearly in the use of M-S with the matrix is how the proper adjustment of the two capsules is accomplished. Each capsule through the matrix produces two outputs. The M+S is the in-phase mono signal from the front facing cardioid capsule. Seen on the oscilloscope the left and right outputs will show a mono signal when this matrix pot is opened. After closing the M+S and opening M-S pot you will see the left and right outputs 180° out of phase. Also, you will hear the ambient room sound of this capsule as compared to the straight on cardioid. To balance these the M+S is opened first to produce an average working level into the board. The M-S side is then advanced until the desired stereo spread is obtained keeping in mind that if M-S overbalances the M+S the entire output will flip-flop and be out of phase. I have seen many engineers

with tracks out of phase due to this phenomenon. I always check my settings by using a scope on the board so I know the out of phase material deliberately introduced is not too much.

### Sweetener Microphones

In addition to the overall stereo units, other condensers both stereo and mono may be used for sweetening and controlling the balance of weaker instruments. Dynamics are usually more useful for percussion or may also be used for woodwinds, guitars and the like. These microphones are usually kept as far from the instruments as is practical without suffering severe leakage. Positioning and gain of these microphones are critical. At no time must the overall perspective change or the position of the instruments shift due to the opening of one or more of these sweeteners. Phase relationships must be evaluated aurally and studied visually on an oscilloscope. Nothing must be introduced which will negate the performance of the musicians. This is why it is incumbent upon a classical music mixer to understand the sound of the music he is recording. The

classical engineer does 85 or 90% of his work before the session ever begins.

Accompanying this text are a few drawings of possible set-ups for some types of music I have recorded; but I dislike showing hard and fast rules for a creative technique. Each situation is unique, and I will always vary the elements to take into account the music, acoustics and instruments involved. Hopefully, an article such as this will stimulate a reader to think creatively while knowing that he must work within the acoustical and electronic limitations of his medium. Thoughtful study will bring ever increasing awareness of the demands of such music and the technology and philosophy it encompasses.

In considering what is happening in the recording studios, I would like to present a few other thoughts for your consideration. All pop music and much classical is being done with multitrack recorders. Most of the results, in my opinion, are less than they should be. In the rush to use more and more tracks, something is being overlooked — the basic fact that as you close mike instrument after instrument and place each mike on a separate channel you will end up with a countless number of mono tracks. No amount of signal processing is ever going to make anything out of it except mono. May I offer a thought which is certainly not original to me. When I do sessions I find people get excited over the results of this approach. When recording multichannel, I always try to break the music down into compatible sections or groups. These I pick up with stereo microphones and record them on at least two tracks. The only time I use a mono pickup is when the voice or instruments call for it, and even then I frequently use the leakage into overall stereo mikes to retain the ambient perspective I want in the entire pickup. This requires very careful planning of your mike placements and the understanding of what leakage is compatible and what is not.

The results from this approach can be gratifying indeed. As you mix-down you will find the tracks blending together in a full, big sound with much less effort and re-mix time. It is absolutely imperative, however, that an understanding of the ultimate goal be achieved beforehand and this goal be kept constantly in mind while recording. Off-axis coloration of the microphone used becomes highly important. It used to be considered by every mixer, but with very close mike placement and single instrument overdubbing this basic requirement seems to have been forgotten.

I do not say that all records are bad — they are not. However, too many engineers and producers forget there is no substitute for knowledge of the medium and that creativity can only flower within the framework of knowledge and understanding. □ □ □

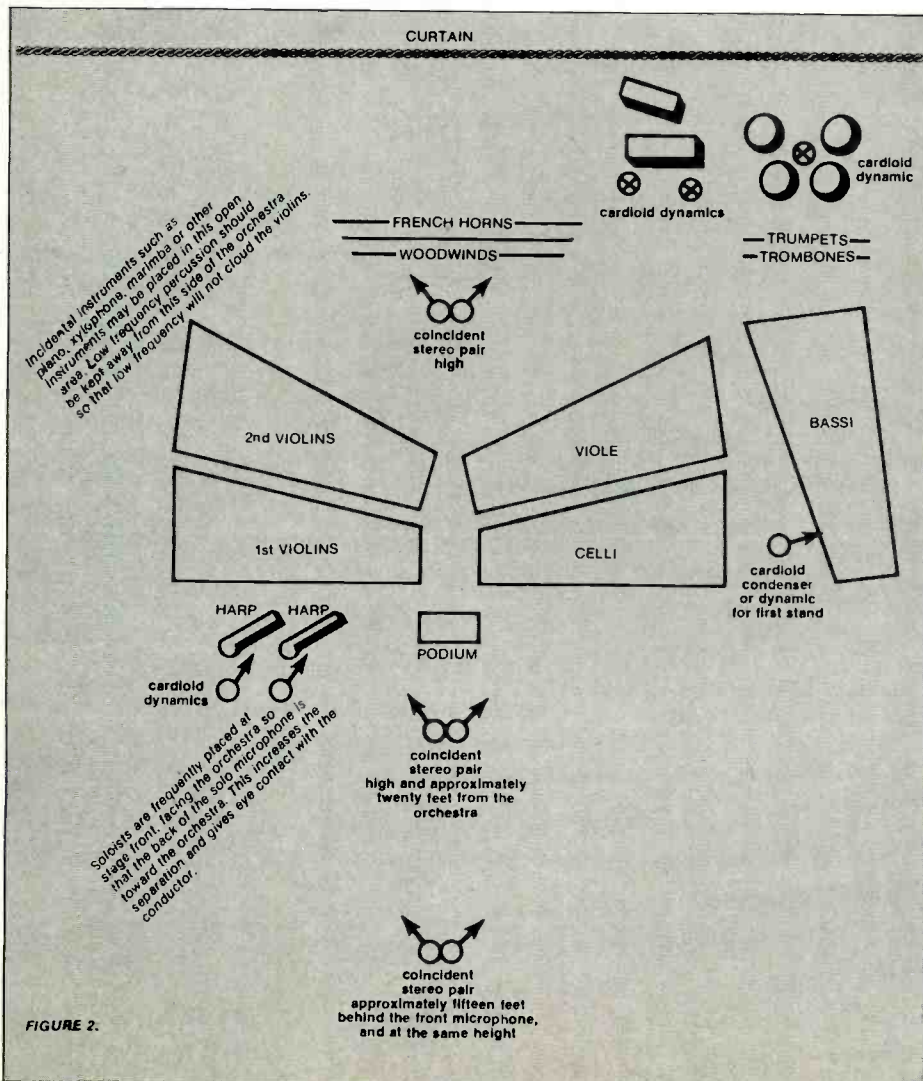
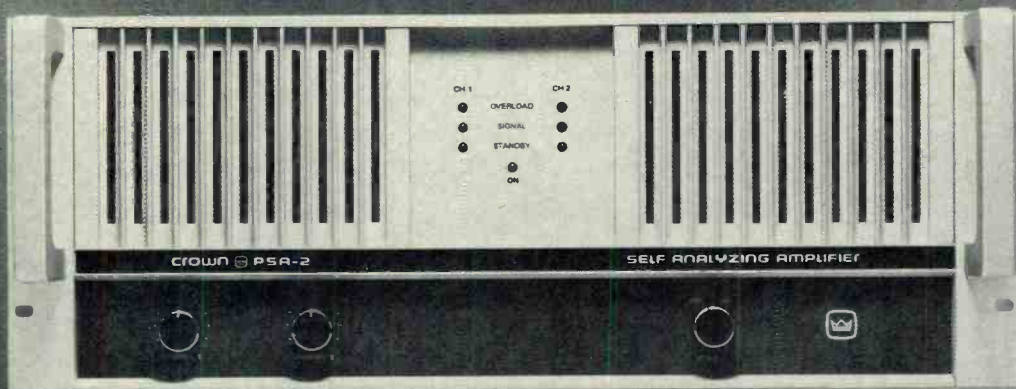


FIGURE 2.

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## VCA's . . . round 2

### Editor's Note:

In organizing the responses to the VCA controversy which originated in the February 1979 issue of *R-e/p* (page 72, ff) the editors have elected to present the protagonist material in series. David Baskind's (B&B) response is followed by the material from Paul Buff (Allison). Thus, in his response some of Mr. Buff's opening comments refer to the less substantive material that follows from B&B's Harvey Rubens and satisfied B&B customers Edward Bannon (One Step Up Recording, L.A.) and Michael Sanders (The Pasha Music House, Hollywood).

from: **Dave Baskind, President  
Baskind, Bissot & Associates  
(B&B Audio)  
Los Angeles, CA**

In the article authored by Harvey Rubens, Marvin Caesar and myself in your March, 1979 issue we made the mistake of not acknowledging the excellent work done by Messrs. David Blackmer and Paul Buff in the VCA field. Both men are indeed pioneers in the field of applied VCA technology.

It is regrettable that our article was taken as a personal affront by these gentlemen, for that was not the intention at all. On behalf of my colleagues and myself I ask that apologies be accepted as applicable.

With regard to Messrs. Buff and Blackmer's response to our article, I would like to make the following points:

1. The reader will find a valid list of supportive references at the end of our article. Mr. Blackmer cites neither our own nor any other references, and, except for a cryptic referral to "Gibbons and Horn," one cannot find any citations supporting Mr. Buff. As in his previous journalistic efforts, Mr. Buff is supported primarily by his own opinions which are regarded by many practicing audio engineers as unique.

2. Mr. Blackmer's comment about transistor matching totally ignores scores of research papers on the subject. Many of these references are listed in H. Lotsch's paper in "IEEE Transactions on Electron Devices," Volume ED-15, no. 5.

In addition, the reader may be interested in a concise but thorough study of the log amplifiers and multipliers in the McGraw-Hill booklet entitled, *Electronic Circuit Design with Solid State Devices, Manual 4*, pp. 46-53.

3. Mr. Blackmer's allegation concerning offset vs. attenuation in the Allison and B&B VCAs is incorrect. In the Allison samples we evaluated we found this problem virtually nonexistent. In our own VCAs the statistical distribution of the effect insures that the problem is not additive among multiple channels that are properly aligned.

4. Mr. Blackmer's comments on thermal distortion phenomena in his VCA are also at odds with accepted theory and recognized data. In addition to the above cited references I refer the reader to the Allison Research ad appearing in *R-e/p* in the August, 1977 issue.

5. Modulation noise studies are in their infancy at this time, but the data collected from experimentation through December, 1978, are sufficient to support our contentions.

6. Mr. Blackmer claims that his trained listeners could hear no difference between his device and a straight wire. We would appreciate more details on this study, such as what his listeners were trained in and what type of wire was used.

7. With regard to the noise performance of the B&B VCA, its dynamic range of 110 dB (with proper engineering), allows its application in any "state-of-the-art" system.

8. Criticism of the control "taper" of the B&B VCA should be considered in light of the fact that the 1537a obeys a precise mathematical law:

$$\text{Attenuation (dB)} = 20 \log (1 + e^{KV_c})$$

where  $V_c$  is the control voltage, and  $K$  is the attenuation constant (see Figure 1).

In addition, taper correction circuits insuring  $\pm 0.2$  dB accuracy are available from us upon request.

9. Our article was not intended to discredit the dbx VCA, but rather to illuminate some of its inherent limitations. Incidentally, we have tried to obtain the new 202c for evaluation, but after 90 days, we are still waiting on delivery from a dbx distributor.

In response to Mr. Buff's reply:

1. Contrary to Mr. Buff's statements, his company claimed that VCA-5 was in production and was heavily promoting and advertising it until the presentation of a paper on VCA performance by Mr. Rubens and myself at the 60th AES Convention. Immediately following this presentation, advertisements and sales of the VCA-5 were

halted, along with a promise by Mr. Buff of a better VCA in the near future. It should be further noted that the photos in our article were of a VCA-5M using a Sound Technology 1710a without the filter engaged.

2. With regard to the contention that the dbx and Allison VCAs are not class B devices, we will for the moment ask Mr. Buff an interesting question: What is the log of a negative number? In the identity:

$$\log(-A) = \log(\sqrt{-1})^2 A = 2 \log \sqrt{-1} + \log A,$$

notice that the term  $\sqrt{-1}$  is defined as an imaginary number in all math textbooks.

By the time you figure it out, everyone else will know you have an imaginary product. All puns aside, log converters will not generate imaginary products. If they could it would be unnecessary to have signal separators and separate positive and negative processing chains in a log-antilog multiplier. Furthermore, if the VCA-5M were a class AB device, oscilloscope photos would not show crossover notches as the primary distortion products. Allison specifies this distortion at .02% (-74 dB) at midband at high levels. This figure rises significantly both at higher frequencies and at lower input levels, as we discussed in our article. It has been determined in several studies that levels of TIM distortion (an associated phenomenon) of -90 dB (.003%) have been detected by trained listeners presented with music signals (see *Multidimensional Audio*, by Moeller, B&K app. note). It has also been stated by Moeller that .01% notch distortion is subjectively much more annoying than as much as 10% harmonic distortion.

3. In our article we referred to the linearity of log-linear multipliers with respect to accuracy of reproduction of an audio input signal. We did not mean to imply that the attenuation curves of the VCA-5M and the dbx 202 were inaccurate. As far the ear is concerned, accurate reproduction is far more important than accurate attenuation.

4. Mr. Buff asserts that Mr. Rubens does

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not understand the circuit of the VCA-5M. If he so desired, we are prepared, with Mr. Buff's permission, to publish his circuit complete with full computer analysis.

5. In defense of our statements concerning noise modulation, we would like the reader to understand that the work of

Schacknow, Raab, Wier, and Green, as well as our original references, is not at odds with our conclusions.

6. 35 dB of gain following any preamp or tape output will result in the serious degradation of any recording console's performance. To consider this in

comparisons of any VCA or fader-amp combination is ridiculous. To clarify, the following examples are given:

Figures 3 and 4 (*overleaf*) show simplified console line drawings with gain structures. In typical consoles of today we find microphone preamplifiers with variable gains from 20dB to 60dB, buffered faders or VCAs with a maximum gain of 15dB, and buss amplifiers with a typical maximum gain of 10dB. Net maximum overall gain would be:

- 60 dB (mike preamp)
- 15 dB (buffered fader or VCA)
- + 10 dB (net buss amplifier gain)

85 dB (Total maximum available gain)

Actual users *never* operate all preamplifiers, faders, and buss amplifiers at full gain at once. Under such a condition, console dynamic range would be seriously impaired.

To elucidate, we will assume that all amplifiers in our console are noiseless, and all microphones have a source resistance of 200 ohms, with their only noise contribution being thermal. According to the classical formula

$$v_n = \sqrt{4kTBR}$$

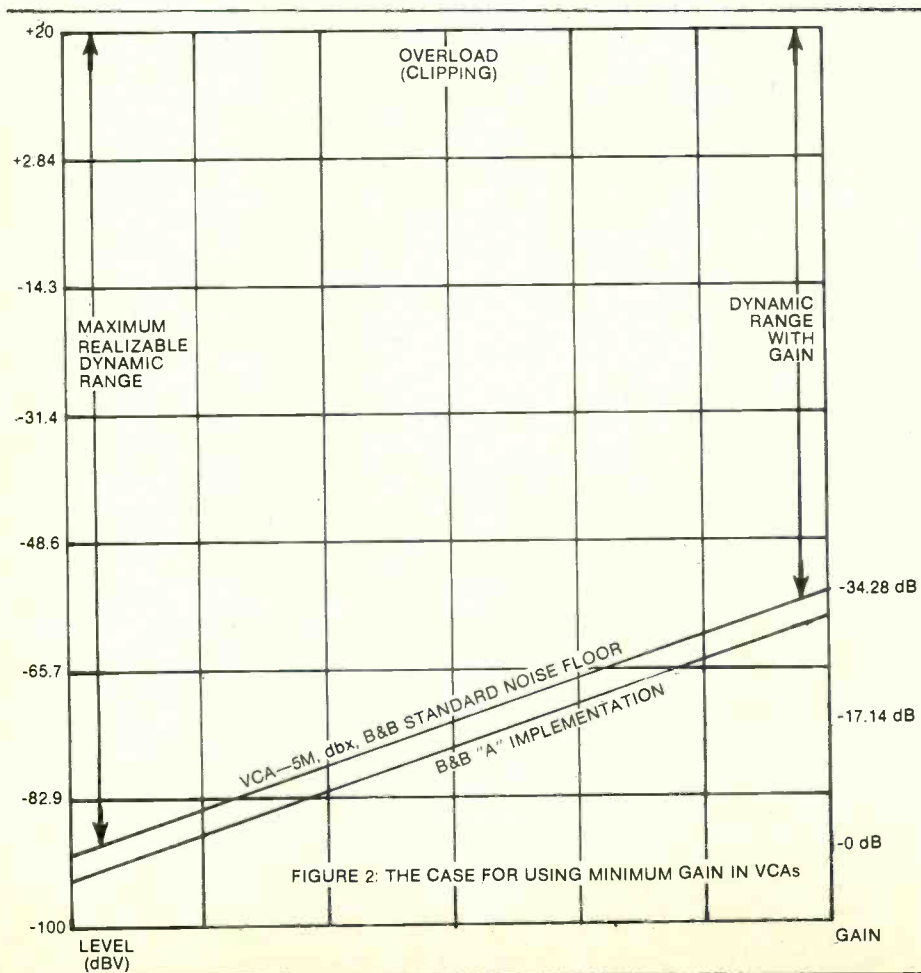
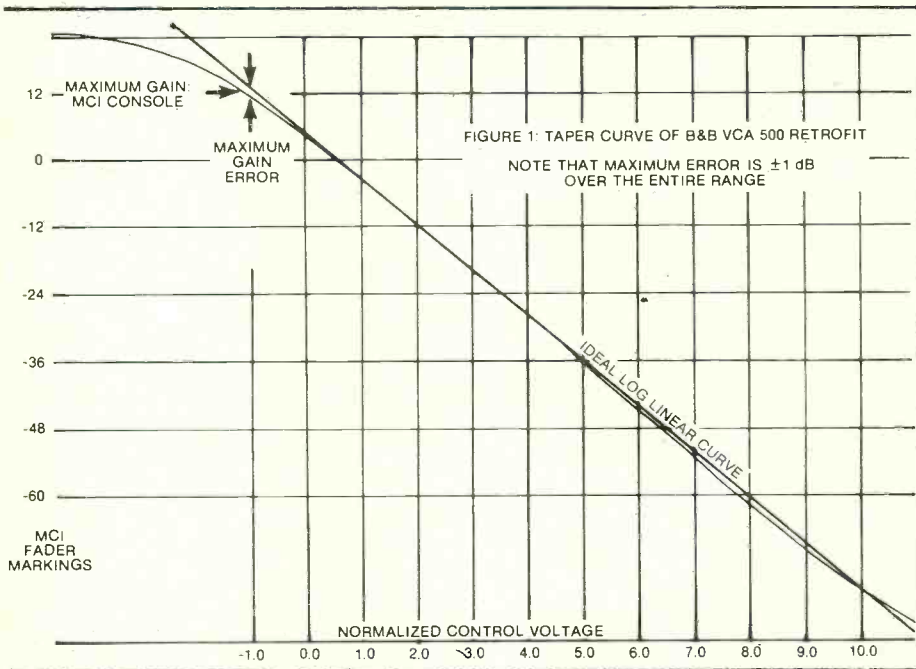
$$v_n = 0.253 \text{ microvolts}$$

or -129.7 dBv (ref. 0.775 volts) at room temperature for 20 kHz bandwidth. If we take 85 dB of gain on this noise voltage, our output noise would be -44.7 dBv for one channel and -29.7 dBv for 32 channels. Keep in mind that this is calculated for a "noiseless" console. If we assume +24 dBv as the overload level of the buss amplifier, then the maximum dynamic range for a single channel would be only 68.7 dB, and 53.7 dB for 32 microphone channels. Note also that the 35 dB of gain suggested by Mr. Buff would degrade these figures by an additional 20 dB.

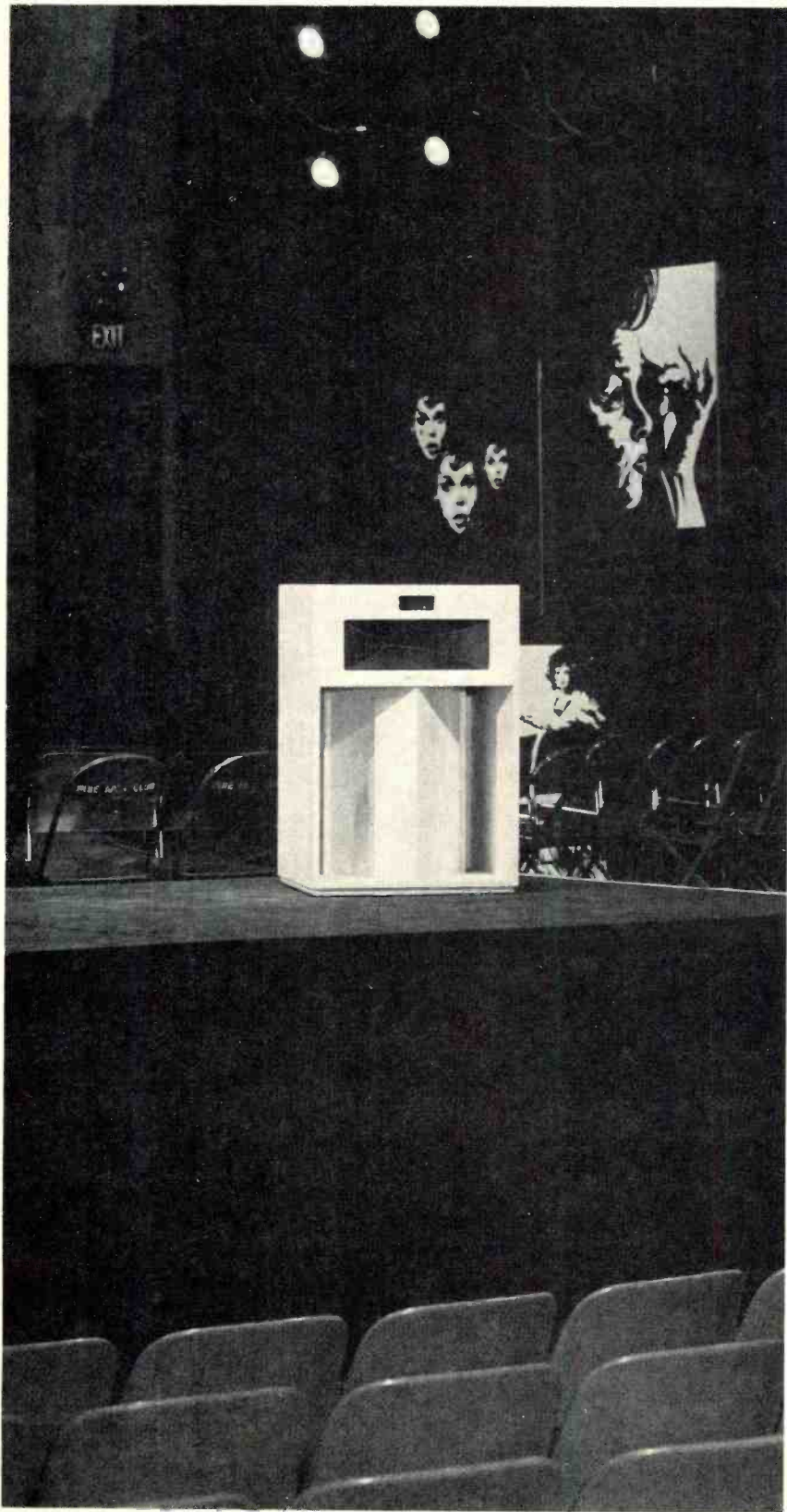
More typically, consoles are operated with as little gain and as few channels per buss as practical. A worst case condition would typically incorporate 8 microphones with average preamplifier gains of 35 dB, average fader settings of 0 dB, and average sub-master settings of +10 dB. In this case, with +24 dBv as a buss overload condition, output noise would be -69.7 dBv, and dynamic range would be 93.7 dB. Notice that this still assumes a "noiseless" console.

In practice, microphone preamps achieve equivalent input noise of approximately -128.5 dBv, which is very close to the theoretical conditions cited above. The greater majority of professional quality recording consoles maintain specifications within a few dB of the above calculations, *except when VCAs are used.*

— continued overleaf



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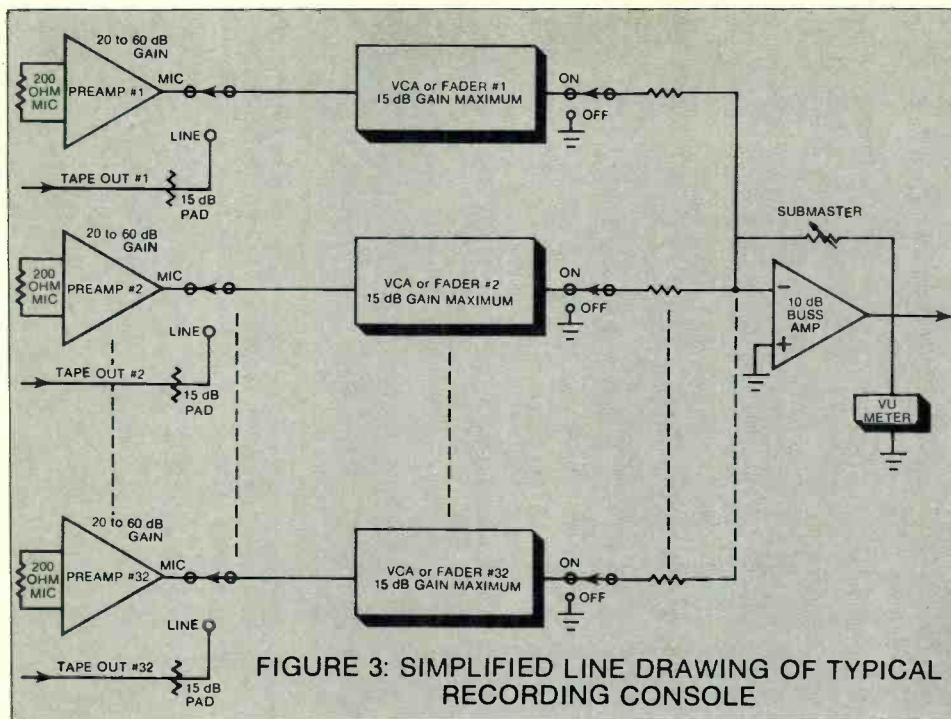


FIGURE 3: SIMPLIFIED LINE DRAWING OF TYPICAL RECORDING CONSOLE

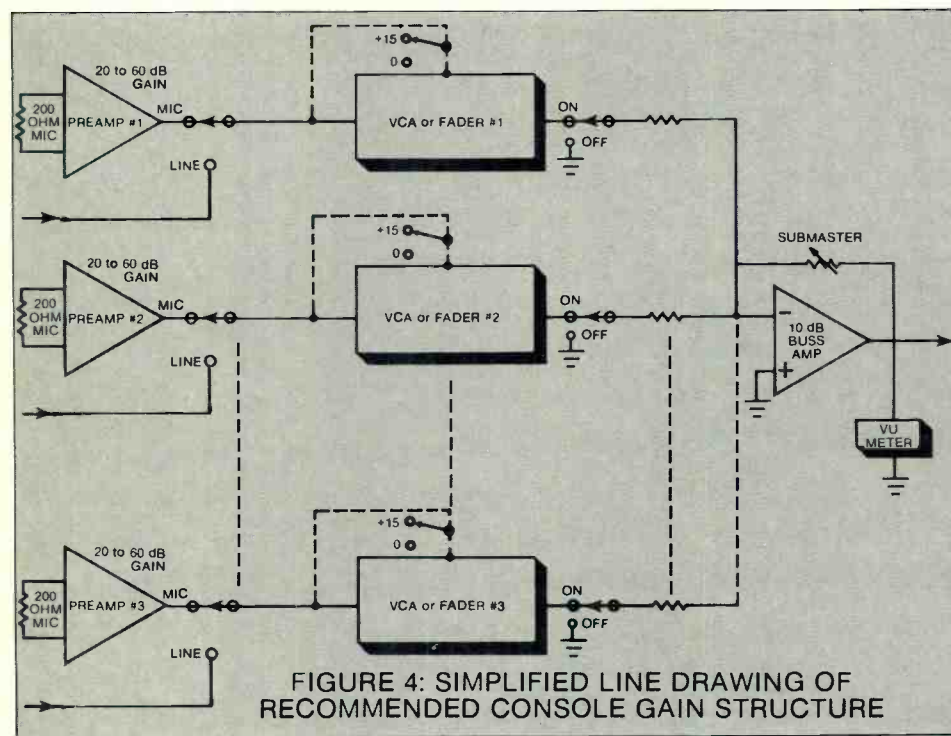


FIGURE 4: SIMPLIFIED LINE DRAWING OF RECOMMENDED CONSOLE GAIN STRUCTURE

We will now observe that  $-90$  dBv is a typical input noise specification for Allison, dbx, and B&B VCAs and calculate the total input noise assuming the VCAs are fed by the output of a  $40$  dB preamplifier with an output noise of  $-89.7$  dBv. This calculation is done by converting to volts and taking the square root of the sum of the squares, yielding  $35.2$  microvolts or  $-86.8$  dBv noise.

For  $8$  channels into a  $10$  dB (net gain) buss amplifier this would result in a buss output noise level of  $-67.6$  dBv and a dynamic range of  $91.8$  dB with  $+24$  dBv clipping level and faders set at unity. This calculation applied

to Allison and dbx VCAs.

The B&B VCA will appear to perform worse under these conditions since it is an inherently different device and may require up to  $15$  dB of post-VCA gain. Its output noise will be  $-80$  dBv at unity gain setting, and the resulting dynamic range for  $8$  channels will be  $85$  dB.

The above calculations were made assuming no input signal. We shall now look at the three VCAs under dynamic conditions.

The Allison and dbx VCAs will exhibit peak noise level some  $20$  dB higher with

signal present. This will result (under the hypothetical  $8$  microphone condition above) in an actual dynamic range of  $71.8$  dB.

Under the same conditions, the B&B VCA exhibits a noise floor increase of  $6.5$  dB with actual dynamic range performance being  $79.5$  dB.

Note that these calculations correspond with user reports that B&B VCAs sound subjectively quieter than dbx 202s. It should be apparent to the reader by now that any gain taken after the mike preamp or line inputs on any console will result in a degradation of system performance and dynamic range, and should be minimized.

Figure 4 shows an improved console topology that yields a  $15$  dB improvement in dynamic range when mixing line signals, while maintaining needed gain for mixing microphone channels.

7. Mr. Buff's evaluation of our MCI retrofit card was apparently not done under appropriate conditions. On  $64$  random samples in the field we are achieving tracking accuracies of  $\pm 0.2$  dB. The curve Mr. Buff represents as being from our MCI card is impossible to obtain, as the circuit is electronically prevented from operating in its non-linear region. In addition, the noise performance in MCI consoles is quite acceptable, being  $10$  to  $14$  dB below tape recorder noise at the mix buss output (see Figure 1).

8. Mr. Rubens' accompanying letter is  $100\%$  correct with respect to our dealings with Mr. Buff and Allison Research. We were extremely careful to inform him of our intentions and goals when requesting samples last Spring. Furthermore, we have never, nor to my knowledge have any of representatives ever, received a request, written, telephonic, or verbal for a sample of the B&B VCA from him.

In closing I would like to thank the reader for bearing with me, and would like to cordially invite all to visit us at the L.A. AES Convention.

#### References:

- Green, Weber and Duncan, "Detection of Pure Tones in Noise," JASA, Vol. 60, No. 4, Oct., 1976.
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**Paul Buff's response begins overleaf . . .**

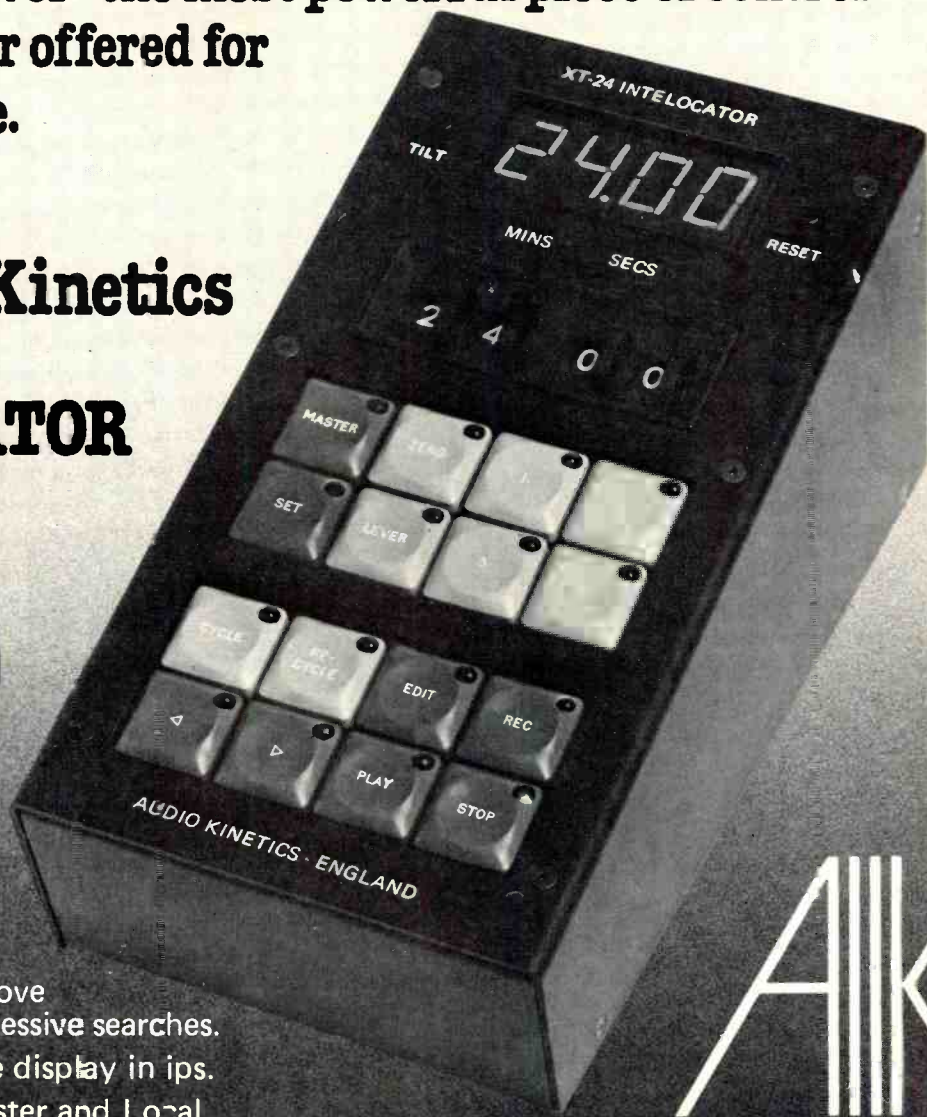


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California 91607, U.S.A.  
Tel: (213) 877 3311. Telex: 674901.

from: **Paul Buff**  
**Allison Research**  
**Nashville, TN**

Being recognized as a "gentleman" is not real high on my list of lifelong ambitions. Nor, is the ability to cite, but not comprehend, endless references to the work of previous authors. My goals are to truly understand the fruits of my labor, to be able to properly define its capabilities, and to be able to place all attributes of a design, whether good or bad, in their true perspective when questioned either logically or illogically.

The very nature of all things analog is based on shades of grey, not blacks and whites. There is no "Perfect Analog Circuit," be it a VCA, Mike Pre-amp, or what-have-you. Each has its limitations, distortions, and deviations from the ideal. The mark of a seasoned engineer lies in his ability to weigh the true effect of each and every area of imperfection in structuring the most useful final result. "Noiseless," or "Distortionless" circuits do not exist. In time, a good engineer realizes that there is always room for improvement in any analog design, and he learns how to make these improvements with hardware, rather than with words.

In the case of our original VCA-5, the circuit represented magnitude of order improvements in the areas of signal distortion and thermal stability, when compared to previous designs. We make no apologies for its performance, nor have our customers given us any cause to. Very shortly after its introduction, the means to make further improvements became apparent. Rather than continuing to market a product which we knew how to improve, we chose to make those improvements, and superceded the VCA-5 with the present VCA-5A and VCA-5M devices. This act, contrary to insinuations made by B&B, had nothing to do with their entering the VCA field. In fact, when Mr. Rubens initially contacted me in the spring of 1978, I informed him that we were in the process of improving the VCA-5, but that the improved version would not be ready in time for inclusion in his "scientific paper." Thus, we forwarded VCA-5 samples to him, asking that he acknowledge the fact that the device was undergoing second generation improvements.

I will not be maligned for superceding one product with an improved version, no matter what the underlying reason might be. On behalf of my customers, the industry as a whole, and, of course, my bank account, my duty is toward continual refinement and the introduction of new concepts as they are uncovered.

In keeping with this policy, it should not surprise the reader that yet another Electronic Gain Control Device, specifically, the Allison EGC-101, will be introduced to the industry at the Spring 1979 AES

convention in Los Angeles. The concepts involved in creating the EGC-101 device have been under development in my laboratory for a number of months, and will be discussed in detail at the end of this letter.

### Class A, B, C and AB

These terms are used to define the signal vs. bias conditions within an amplifying device, and are defined by the author below, as well as graphically in the content of Figure 1. If a differing definition exists, I would like to know about it so that I may be more enlightened in my work.

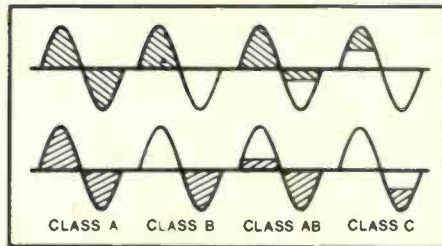


FIGURE 1: AREAS OF CONDUCTION FOR EACH HALF OF A COMPLIMENTARY CIRCUIT VS THE BIAS CLASSES A, B, AB & C

**Class A:** A device whose individual elements (tubes, transistors, etc.) are all in conduction throughout the entire excursion of the signal waveform.

**Class B:** A device whose individual elements are in conduction during alternate halves of the signal waveform. Class B is characterized as having a "dead zone" at zero crossings, where neither of a pair of circuit elements is in conduction.

**Class C:** A device whose individual elements are in conduction for much less than 1/2 of the signal. Class C is not generally used for audio, but is primarily used in tuned RF circuits.

**Class AB:** A device whose individual elements are in conduction for more than 1/2 of the total waveform, but for less than 100% of the waveform. Thus, AB operation falls, as its name implies, between the confines of Class A and Class B. Class AB is characterized as having one element or the other, or both, in conduction during all portions of the signal waveform. In the crossover region, both elements conduct, thereby eliminating the "dead zone" associated with Classes B and C.

I will reiterate from my last reply to B&B that both the dbx 202 and the Allison VCAs are Class AB devices, and do not have "dead zones" in their signal transfer parameters.

It is unfortunate for Mr. Baskind that, as evidenced by his response #2 directed to me, he appears unable to comprehend the meaning of the various classes of amplifier operation. It is further evident to me that Mr. Baskind is not as versed as he would like us to believe in the identification of various distortion types, not in their audible consequences.

I will explain these observations.

Mr. Baskind correctly points out the fact that log convertors cannot physically process negative numbers. He then attempts to convince the reader that, due to this fact, log multipliers cannot be anything other than Class B devices. *Really*, Mr. Baskind; have you not somewhere in your reference library learned that conventional bipolar transistors, vacuum tubes, diodes and electrolytic capacitors are all incapable of physically processing negative numbers for the same reason as are log amps? Have you never heard of bias?

For clarification, I have shown in my Figure 2 a rudimentary example of a balanced log/antilog multiplier. By adjustment of the magnitude of the applied bias voltage, the circuit may be made to perform Class A (bias is greater than signal peaks), Class AB (slight bias to insure no dead zone), or Class B (no bias). Class C operation could be obtained by inverting the polarity of the bias source.

These principles are the same as those employed in appropriate biasing of all amplifier circuits utilizing tubes or transistors.

### Crossover or Notch Distortion

In Class B or C circuits, the "dead zone" at signal zero crossings can cause a discontinuity in the waveform, as shown in Figure 3. In its classic form, as induced by Class B or C operation, the magnitude of the dead zone is constant, regardless of

— Figure 3 appears overleaf —

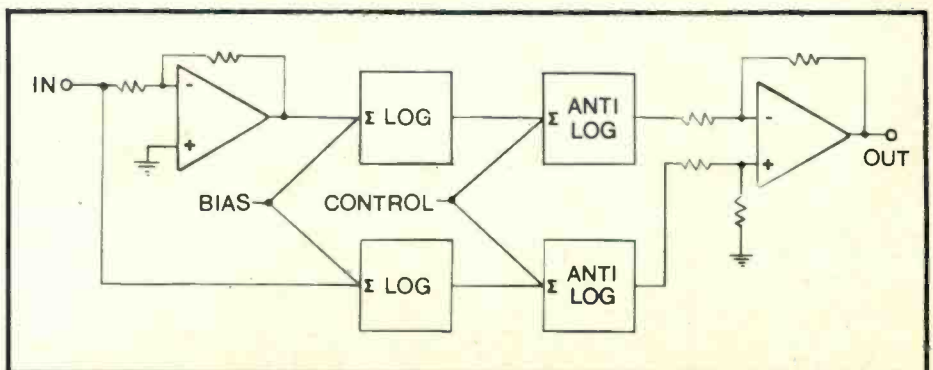
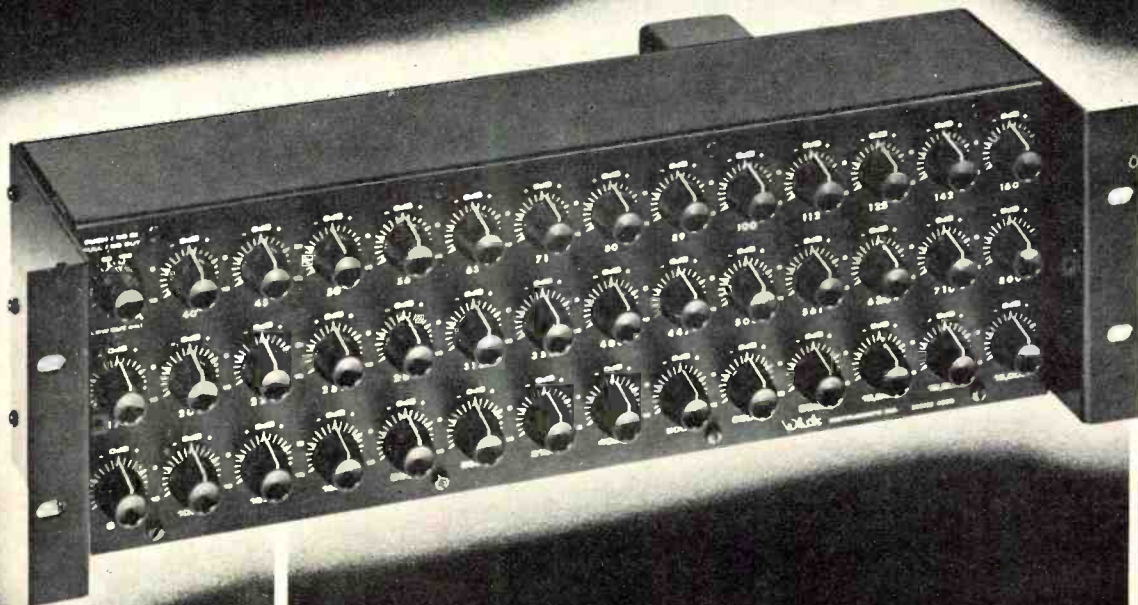


FIGURE 2: RUDIMENTARY CIRCUIT FOR A CLASS A, AB, B or C BALANCED LOG/ANTILOG MULTIPLIER

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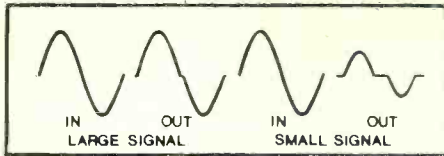


FIGURE 3: CLASS B or C INDUCED CROSSOVER DISTORTION

signal magnitude or signal frequency. Consider the example where the magnitude of the dead zone is 2 mv and is of the classic form. If one were to apply a 20 volt peak to peak signal (+20 dBv) at any frequency, a peak distortion residual of .01% would be measured, due to the 2 mv discontinuity. The effect would be fairly inaudible, since the distortion products produced would be of a peak magnitude 80 dB below the fundamental. An audible product could be detected, however, if the signal were of a low frequency, since the distortion product, though 80 dB down, would fall in a frequency band of greater sensitivity to the ear than that of the fundamental.

Now consider the consequences, in the same circuit, of reducing the signal level to .2 volts peak to peak (-20 dBv). The 2 mv discontinuity will now appear as a distortion product measuring 1% peak, or 40 dB below the signal level. If this signal level were of a low frequency, the audibility of the distortion product could easily exceed an apparent 10%, and become very annoying.

Indeed, then, I would wholeheartedly endorse the findings of Mr. Moeller, without the need for reading his paper. As is the case in essentially all signal abnormalities, the question of audibility simply comes down to a question of the *apparent audibility* of the produced distortion product, with respect to the *apparent audibility* of the signal. I must point out, however, that the determination of *apparent audibility* of sound involves a keen understanding of the nature of the human ear. Only after one has developed this understanding may he accurately predict the results.

Mr. Baskind makes the erroneous statements that the primary distortion products of the VCA-5M are "crossover notches," and that Allison specifications concur. He then further attempts to delude the reader into believing that these anomalies have content within the audio spectrum, and are "more annoying than as much as 10% harmonic distortion." In making his arguments, he shows scope traces of distortion products produced by passing 20 kHz waveforms, wherein the displayed notches represent energy in the AM radio band.

An examination of all graphs and scope photos introduced in the original article will clearly show an absence of Class B induced crossover distortion in the VCA-5M, as will examination of the device itself, by either

measurement, spectrum, analysis, or listening test. What is evidenced and explained by myself at the close of my original reply (*February, 1979 R-e/p*) is a small waveform anomaly of a relatively constant 1 to 2 msec width, which is caused by slightly unequal phase delays in the two circuit halves. It has nothing to do with the type of crossover distortion implied by Mr. Baskind, nor does it relate, as suggested by Mr. Baskind, to audible TIM distortion.

This is so for three reasons:

A. An anomaly having a period of 2 msec has spectral energy in the region of 500 kHz, and is of no audible consequence.

B. The effect, while showing a slight rise with descending levels from +20 dBv to 0 dBv, then begins to diminish to non-measurability at low levels. The effect is nonexistent at moderate to low frequencies, at any signal level. These characteristics are contrary to audible crossover distortion. At no point of either applied frequency or level does the effect manifest itself as a perceivable distortion product.

C. When audio range filters are introduced in the measurement equipment, the effect is gone entirely, as it is in listening tests.

#### The VCA-5M in Practice

Mr. Baskind claims that my suggested console implementation with VCA circuits capable of taking 30 to 35 dB of gain is ridiculous, and will result in serious degradation to the console's performance. I beg to differ, as I believe will Trident, Sphere, Auditronics, Tangent, API, Harrison, and those other companies who have adopted or plan to adopt this sort of level structure.

You see, Mr. Baskind, with the advent of noise reduction, as pioneered by Dolby and dbx, digital recording as pioneered by Soundstream, 3M and others, and automated mixing as pioneered by yours truly and by Mr. Wayne Jones, modern studios no longer universally stuff meter banging levels on their multitrack. We can afford to be a little more sedate these days.

A modern console, particularly an automated one, needs a gain reserve sufficient to pull up the most delicate passage on tape to any of predominance desired by the producer. Additionally, there is the level modifying effect of the equalizers, compressors, expanders and other effects devices which might be inserted at any point in the signal path.

If anyone is interested in obtaining first-hand information on the validity of what I have stated, and on the field performance of the VCA-5M, I would suggest personal contact with one of the studios listed at the end of this letter. They have in common the fact that all have converted standard non-VCA consoles to automated formats; using the Allison Fadex system, which utilizes the

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VCA-5M in the 35 dB gain configuration. I would suggest that the reader ask:

A. Does the console benefit from the increased gain flexibility in the channel, group, and VCA master faders?

B. Did the installation degrade the console's noise performance?

C. Is there audible degradation to the audio signal quality?

### The Baskind Suggested Console

I couldn't agree more with Mr. Baskind's psychology that a minimum amount of gain should follow the VCA, for that has been my prime point in these letters all along. Beyond that point, he leads the reader through a nonsensical series of calculations which bear no resemblance to an in-use analysis of a modern recording console, and which are completely erroneous in reference to the stated noise under signal conditions. These errors would appear to suggest an incomplete understanding on the part of Mr. Baskind on the cause and effect of modulation noise.

He then takes a workable but somewhat outdated 32 channel console structure (Baskind Figure 3), which is incapable of accepting B&B VCATTs without noise degradation, and converts it to an 8 track console which can accept the VCATTs but is no longer workable in the real world (Baskind Figure 4). Where do the equalizers go? How do you make up for their potential signal loss? Where are the VCA group masters? How do you bring up a group since the VCATT has no gain reserve? What happens when a vocal line is -15 dBv on tape and the producer wants it +4 dBv in the mix? How do you keep your retrofit customer from crying when you tell him he must rebuild his console, give up 15 dB of gain reserve, and go back to 8 track in order to use your product?

Now let's go back and review my recommended console structure, and find out just which one is ridiculous.

### Figure 4

In referring to my Figure 4, it can be seen that no gain follows the VCA, but that the

VCA itself may provide up to 35 dB of gain as directed by the various controlling sources, thus allowing the operator complete mixing freedom. It should be further noted that at least 20 dB of headroom exists, and that the structure is nearly impossible to overload without the operator being alerted by the smell of burning VU meters.

In following the signal and noise in a normal mixing or miking session, it is shown that the VCA is presented a nominal level of +4 dBv with an accompanying noise of about -90 dBv. Since my mixing experience has shown that for a typical music program, the sum total of a number of mixed signals will average around 6 dB higher than the individual signals, I have placed the channel faders at 6 dB attenuation. (The group faders and the VCA Grandmaster are placed at 0 dB.) The output noise from each VCA is around -92 dBv, while the signal levels are about -2 dBv.

Contrary to Mr. Baskind's fabrication that modulation noise in the VCA-5M suddenly causes a 20 dB increase in noise level the instant *any level of signal* is applied, the VCA output noise shown in my Figure 4 includes modulation noise, and is typical of the noise performance in the presence of the stated signal level.

As in the past article, Mr. Baskind was a bit overzealous in relating these parameters. In actuality, as I stated in my first reply, the signal induced noise increase in the VCA-5M is proportional to the signal level, and is consistently around 92 dB below the signal level. Thus, noise modulation becomes significant only when large signals are applied, and then still poses no audible consequence, since the RMS noise level tracks the RMS signal level at a 92 dB factor of separation.

Getting back to my Figure 4, the signals pass from the VCA outputs, through the nominally unity gain EQs, and are summed in the unity gain buss amplifier(s).

At the output, we find that the music has summed to produce a +4 dBv, while the 32 noise sources have summed to produce a -77 dBv noise level. Finally, S/N = 81 dB with

20 dB headroom.

Dynamic range? In Mr. Baskind's analysis, the only conclusion one can extract from his example is that all input signals were elevated to the point of producing the maximum buss output level of +24 dBv. Under this condition, the VCAs will each produce an output noise of 92 dB below each signal level in such a manner as to *sum in exactly the same fashion as does the signal*. If the signal in this exaggerated example sums to +24 dBv, the noise will sum to -68 dBv, thereby resulting in a dynamic range of 92 dB. (For 32 channels, 8 channels, or whatever number you like.)

Now, let's go back to the real world mix and assume that, at the end of the second verse, the lead singer had gasped a sigh of relief for having sung the whole verse right. It registered -29 on the VU meter (-25 dBv). During the mix session, the producer says, "I love it! Bring it out in front, real loud." You work the group and channel faders during the passage to bring up the sigh to +4 on the output buss.

During the passage, you have directed 29 dB of gain to the lead vocal VCA, which causes its output noise to become about -60 dBv. The output buss noise also goes to -60 dBv since its noise predominantly comes from the one elevated channel. The output S/N ratio becomes 64 dB during that passage, then reverts to the normal 81 dB.

In my first reply (February, 1979 R-e/p), I showed that a hypothetical console configured for 35 dB gain reserve with the B&B VCATT would produce, at nominal mix position, an output S/N ratio of 53 dB.

I further showed that, both by testing, and by published specification, the marketed B&B/MCI retrofit module would produce, at nominal mix position on a real 32 channel console, an output S/N ratio of 60 dB, without considering any noise produced by the console itself, or by the signal source.

These findings correlate to the dB with Mr. Baskind's own statement in this issue that "the noise performance of the B&B retrofitted MCI console is quite acceptable, being 10 to 14 dB below tape recorder noise at the buss output."

Since non-noise-reduced tape recorders produce S/N ratios of 61 to 66 dB per track, the summation of 32 tracks would come to an S/N ratio of between 46 dB and 50 dB, exactly as Mr. Baskind submits — 10 to 14 dB above the noise of the B&B/MCI console.

What Mr. Baskind conveniently fails to mention is that, thanks to his competitor, dbx, the tape machines used in modern studios employ up to 30 dB of noise reduction. Thus, in the real world sense, the console noise exceeds the tape noise by up to 20 dB — not what I would call "quite acceptable."

On the final subject of the control linearity of the B&B/MCI retrofit, I can only state

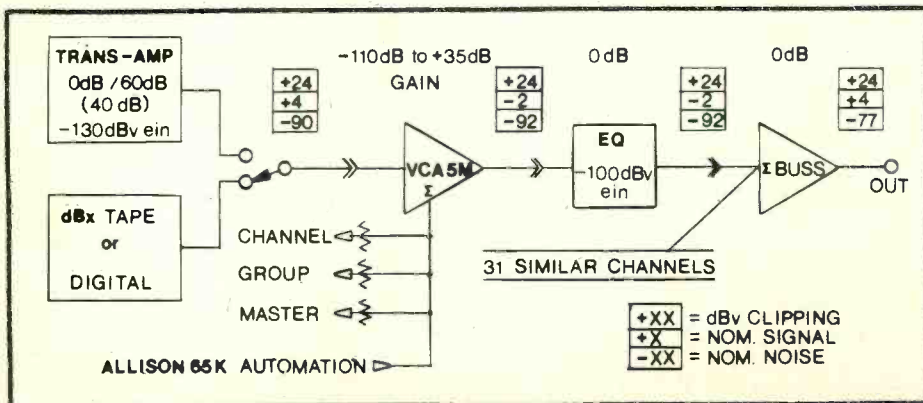
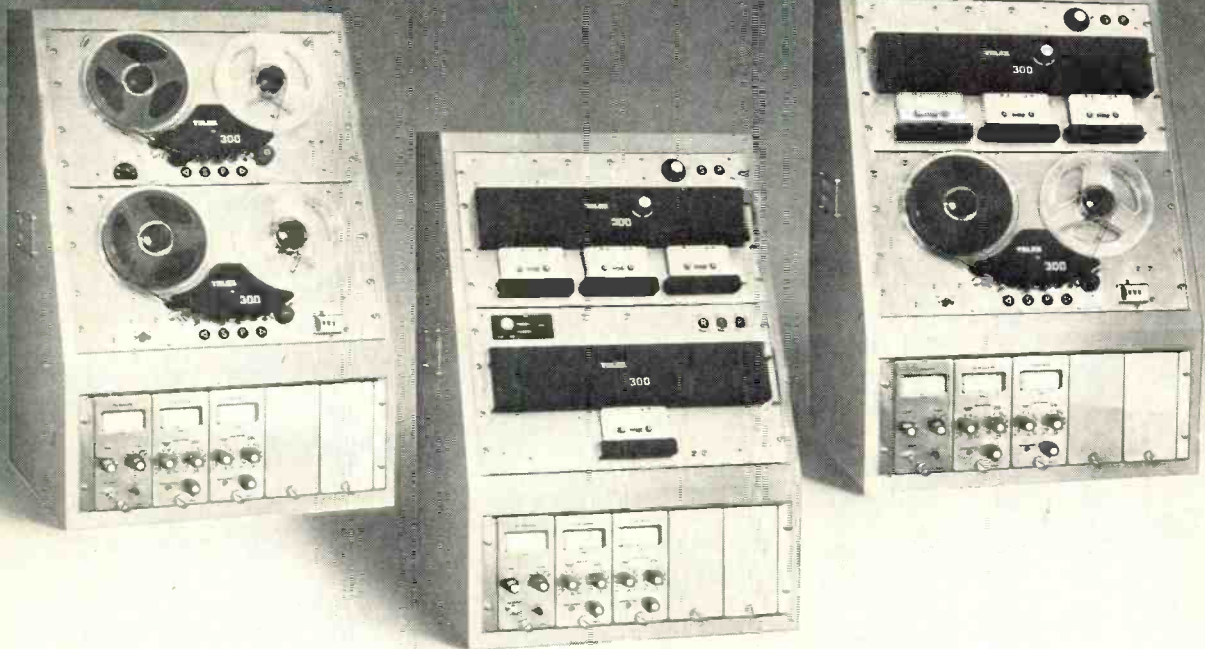


FIGURE 4: ALLISON RESEARCH PREFERRED CONSOLE SIGNAL FLOW

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what I observed in lab testing the marketed sample. Since my test results very closely matched the attenuation vs. control volts curve published in the B&B 1573A literature, and did not resemble Mr. Baskind's Figure 1, I must draw my own conclusions. Out of fairness to B&B, however, I shall attempt to retrieve the sample and re-perform the tests. Should I be wrong, my apologies will be forthcoming.

### The Allison EGC-101

As stated earlier in this letter, Allison Research herewith announces the release of a new generation of Electronic Gain Control Devices, under the basic nomenclature EGC-101.

The reader might ask why, if our VCA-5 is so great, we would contemplate a further generation. The answer lies in my opening statements regarding the continuing ability to improve any analog circuit. I believe that the reader will appreciate the magnitude of improvement offered by the EGC series, after reading the following descriptions.

Generically speaking, the EGC is a complementarily balanced and symmetrical cross balanced Class A log/antilog multiplier.

The device uses neither signal separators nor split signal paths in achieving its transform, nor does the device require the use of the symmetry control (distortion null) associated with Class AB or B devices.

There is no distortion form associated with the crossover region, nor is there any modulation noise beyond the 4 to 5 dB increase associated with large signal peaks in a Class A non-feedback circuit.

The EGC-101 is a current in, current out gain cell which requires but two user definable op-amps in the signal path, those being one input device and one output device.

No differential combining networks or amplifiers are employed,

### Gain Control Range

The theoretical gain control range of the device is from 180 dB gain to 180 dB attenuation, following a precise log (dB vs. volts) control law. This range, in practice, is restricted by the input op-amp, and by stray leakage paths, to a usable range of from 60 dB gain to 125 dB attenuation (at low and mid frequencies), and 100 dB at 20 kHz.

### Noise Performance

Noise performance is excellent, and is affected (within the limits shown below) by the user definable operating currents and choice of op-amps.

Output noise (20 Hz - 20 kHz):  
at full attenuation = -105 dBv to -115 dBv,  
at unity gain = -86 dBv to -90 dBv,  
at 40 dB gain = -65 dBv to -75 dBv.

It should be noted that, while noise performance is similar to the VCA-5M at

**FIGURE 5: DISTORTION TABULATION**

	Trimmed	Untrimmed
SMPT E IMD @ +20 dBv input or output, any gain setting	.009%	.08%
SMPT E IMD @ <+15 dBv input or output, any gain setting	<.005%	<.04%
1 kHz THD @ +20 dBv input or output, any gain setting	.0075%	.04%
1 kHz THD @ <+15 dBv input or output, any gain setting	<.003%	<.02%

unity gain, a 10 to 20 dB improvement is evident at the gain extremes, where noise approaches the theoretical limits, as governed by the values of the input and output resistors. It should further be noted that this noise performance is in the presence of nominal signals, and shows only a slight increase in the presence of high level signals.

### Distortion Performance

The intricate balancing and cross balancing of the gain cell, together with computer selection of its elements, assures an exceedingly low production of distortion products. The further inclusion of two stable external trims (test and connect resistors or inexpensive trim pots) can reduce the residual distortion levels to near non-measurability, as shown below. It should be noted that the values shown are based on a median current level, coinciding with a unity gain noise of about -87.5 dBv, and are anticipated maximum values, reliably achievable on marketed product. It should further be noted that the distortion characteristics are essentially unaffected by thermal conditions. (Figure 5)

### Bandwidth/Slew Rate

Both the small signal parameters and full power bandwidth parameters of the EGC-101 are a function of the op-amps employed. Slew rates of 13V/microsecond are obtained using inexpensive TL070 series op-amps. The effect with still faster devices has not been determined at the time of this writing, but figures around 30V/microsecond are anticipated. Since the gain x bandwidth parameters of the EGC-101 are primarily a function of the input op-amp, attention should be paid to the op-amp's gain x bandwidth, if VCA gains in excess of 40 dB are anticipated.

### Control Rejection

In a Class A true VCA, it is a necessity to trim for minimum control feed through, as well as to AC couple the signal input to eliminate variable amplification of the input offset component. Thus defined, the device can be trimmed to exhibit less than 10 mv (typically 3 mv) control feed through when operated over a gain range of -100 dB to +30 dB.

### Powering/Input Output Overload

When configured as recommended, and powered with  $\pm 16$  volts, the maximum input level, at attenuation, is +27 dB, and diminishes to +22 dBv at unity gain. The

maximum output, with this configuration, is +22 dBv.

The gain cell itself is not powered. Thus, the user's ability to configure circuits with elevated levels is restricted only by the breakdown voltage of the op-amps he selects. It should be noted, however, that unity gain noise must increase proportionately to the higher operating levels, in such an elevated level circuit, in order to maintain Class A operation.

### Packaging

The EGC-101 gain cell is packaged as a .5" x 1" x .4" epoxy molded module with 8 pins, arranged to plug into a standard 18 pin DIP socket. It requires a minimum amount of external circuitry, and may be configured in several ways, to suit the user's needs. The employment of the basic EGC-101 cell is very cost effective, particularly at OEM pricing levels.

Complete factory trimmed VCAs are also available, in a variety of physical configurations, for second source and retrofit applications.

### Patent Information

In addition to patents applications currently in process by the author, the EGC principles are licensed under U.S. Patent #3,714,462, and may not be practiced without specific authority from the patent holders. □ □ □

from: **Harvey Rubens**  
**VCA Applications Engineer**  
**B&B Audio**  
**Aphex Systems, Ltd.**  
**Los Angeles, CA**

When we have met in the past you [Paul Buff] were always a gentleman. Unfortunately, such was not the case when, under the guise of a "factual reply" to our VCA article, you chose to attack us personally by publicly questioning our ethics, our motivation, and our veracity.

For the record, let's get a few facts straight:

1. You say that VCA-5 was an "interim product." Prior to preparation of our paper for the AES Spring '78 Convention you announced in full-page ads that "VCA-5 is here NOW," calling it the "Better VCA." (R-e/p, August and December, 1977.) Perhaps, if this was to be an "interim product," the ad should have read, "VCA-5 is here for a limited engagement," or some such wording.



In our supposed hasty search for quick riches we spent more than two years in uncompensated research and lab work plus considerable money to arrive at a working IC before we even announced that we had a device worthy of professional consideration. We did not bother to try to market any "interim models."

2. When we requested a sample of VCA-5 I personally told you that we were working on a device which, when completed, would be a competitive product and that we would understand if you did not want to send the sample.

3. We agreed to advise you in advance of any performance anomalies we found and to verify them with you before we presented them publicly. This we did in several long distance phone calls at our own expense, and it was only after we reported our findings to you that you mentioned that you were working on an update for VCA-5. This was duly mentioned in our oral presentation to the convention.

4. In our presentation to the convention we announced to the audience that if any manufacturer believed we had misrepresented his product, he could contact us at the convention, and we would publicly offer any required corrections, both in print and to the convention. This same offer was made personally both to you and Mr. Blackmer. *No such communication was ever presented to us in any of our subsequent meetings in the year since then.*

5. We have received considerable favorable comment from all over the world with respect to our findings presented in that paper and in subsequent research. Your attempt to belittle it by punctuating the words "scientific paper" with quotation marks is petty and totally unwarranted.

6. Unfortunately, in the last minute editing of our article in *R-e/p*, not all changes in the text were included. For this reason there is some confusion as to some illustration references. Be this as it may, all comparative photos and graphs in the article as printed contain data measured from your VCA-5M under conditions identical to those for the dbx 202 and our own device. Specific corrections of interest to the reader are:

A. Figure 5A and 5B (page 74) show a greater crossover notch at 20 kHz (not 20 Hz) than at 2 kHz.

B. The first paragraph on page 76 should refer to graphs 6A and 6B and photos 7A, 7B, and 7C. The figures themselves are properly labeled.

7. Libel is an actionable offense with specific legal meaning. If you believe we are guilty of libeling you, please notify either us or our attorney. If you are unprepared to do so, your action labelling our comments as such in print is, in and of itself, a libelous act which we are, as of this moment, willing to overlook. However, in the future, please choose your public wording more carefully.

We sincerely hope that in all future discussions there be no more personal attacks, so we can stick to the merits of our respective products.

You and the public at large are cordially invited to visit us at the Spring AES show where we will have all three VCAs side-by-side for comparison, with sufficient equipment for proper testing.

from: **Edward Bannon**  
**Director of Engineering**  
**One Step Up Recording**  
**Studios**  
**Los Angeles, CA**

As director of engineering at One Step Up Recording Studios, in Los Angeles, I read your collected articles on VCAs with particular interest, since our MCI JH-528 console is fully decked out with B&B VCAs (or VCATTs, if you prefer), as is the JH-528 at Pasha Music House, another MCI studio in Los Angeles which I designed, built, and specified equipment for.

Before we put out the bucks for 32 channels of replacement VCAs in each working console, believe me — *we listened* to both taped and directly miked material-in versus bypass and one VCA versus the other. With the B&B VCA we often had to double check whether it was in circuit or being bypassed. On the other hand, with the dbx 202s (supplied with the stock JH-528), it was like losing a generation of tape — or worse — compared to either the B&B VCA or bypass. In fact, we used to record tracks using the monitor faders just to avoid going through the dbx's more than the one necessary pass during mixdown. Two times through those things was more than we could stand.

If listening is the final standard for judgement then the B&B VCA wins hands-down compared to the dbx 202, and I suggest that Mr. Blackmer's trained listeners used a very rusty wire.

As for Paul Buff's analysis of the noise performance of our MCI console, all I can say is that the noise measured at the stereo buss out with the 24-track machine turned off is 11 to 14 dB quieter than when the machine's own noise is added in. VCA noise hasn't been a complaint here from either engineers or clients.

The same is true for whatever grouping problems Mr. Buff thinks are present. As a matter of fact, I would say we had a problem keeping the group sound together when we had the dbx's.

Client response at both studios has been very positive. One producer here had cut some tracks in Mussel Shoals on a Neve board and an MCI tape machine. He continued overdubbing in Los Angeles on an automated Harrison console, again with an MCI tape machine. In a last minute attempt to get a better bass sound he flew in the original bass player and was surprised

that the bass sound he got directly through our board with no EQ was better than anything he had been able to get *with* EQ and other processing in the other rooms. This is one of many such cases that tell me that it is better not to degrade the signal than to try to repair it.

We are about to add two more rooms. I have specified the console in each to be an MCI JH-542. I have also specified that if MCI cannot supply these boards with B&B VCAs that I would like them shipped with no VCA cards, and I'll get the B&Bs here.

I am not an electronic design engineer, and I leave it to those who are to argue about all the numbers. My specialty is applications, and my living depends on continued user satisfaction. I don't generally speak out in print about one product or another, but I felt it was necessary in this case where a product which has brought so much user satisfaction was taking such a misleading rap from Messrs. Blackmer and Buff.

Those who know me know that I was a true die-hard against VCAs and automation. Now I'm a believer.

from: **Michael C. Sanders**  
**Director, Research and**  
**Development**  
**The Pasha Music House**  
**Hollywood, CA**

For inclusion with the article from B&B Audio:

When Ed Bannon suggested that we try the new B&B VCAs at Pasha, our chief engineer, Larry Brown, set up a listening session with the assistance of Mike Lietz and Dave Holman. They compared channels in our MCI 528 equipped with dbx, B&B, and hardwired faders. The overall consensus was that the B&Bs sounded very much like the hardwires, giving the room more punch and openness than it had before. Over and above anyone's spec sheets, our decision to switch to B&Bs was made on the basis of audible differences. Both we and our clients have been extremely pleased with the results.

---

**Partial list of studios who have retrofitted conventional non-VCA consoles with the Allison Fadex system, using VCA-5M VCAs:**

*Neve Console*  
**Music City Music Hall**  
RCA Building, Nashville, TN

*Auditronics Console*  
**Right Track Recording Studios**  
New York, NY

*API Console*  
**Capricorn Records**  
Macon, GA

*API Console*  
**Kaye-Smith Recording Studio**  
Seattle, WA

Unique double-spider system guarantees centering of the voice coil, and coil alignment in the gap during high power operation at all frequencies.

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Anodized aluminum voice coil support to assist in transmission and dissipation of heat in high power operations.

Voice coil wire terminates at flex lead on the voice coil tube, thus eliminating breakage.

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## THE ECHOPATE CHAMBER

(A Decay Whose Time Has Come.)

by

Larry Rebhun

Over the last twenty years just about everyone involved in professional recording has at one time or another worked with the EMT-140 echo device. Often, engineers use as the standard the fine concert hall characteristics and performance of the 140 when making comparisons of the various other forms of echo devices (i.e.: spring, digital, analogue, even live chambers). The only detractive comment that is expressed by many engineers is that the EMT needs more of a "sizzling" high end echo characteristic. This is particularly true among "rock and roll" engineers. Attempts to design and produce a plate device that more closely conforms to these subjective parameters has for some years run head-on into the EMT patent protections. This patent ran out February 2, 1977. Since that time at least three plate reverb development projects have been undertaken. One such project has been carried to a successful conclusion by veteran recording engineer Jim Cunningham.

Cunningham is presently technical director of United Western Studios (division of URC), in Hollywood. Jim began development of his *Ecoplate* reverberation device while he was studio manager at Sound Market, in Chicago. He started his experiments during the early days of quad (which wasn't too long before the last days of quad), by adding two additional pickups

to a stereo 140. The pickups were held in place with two small magnets so that they could be easily moved to various positions on the plate. By moving the pickups from position to position on the surface of the plate it was concluded that their placement was non-critical. The effect was basically the same. The only degradation in the sound was noticed when they were placed closer than two inches from the edge of the plate. Anywhere else produced enough of a difference between the pickups to maintain the quad effect.

Well, quad died, but when Jim moved west he continued his investigations using the five EMTs belonging to Western. What quickly became apparent to him were the variations between the various 140 plates. One of them definitely had a "better" sound than the others. "A more open sound," according to Jim. He spent enumerable hours trying to make each of the other units sound as good as the best one. He experimented with changing the tension, tried different pickups and amplifiers and even sawed up old speakers for drivers. (The customized speaker drivers were quickly given up since the metal filings kept getting stuck in the gap.) Whenever he tried something new he would ask whoever was mixing at the time for their opinion. Since engineers are not prone to be shy about expressing their views, Jim was able to get

some very useful feedback that was invaluable in arriving at the *Ecoplate's* final design.

It became fairly apparent as a result of his exploration that the sonic differences between the 140s was due to the kind of steel they use, and the ability of EMT to control the quality of the cold-rolled plate. Interestingly, it is said that EMT selects their plates from those that are produced by rollers that are nearing the end of their useful life, hence they tend to be even smoother than new ones. Even though EMT rejects two-thirds of these sheets, Jim concluded that there still existed enough difference from one plate to another to effect the sound of the final product. After extensive metallurgical research he decided that stainless steel was a more desirable plate medium than the cold-rolled steel.

The stainless steel appeared to have a better high frequency response, with a natural decay characteristic in the 1 kHz to 2 kHz region as opposed to 500 Hz with the steel type. The size remains the same, 1 meter x 2 meters. Also, the stainless plate will not rust when you put your unit on the roof, although Jim has seen a lot of rusty EMTs that sounded very good. He claims the rust doesn't seem to affect their performance.

The key to the whole design is something called a bending mode speed. This is equal to the speed that the sound travels through the metal, which in steel is 6,000 meters/second, or

$$C_D = \sqrt{d \times f \times C_1 \times 1.5}$$

d = Thickness

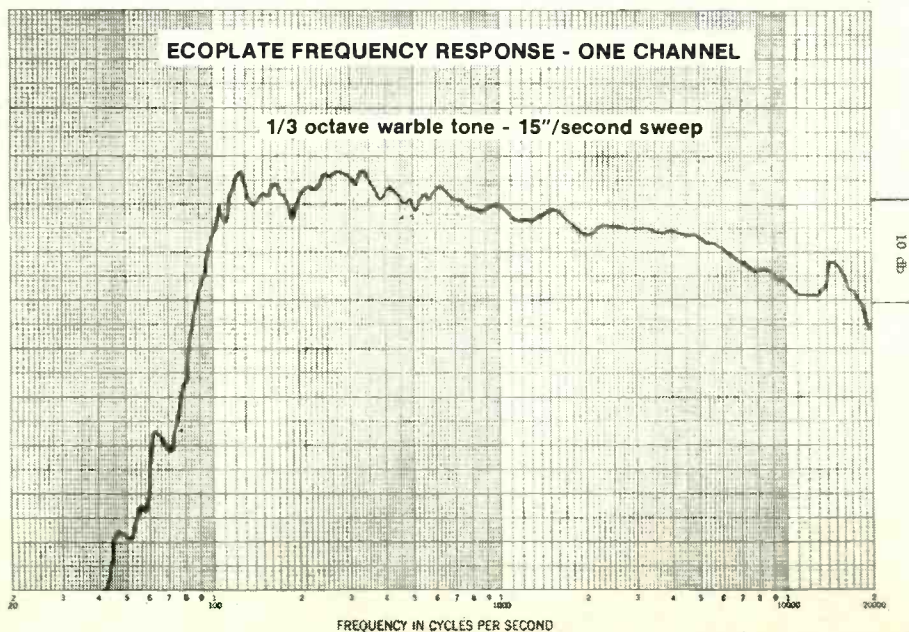
f = Frequency

C<sub>1</sub> = Speed of sound in metal

C<sub>D</sub> = Bending mode speed

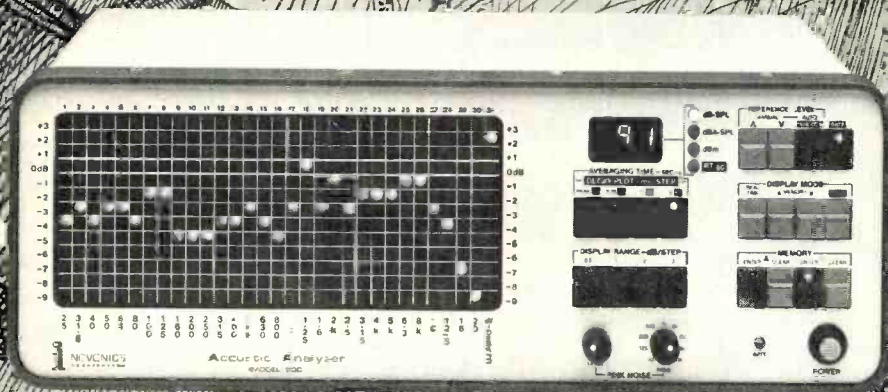
Suffice it to say that researchers tried to make the piece of steel smaller and thinner, to reduce the size of the echo unit, but then found that when you reach a certain point, the high frequency decay is substantially decreased. With a piece 2 mils thick, you have no high frequency decay above 2 kHz because the air pressure dampens the plate. In fact, there is a European radio station that has a reverb system that uses a nickle plate operating in a vacuum. It works quite well, but is a little impractical for the average studio.

All this bending is too small to be seen



The Author: Larry Rebhun has been engineering for the past nine years. He has been on staff at Bearsville Sound in New York, Two: Dot, Ojal, California and Hajj in Hollywood. Presently he lives in Los Angeles and is head of the engineering staff at Cherokee.

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even at the lowest frequencies, but the movement can be slowed by a damping pad, parallel to the plate and a half-inch or so away from it. During the *Ecoplate's* development Cunningham found that frequencies below 100 Hz produced more "mud" than sound, so he put a three pole 100 Hz high pass filter in the unit.

"If you're dumb enough to put a kick drum in the chamber you hear this boom going on for 5 or 10 seconds, and that 50 Hz information would just clutter the reverb, so we cut it off at the input. Once it gets excited with low frequencies you won't be able to stop it. For a decay time of 3½ seconds, the damper is about ½ inch from the plate. The dampening material is also critical. It must have just the right amount of flow resistance to the air pressure. It tends to affect the low frequencies more than the highs.

"Another thing we were aiming at is a flat response with respect to decay time. That's a matter of tightening the plate. A lot of people will double clip an EMT to get rid of that long reverb time at low frequencies. We have real heavy clips on ours so you can tighten it up to anything you want. You can get rid of *all* the low frequency reverb if you want, but it sounds ghastly."

One idea that Jim is planning for the *Ecoplate* is a series of strain gauges . . . one at each tension point with a meter that could be switched to read each one. This would make tensioning a cinch! They only cost about a dollar apiece, and would save hours of hassle.

There are a number of old wives tales floating around about tuning the plates. The main problem has been trying to get enough high frequencies out of the system. Many people feel that tightening the plate increases the top end response; but, in fact,

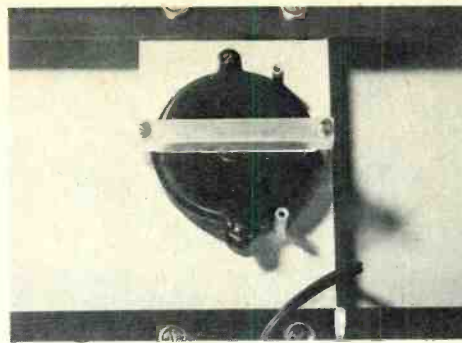


Plate driver.

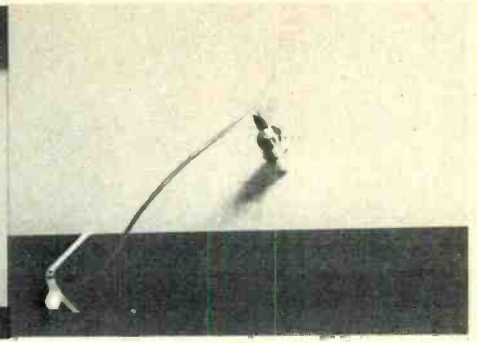


Plate pickup.

increasing the tension only diminishes the bass response. The high frequency output is not significantly increased. The evenness of tension does affect the smoothness of decay and is fairly critical. It is important to have an even tension all around, or else the decay starts to "plateau." If you get 'way off track, you will lose bottom end. There is no way, however, to boost the highs by tensioning. That is why the stainless steel plate seems to give the desired "sound."

The way to measure frequency response of an echo chamber, is through the use of 1/3 octave warble tones. Using a pure tone to set level would drive you crazy because of all the random resonances in the metal.

To check decay time Jim uses a "pinger" which consists of an oscillator, a VCA and an envelope generator. The VCA controls the oscillator output and the envelope generator controls the gain of the VCA. Hence, any combination of frequencies and envelopes can be fed to the plate, from a very short staccato pulse to long, rolling waves.

"You listen on earphones, while you are tuning, by turning the tension nuts. You

might turn this one and hear the decay plateau, so you turn it the other way and it goes straight down, then you know you're doing the right thing. Then you move on to the next nut. You have to do it at a lot of different frequencies. It's a compromise. You adjust them all until it sounds pretty good. That's why the strain gauge would be very nice. It would save a lot of time."

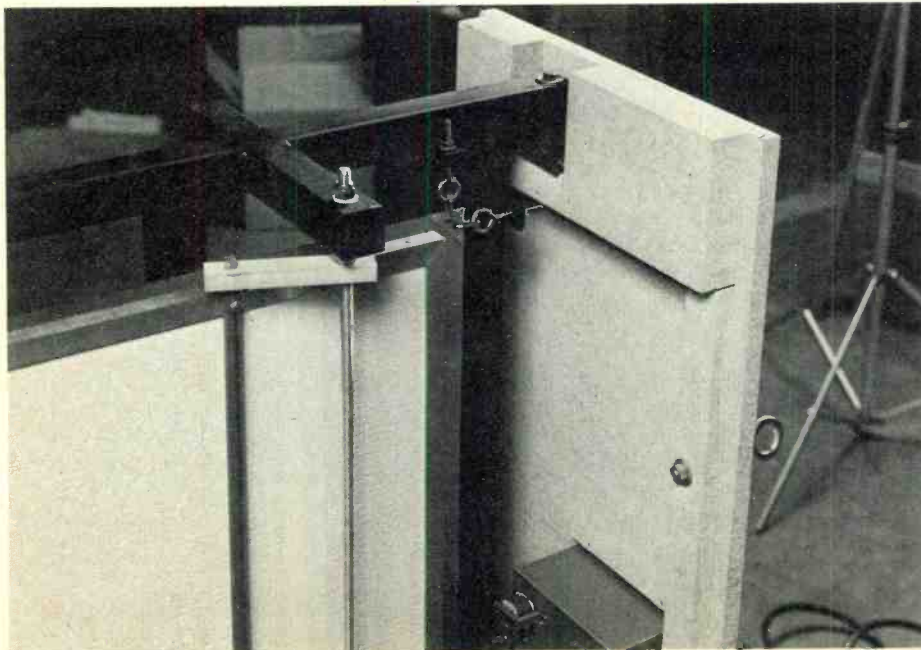
In the area of amplifiers, Jim acknowledges that all he could really do was improve the signal-to-noise and power capabilities. "The most recent EMT device is, of course, a solid state device that was designed, probably seven or eight years ago and it uses perfectly good components. They are just a little bit dated. Now there is available newer, lower noise circuits, so we took advantage of it. We can design something that is smaller and cheaper than the fancy one that EMT has been using." The *Ecoplate* amp will simply plug-in for easy servicing.

The EMT 140 has a switchable, slow acting, vactec type limiter. The *Ecoplate* does not use a limiter since its design can better withstand the heavy transients found in today's recording.

Another area that Cunningham experimented with were the pickups. His plate has two accelerometers attached to it. These devices were originally developed to measure stress by utilizing a small crystal and a lead weight. The pickups have a resonant frequency of 50 kHz. Obviously out of the frequency range of human hearing, it nevertheless contributes to the openness of the *Ecoplate's* sound. The EMT pickups have a resonant frequency of 25 kHz.

Jim also "filled me in" on some of the new design ideas behind the gold foil EMT 240. They knew that the 140 patent was running out, so a few years ago they began designing the gold foil, therefore making enough of a change to warrant a new patent, which would hold for another 17 years. Some of the same people who had worked on the original 140 helped produce the smaller version. In the process they had to come up with a new type of plate. They manufactured an electro-deposited gold foil and somehow changed the characteristics so they could

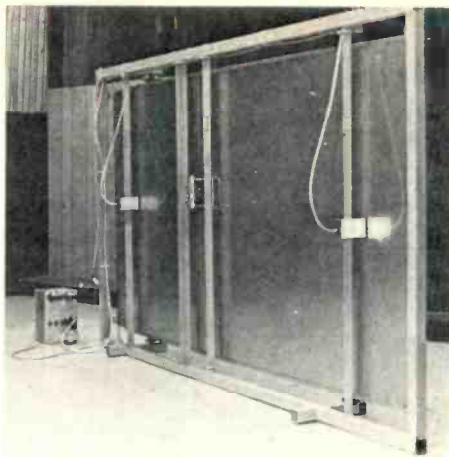
Corner tension assembly, dampening plate and amplifier.



get high frequency decay with a thin sheet. According to the patent (which Jim had in his desk), "The metal foil comprises a nearly pure metal having the characteristics of high thermal conductivity with a low coefficient of thermal expansion."

Cunningham said, "There have been a lot of guys who will take a piece of equipment that they buy from some reputable manufacturer, and they'll just tear it apart and start all over again, thinking they are one-upping the designers. Usually, they wind up with something inferior to what they bought. But when we got all these comments that one EMT chamber was better than the others, we decided to try and make something that was as good or better than that. It was not easy. The designers of these things were no slouches. I have a tremendous amount of respect for them. In designing our unit we made countless changes in the electronics, the pickups and the drivers before we arrived at the solution to the problem. What we think we have developed is a plate which is more current with today's existing recording techniques, at least that's the design aim we worked toward."

Our discussion gradually turned to digital forms of reverberation. "There is a lot of confusion about what reverberation is. Authorities talk about reverb using a digital delay. That's absurd! You would need at



*Ecoplate frame design.*

least a thousand of them. The echo density that is required is a thousand reflections per second, otherwise the ear detects it as not realistic reverberation. You could take a bunch of digital delays and feed them back into themselves through a very complex network, and still the ear would detect it instantly as being artificial.

"The ear needs to hear random characteristics. Real life is random. There is nothing regular about anything in the world. For example, that's why a synthesizer sounds like a reed organ . . . it's a sawtooth. You can do all sorts of fancy things to it, but

the ear detects it right away. Or a trumpet player doesn't hold the same waveform. His embouchure is constantly changing. That's what adds the human-ness . . . the overtone structure is varying.

"There are a number of things that give metal plates their coloration, and they all have to do with the way the ear senses sound. In order to sound fantastic, or natural, an echo unit has to produce at least four resonances per Hertz, in the area of 1 kHz."

To get away from the theory a bit, we talked about the physical appearance. The box is very utilitarian looking. No frills. But who cares . . . the things are stuck away somewhere, out of sight, and anyway it's the sound that's important.

Jim's firm, Programming Technologies, will be offering their plate for a list price through dealers for around \$5,000, and it will come with a rather detailed instruction manual so you can tweak to your ears' delight.

I recently had the opportunity to listen to an *Ecoplate* side-by-side with a 140. It may be close to blasphemy, but there was no doubt about the sound being clearer and more open. It's great to know that there are people out there like Jim Cunningham experimenting so that engineers can sit down at consoles, push up faders, and say, "Ah-h-h-h-h-h-h!"

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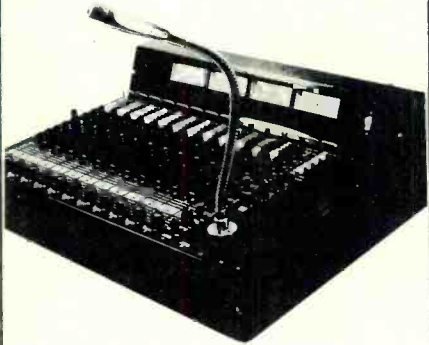


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Other features include: electronic cueing of tape by use of front panel fader,  $\pm 20\%$  speed variation (calibrated in tenths of a percent), timed electronic inserts for gapless and noiseless punches (automatic compensation for vari-speed), rear panel access for interface with SMPTE synchronizers and tape motion controllers, single card electronics, and more.

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Besides these outstanding conveniences, you can have the Sound Tech 1710A with an option that enables you to measure intermodulation distortion.

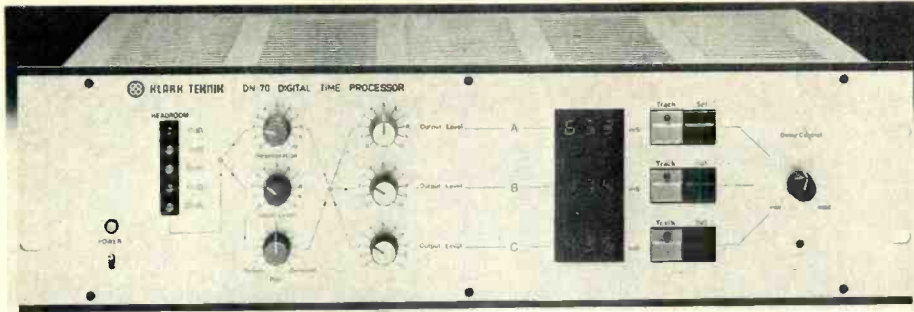
Call Mike Hogue/Larry Maguire to get full information on an instrument recognized everywhere as the standard of the audio field.

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for additional information circle no. 75

R-e/p 151



**KLARK-TEKNIK DN70  
DIGITAL TIME PROCESSOR**

Hammond Industries, Inc., has announced the availability of the Klark-Teknik DN70 Digital Time Processor.

The DN70 is available with delay options of 163 ms, 326 ms, and 652 ms, with a frequency response of 30 Hz to 15 kHz at maximum delay. Because the analog to digital converter was designed in-house, Klark-Teknik's DN70 boasts excellent noise specifications and a full 90 dB dynamic range.

The front panel facilities include an input level control and an LED headroom indicator for constant input level monitoring. Internal input and output level presets can also be adjusted to provide level matching for optimum signal-to-noise ratio. These functions are fully detailed in the operator's manual provided with each unit.

The DN70 incorporates one input and four output channels. All inputs and outputs are standard XLR 3-pin audio connectors. Output A, B, and C are intended for use when straight time delays are needed to compensate for natural time delays in multiple speaker installations. A digital readout of the set time delay is located on the front panel for channels A, B, and C. The DN70 also includes a front panel lockout control to prevent tampering with delay settings in permanent and semi-permanent installations. The control is accessible with a common screwdriver.

The mixed output enables the DN70 to be used as a time-based effects unit and provides a continuous mix of the delayed signal from channels A, B, and C. On the front panel are Regeneration and Direct/Delayed Pan controls which are used in conjunction with the A, B, and C

output levels in determining the composite signal at the mixed output. These facilities enable the user to obtain multiple-repeat effects with full control over the level of each time delay.

The DN70 is available from franchised Klark-Teknik dealers nationwide.

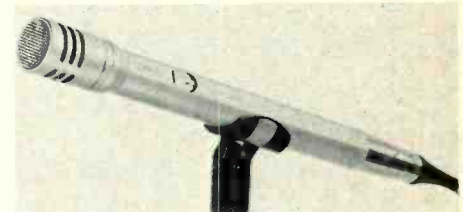
**HAMMOND INDUSTRIES, INC.**  
155 MICHAEL DRIVE  
SYOSSET, NY 11791  
(516) 364-1900

for additional information circle no. 77

**NEW SHURE SM81  
PROFESSIONAL CONDENSER**

Shure Brothers, Inc., has announced its entry into the professional condenser microphone market with the Shure Model SM81, a cardioid condenser unit. Shure feels this microphone is designed to set new standards for mechanical and environmental ruggedness and reliability, while advancing state-of-the-art electroacoustical performance.

The company states that the Model SM81 is a product of years of research and operational testing in a wide range of studio and field situations involving extremes in temperature, humidity, and physical punishment. As a result, the SM81 is said to be capable of withstanding extensive use and abuse, while at the same time maintaining the high quality performance expected of the very best studio condenser microphones, not only in the studio, but in virtually any professional application.



Similarly, the electroacoustical performance characteristics of the Shure SM81 are reportedly the result of extensive development effort. The signal-to-noise ratio and smooth consistent cardioid pattern at all frequencies provide exception off-axis rejection of unwanted sound for improved separation and isolation. In addition to a precise cardioid polar pattern, the electronics section of the SM81 exhibits unparalleled low total harmonic and intermodulation distortion below its clipping point — significantly lower than that of other professional condenser microphones, with no compromise in performance over an extremely wide range of simplex power operating conditions.

The SM81 also features a three-position low-frequency response switch conveniently located on the microphone's case. The switch, which is adjustable without tools or disassembly, can provide the option of a flat

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R-e p 153

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- The Shade Tree Playboy Club Lake Geneva, Wisconsin new studio
- Group Four, Hollywood, Calif.
- KBK Earth City Studios St. Louis, Missouri
- Village Recorders, Los Angeles, California new studio
- Record Plant, Los Angeles, California new studio
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response, a low-frequency rolloff at 6 dB per octave below 100 Hz, or a low-frequency cutoff of 18 dB per octave below 80 Hz. The switch can also be used to compensate for proximity effect.

Another feature of the SM81 is a switchable 10 dB attenuator built into the head of the microphone to prevent high sound pressure levels from overloading the microphone's internal electronics.

The SM81 operates over a wide range of simplex (phantom) powering voltages and impedances. This includes the DIN 45 596 standard voltages of 12 and 48 volts.

The SM81 features a slim, sleek appearance, weighs only 230 grams (8 oz.), and is just 212 mm (8-11/32 in.) in length.

User net price of the SM81 is \$225.00, which includes a windscreen, swivel adapter, and attenuator lock furnished as accessories. Optional accessories include simplex power supplies, a heavy-duty windscreen, a unique new stereo microphone adapter, boom and isolation mount assemblies, and a special 4.3 m (14 ft.) microphone stand.

**SHURE BROTHERS, INC.**  
**222 HARTREY AVENUE**  
**EVANSTON, IL 60204**

for additional information circle no. 80

### EXR CORPORATION EXCITER MODEL EX2

According to the EXR Corporation, their Exciter is the first Psychoacoustic Audio Processing System to be offered for sale. Designed for recording studio, broadcasting, motion picture, television and sound reinforcement applications, the stereo unit restores the natural presence, clarity, fullness and individual signal separation lost in the audio reproduction chain.

EXR Corporation has added internal mix capabilities, pushbutton switching, input level control in solo mode, and multiple LED indicators to the EX2. The internal mixing capability allows the unit to be used in areas where external mixing is not readily available, primarily in broadcasting and disk mastering. The EXR Exciter can now be added in line before the compressor/limiter in broadcasting. Since there is no multiplier effect or phase problems introduced to the broadcast chain, the Exciter is totally compatible with previously enhanced program material. It also adds to the apparent signal strength without noticeably

triggering limiters or compressors.

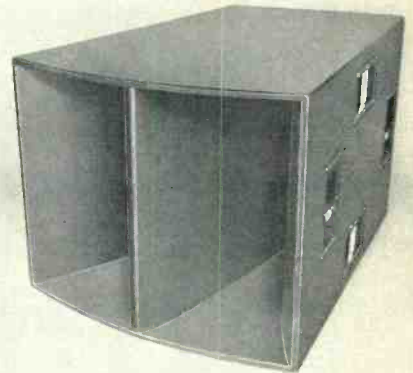
EXR claims their unit has a signal-to-noise ratio of better than 90 dB, its operational simplicity, and its avoidance of the use of distortion, the EXR Exciter may be used anywhere in the audio reproduction chain, from cutting basic tracks to broadcasting.

**EXR CORPORATION**  
**11523 DEXTER-PINCKNEY ROAD**  
**PINCKNEY, MI 48169**  
**(313) 878-9445**

for additional information circle no. 81

### LOW FREQUENCY HORN FROM EASTERN ACOUSTIC WORKS

The new B-212 CT bass horn from Eastern Acoustic Works is designed for applications requiring the highest definition sonic performance at extremely high sound levels. According to the manufacturer, the horn incorporates a novel means of efficiently coupling the bass drivers to the throat of the horn and achieves a theoretically correct exponential transfer over the full horn length which minimizes discontinuity in the air-loaded impedance characteristic. This throat-coupling plug totally avoids degradations of sound pressure level and high-end frequency response which occur in generally available folded bass horns due to their step transition design.



Eastern Acoustic Works reports the construction of the B-212 CT employs new techniques developed to achieve the complex structures required for this design without the resonance and rigidity problems inherent in conventional fiberglass and wood enclosures. The finished horn uses an assortment of woods, high-density foams and special dampening compounds specially selected for each application. The





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They're the new BGW pro amps you'll go for - From top to bottom, The Model 10 Electronic Crossover, The Model 100B Power Amp, and the 250E Power Amp. Each one an extension of our basic philosophy at BGW; The Best.

Whether its a simple resistor or a complex semiconductor, BGW is dedicated to the principle that a pro knows the difference between "good enough" and "outstanding." Because we know that quality in a pro product is indeed something you can see, touch and hear, everything that goes into a BGW product, everything we do in its manufacture, is designed to back up the man who depends on our gear to make his living. And, like all BGW products, the new 250E with our exclusive arc-scale power indicators joins with the new 100B and Model 10 in answer to your demands. They're worthy additions to the solid-gold reputation that's been earned in recording studios, discos and concert stages throughout the world.

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13130 South Yukon Avenue,  
Hawthorne, California 90250  
In Canada: Omnimedia Corp.  
9653 Cote de Liesse  
Dorval, Quebec H9P 1A3

for additional information circle no. 82

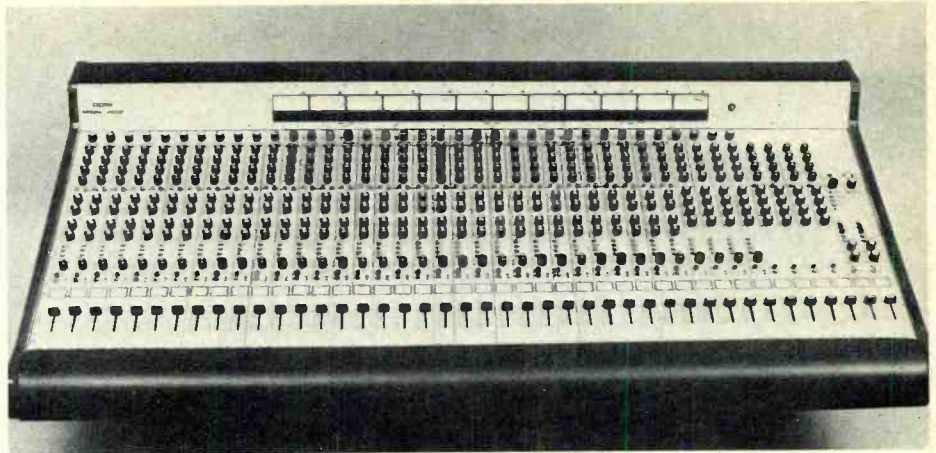
whole device is encased in 15 mm cross grain laminated Baltic Birch and is finished with a semi-gloss black catalysed polyurethane industrial coating that exhibits superior moisture and scuff resistance. Standard convenience features include recessed bar-handles, full hardware complement, and an input assembly consisting of dual 1/4" phone jacks, dual twist locks and banana connections. Wheels and edge trim are available as an option.

The bass horn is intended for modular system use, offering extended low frequency performance when used in multiple arrays. As a result of the low flare rate, a quad array of B-212 CT's will produce 140 dB SPL on axis at one meter from 40 to 350 Hz as supplied with two ATC PA75-314 B-LCR 12" drivers. The use of 12" drivers provides better transient response and lower distortion than typical designs using 15" drivers.

**EASTERN ACOUSTIC WORKS**  
**59 FOUNTAIN STREET, BOX 111**  
**FRAMINGHAM, MA 01701**  
**(617) 620-1478**

for additional information circle no. 83

**APSI ANNOUNCES**  
**TOUGH, NEW ROAD CONSOLE**  
 Audio Processing Systems, Inc., (APSI) has announced immediate production availability of their sound reinforcement



console, the Model 2000 Mixing Console.

According to the company, the Model 2000 is unique in that it has been built to withstand the rough handling of a road operation while retaining all the sensitivity, flexibility and ease of operation of the most sophisticated studio units.

All necessary functions are incorporated in the standard APSI console. As many as 32 input channels feed four sub-mix, four master and four quad output channels in any combination. The twelve outputs may be configured to provide effects, sub-grouping, stage monitors, taping, or house mixes in any combination. All controls and indicators are color coded and logically

arranged to aid in maintaining precise control over each signal.

APSI reports that reliability and versatility of the Model 2000 have been road proven in hundreds of thousands of miles of travel and hundred of flawless performances in concert halls, theaters and clubs of all sizes. No compromise has been made in either sound quality or construction of the console.

**AUDIO PROCESSING SYSTEMS**  
**38 LANDSDOWNE STREET**  
**CAMBRIDGE, MA 02139**  
**(617) 263-8827**

for additional information circle no. 85

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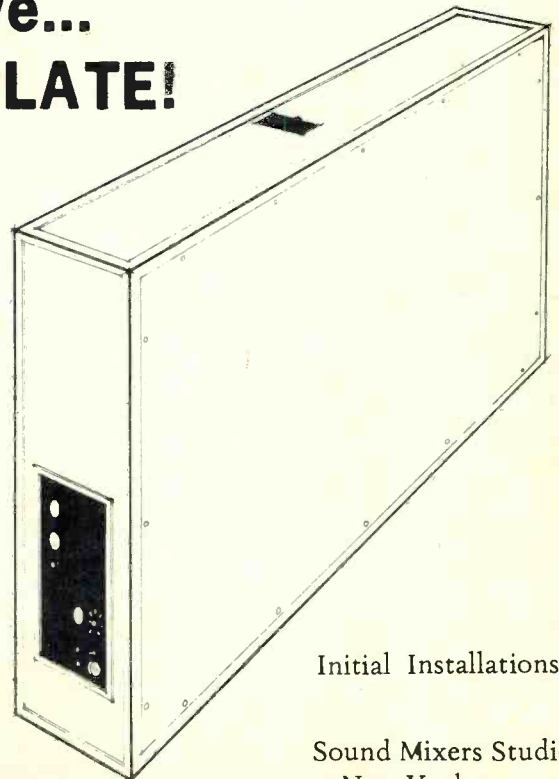
But the real beauty is in the price...

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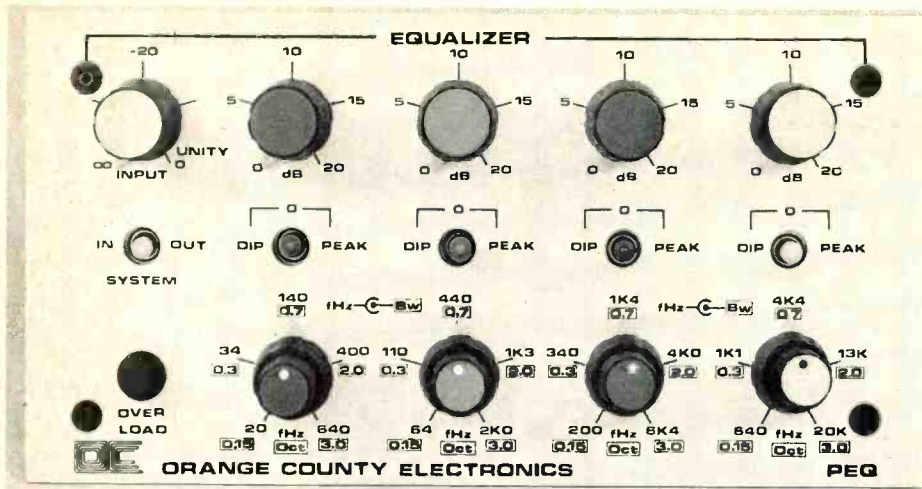
For technical specs and dealers:

**AUDICON MARKETING GROUP**  
**1200 Beechwood Avenue • Nashville, TN 37212**  
**615-256-6900**



Initial Installations:

Sound Mixers Studio  
 New York  
 Tulsa Studios  
 Oklahoma



### NEW PARAMETRIC EQUALIZER MODULE FROM ORANGE COUNTY

Orange County Electronics, Winnipeg, Manitoba, Canada, has introduced their new PEQ full Parametric Equalizer module. The new PEQ module is a four-band parametric with center frequencies variable from 20 Hz to 20 kHz in overlapping five octave (32:1) ranges. Each section tunes over a 40 dB control range. Bandwidth is variable from .15-3 octaves (Q = 10 - 0.33).

According to the manufacturer, a unique feature of this parametric equalizer is that all controls are non-interacting. This means that when the bandwidth is varied, for

example, there is no change in level.

This module reportedly offers extremely low noise operation. Signal-to-noise is 110 dB with all sections in 20 dB boost. Distortion is 0.05% THD @ 18 dBm output. Standard balanced or unbalanced operation is available. An overload indicator warns of excessive levels in any stage of the module. Output capability is +30 dB (10 k load); +24 dB (600 ohm load).

The PEQ is designed to be used as either a mono or stereo parametric in the standard Orange County rack frame. It can also be utilized as part of the Orange County VS-1 Stressor, thereby offering more control in a

signal processing system than is reportedly available elsewhere in the market.

**ORANGE COUNTY ELECTRONICS  
PARASOUND, INC.**

**SUITE 414, 680 BEACH STREET  
SAN FRANCISCO, CA 94109  
(415) 673-4544**

for additional information circle no. 86

### NEVE ANNOUNCES LARGEST STANDARD CONSOLE YET

Recognizing the growing need for high quality 46-track recording, Neve Electronics International, Limited, has announced details of a standard 48-track console specifically designed to meet the latest professional requirements.

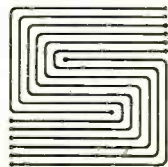
Called the 8098, this new 48-track recording and mixdown console follows hard on the heels of Neve's recently introduced 8078 40-channel 32-track model, but with its 56 input channel capacity it is very much the big brother of the 8078.

Unlike the 8078 with its straight design, the 8098 features an L-shaped design to allow the 56-input channels to be utilized more conveniently. Although Neve have built larger custom designed consoles, the 8098 is the largest standard console so far and, as might be expected, it offers a very comprehensive array of facilities designed to satisfy even the most demanding

— continued overleaf

# 2 4 8 16 24 32 40

SIGNAL-TO-NOISE RATIO referenced to 1040 nWb/m (3% THD) unweighted wideband at 30 ips: on our 2-track 1/2" 80dB; on our 4-track 1/2", 8-track 1" and 16-track 2" 75dB; on our 24-track 2" 72dB; on our 32-track 2" 71dB; and an amazing 70dB on our 40-track 2". We're the quiet one.



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professional applications.

As with most Neve consoles, the 8098's capabilities can be considerably enhanced at any time by the addition of Neve's powerful NECAM computer assisted mixdown system and VCA sub-grouping facilities.

According to Neve, some of the 8098's features include: 56 input channels with full equalization and Penny and Giles faders on each channel; master microphone/line changeover facilities; and master cut A and B facility to enable pre-selected groups of channels to be muted. Four reverberation outputs with delay and slap-back facilities; 6 cue (foldback) groups, 4 mono and 1 stereo output; muting positional solo facilities on all channels; 48 track monitor mixdown section with full quad panning; and 48 track metering using VU or PPM or Bargraph meters. Plus all the usual facilities found on Neve multitrack consoles such as full quadrasonic monitoring, studio loud-speaker circuits, comprehensive talkback facilities, a range of patch-panel options, integral limiter/compressor effects, etc., to customer specifications.

**RUPERT NEVE, INC.**  
**BERKSHIRE INDUSTRIAL PARK**  
**BETHEL, CT 06801**  
**(203) 744-6230**

for additional information circle no. 88



### NEW E-V SHOCK MOUNTED OMNIDIRECTIONAL MIKE

A new shock mounted omnidirectional microphone tagged the DO56 has been announced by Greg Silsby, Professional Products Sales Manager at Electro-Voice.

The DO56 is primarily intended for hand-held broadcast and sound reinforcement applications. According to Silsby, "Isolation of handling noises and mike cable vibration are achieved by having the main acoustic cavity and the diaphragm/voice coil assembly isolated as an integral unit, from the case. This makes a capsule/case collision virtually impossible even under the

most demanding circumstances."

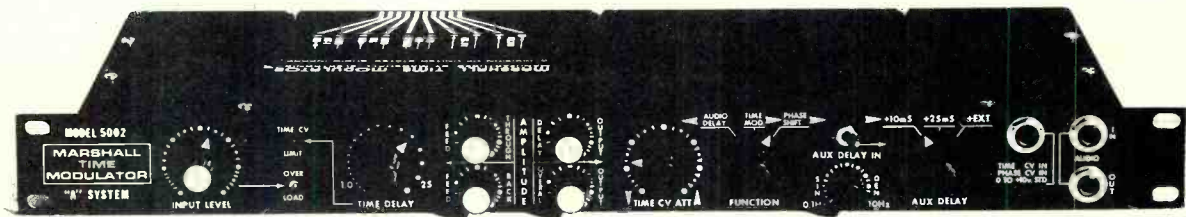
Frequency response extends to 18,000 Hz. A slight emphasis in the 2,000 to 12,000 range enhances the DO56's vocal qualities while a slow rolloff below 200 Hz reduces low-frequency noise interference. "Popping" protection is provided by a high-density Acoustifoam™ blast filter.

The suggested retail price: \$100.

**ELECTRO-VOICE, INC.**  
**600 CECIL STREET**  
**BUCHANAN, MI 49107**  
**(616) 695-6831**

for additional information circle no. 90

## THE MARSHALL TIME MODULATOR™



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Others claim it; we do it.

The Marshall Time Modulator™ started it all, and is now the reference standard to which others compare. Even the effects introduced by the Time Modulator™ have become industry standards; such as Positive Flanging™, Negative Flanging™, ADT™, Card-board Tube Echo™, Resonant Flanging™ and others.

We have not been sitting back and resting these past three years since the Time Modulator™ was introduced. Every advancement in the technologies that apply to delay processing has been incorporated in the new Time Modulator™, assuring performance and specifications that exceed the very best of the newcomers.

New advances now make the unit even

more versatile; with an internal power supply and up to 400 milliseconds of delay at 95 dB.

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**WIREWOKS INTRODUCES  
MULTICABLE COMPONENTS  
GROUP**

Wireworks Corporation, manufacturer of microphone cable and professional multicable systems, is announcing their expanded line of Multicable Components. Geared for the professional user, all components are interchangeable to allow for a system configuration tailored to the application.

Included within the components group are Multiboxes (chassis mount), Multitracks (rack mount), Multitrunk sections and Multitails. Featuring AMP Multipin and Switchcraft QG Series connectors, Wireworks' Multicable Components are now available in sizes ranging from 3 to 50 pairs.



Multiboxes are housed in a chassis constructed of .090" steel, welded and ground and feature two bar-type protective handles. The durable Multitracks are designed to mount directly into all standard 19" equipment racks and feature handles which provide connector protection and additional tie-off points. Multitrunks and Multitails incorporate individually shielded, multipair cable with heavy wall neoprene shrink tubing at connector to provide stress relief.

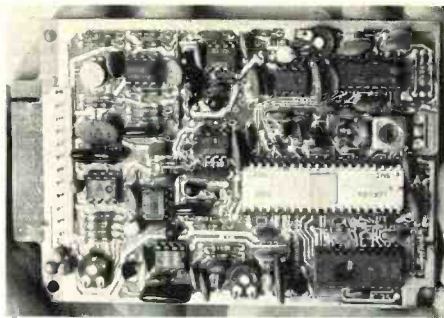
Wireworks Multicable Components are available with XLR or quarter-inch return lines and with 2-way, 3-way, and 4-way mike splitting capability.

**WIREWOKS CORPORATION  
380 HILLSIDE AVENUE  
HILLSIDE, NJ 07205  
(201) 686-7400**

for additional information circle no. 91

**LEXICON PITCH SHIFT  
MODULE AVAILABLE**

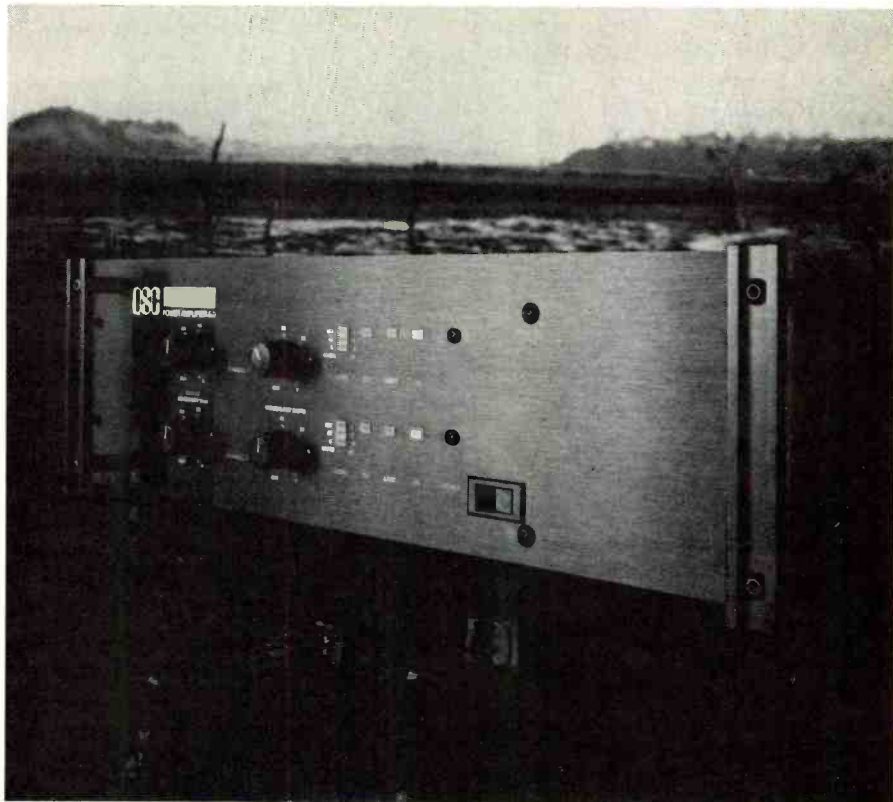
The Lexicon Model 20 is an LSI-based audio pitch shift module that permits tape, disk, and film editors, previewers, and sound reproducers to create off-speed



intelligible speech over a range from 1/2 to 2 1/2 times normal sound speed. Use of a patented, digital "intelligent splicing"

technique allows the module to provide speech time compression/expansion with noise-free splicing. A true multiplicative pitch shift is produced in real time for all frequency components of the input.

According to Lexicon the Model 20 is a continuously adjustable x2.0 to x0.4 pitch shift range, and offers a 100 to 5,000 Hz +0/-3 dB frequency response, greater than 56 dB dynamic range, and 0.6% total distortion and noise. Easily integrated into systems, the 3.5" x 5" module requires only +12 VDC @ 150 ma/-12 VDC @ 50 ma and audio input to function. Provisions for slaving control of an external DC motor to



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rising gradually to 0.2% THD at 20 kHz into 4 ohms) and 600 watts into 8 ohms with the same specs in the bridged-mono operation.

Features include: PowerLimit Controls; Fan Cooling; 3-way Load Protection; LED displays for level, distortion, and limiting indicators; Balanced Inputs with XLR type 3-pin connectors; and Outputs with 5-way binding posts, phone jacks, and speaker protection fuses. Ask your Pro-Audio

Dealer about the A 8.0 or write directly to us for a free brochure detailing the incredible features and specifications of this exceptional new power amplifier from QSC.



AUDIO PRODUCTS  
1926 Placentia Avenue  
Costa Mesa, CA 92627  
714/645-2540

for additional information circle no. 92

R-e/p 163

the selected pitch factor are included.

The Lexicon Model 20 is priced at \$170 each (100 pieces per year). OEM discounts and licensing arrangements are offered. Complete documentation and literature are available on request.

**LEXICON, INC.**  
60 TURNER STREET  
WALTHAM, MA 02154  
(617) 891-6790

for additional information circle no. 93

### AUDIO-TECHNICA 'ARTISTS SERIES' MICROPHONES FOR MUSICIANS

Called the Artists Series, the new line consists of six microphones with various pickup patterns and electrical designs. Three of the microphones are designed for vocalists, three for instrumental pickup.

"A major feature of each of our road-tough vocal microphones is the triple-layer windscreen," says Charlie Winkler, recently appointed as Audio-Technica's first marketing manager - music products. "Rather than a conventional, single-layer screen, there is a heavy outer wire mesh, a finer inner mesh and a fine brass screen. All are soldered in place, rather than glued. This helps assure that the mike will withstand rough handling."

The mikes are available in moving-coil dynamic and fixed-charge condenser



models. According to Audio-Technica, the fixed-charge condenser offers benefits over earlier electret designs. The permanently charged element is mounted behind the moving diaphragm — not on it. The diaphragm is thinner than usual to deliver extremely low distortion and uniform wide range.

Three vocal mikes are designed to eliminate feedback while providing high output. The frequency response is tailored

to "roll off" the low frequencies from the instrumental backup and room environment while accenting the vocal range. The microphones include: ATM31, a unidirectional (cardioid), fixed-charge condenser model; ATM41, a unidirectional (cardioid), moving-coil dynamic model; and the ATM91, a unidirectional (cardioid), fixed-charge condenser model.

Audio-Technica Artists Series instrument mikes include: The ATM10, an omnidirectional, fixed-charge condenser model; ATM11, a unidirectional (cardioid), fixed-charge condenser model; ATM21, a unidirectional (cardioid), moving-coil dynamic model.

The ATM10 and ATM11 fixed-charge instrument mikes are engineered to eliminate potentially dangerous, sub-harmonic frequencies that might add distortion and damage speakers.

The instrument mikes are available with optional shock mounts.

Each microphone in Audio-Technica's Artists Series has a heavy-duty housing with a low-reflectance matte finish.

**AUDIO-TECHNICA, U.S.**  
33 SHIAWASSEE AVENUE  
FAIRLAWN, OH 44313  
(216) 836-0246

for additional information circle no. 95

## Amber 4400A: top studio performer.

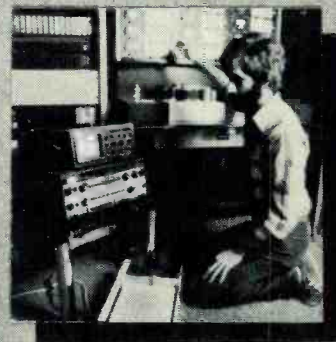
**AMBER 4400A MULTIPURPOSE AUDIO TEST SET.** Designed for an industry where time is money, and maintaining top performance is essential. It saves you time by integrating virtually every test and measurement function you could need. It cuts setup time, and assures quality equal to or exceeding competitive equipment, but at a fraction of the cost.

With your oscilloscope, the Amber 4400A can plot the frequency response of a tape recorder or monitor system; measure the weighted noise of a console; plot the phase response of an equalizer or check the transient behaviour of a speaker; tune your room or measure the RT<sub>60</sub> of your studio. Optional interface lets you make hard copy plots with any XY recorder.

The Amber 4400A combines versatility with quality. It integrates sine, function, sweep, tone burst and noise generator; autoranging digital dBm meter and frequency counter; multimode filter; spectrum analyser; frequency response and phase response plotter.



The Amber 4400A lets you make sure your product is always at its best.



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REPRODUCER CALIBRATOR  
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This precision de-emphasis network provides seven high and three low frequency characteristics for standardizing tape playback equipment with the induction loop technique. Various induction loop assemblies for open reel and cartridge or cassette machines are available for use with the calibrator. The network is passive and employs specially manufactured components to provide all required curves to be used with magnetic tape and film equipment of all formats. A fact sheet and price information may be obtained by writing to the publisher of the Standard Tape Manual.

**R. K. MORRISON  
819 COVENTRY ROAD  
KENSINGTON, CA 94707**

for additional information circle no. 96

**E-V INTRODUCES LOW-COST  
MICROPHONE SHOCK MOUNT**

A new shock mount clamp, designated the 313A, was announced by Greg Silsby, Professional Products Sales Manager at Electro-Voice. The unit has the outward appearance of being a standard stand clamp, but is actually a whole lot more.

Meant to hold microphones with an approximate 3/4" barrel diameter, the 313A is manufactured from polycarbonate and



metal to withstand the abuse commonly encountered in "real world" use. The microphone itself is suspended in the shock mount by four replaceable urethane bands. A hinged metal latch is provided for those applications that require only temporary shock mounting of the microphone, or, when used with a supplied set screw, the 313A becomes an inexpensive semi-permanent shock mount for those applications that don't require frequent microphone changes.

**ELECTRO-VOICE, INC.  
DEPARTMENT SH  
600 CECIL STREET  
BUCHANAN, MI 49107  
(616) 695-6831**

for additional information circle no. 97

**"THE PLATE" BY AUDICON**  
The Audicon Marketing Group announ-

ces "The Plate," a new standard for reverberation systems for use in demanding studios and broadcast facilities.

The surprise in this quality reverb is its surprisingly low price; about two-thirds of other comparable units.

Reverberation characteristics surpass by far those of "plate-type" systems now available. Driver and pickup systems employ the latest technological improvements.

There are no limiter or compressing units in the extremely low-noise amplifier. The low noise circuitry offers a wide dynamic range with headroom to spare.

The plate system in "The Plate" is pre-tensioned prior to shipment so there are no adjustments and no setup is required.

"The Plate" has already been installed at Sound Mixers Studio, in New York, and at Tulsa Studios, in Oklahoma. The unit is priced at \$4,500.00, including shipping within the continental United States.

Other products available from Audicon Marketing Group are multi-pair cables for audio wiring, and specialized power supplies for phantom power and other audio applications.

**AUDICON MARKETING GROUP  
1200 BEECHWOOD AVENUE  
NASHVILLE, TN 37212  
(615) 256-6900**

for additional information circle no. 98

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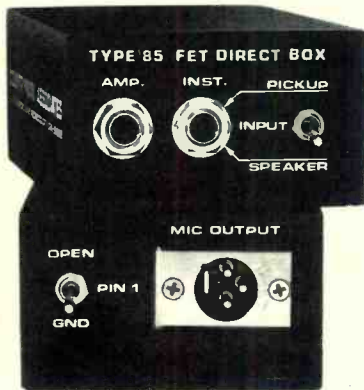


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**NEW NEUMANN CONDENSER:  
THE MODEL U-89**

Gotham Audio Corporation, the exclusive U.S./Canada representative for Neumann products for over 22 years, is pleased to announce the introduction of a revolutionary new condenser microphone: the Model U-89.

Since 1947, when Neumann brought to this country their U-47, and with it revolutionized the recording industry, every introduction of a new model studio microphone has heralded a new fashion in sound, and therefore this new arrival will be watched with great interest.



The U-89, the latest of the FET-80 48 Volt "Phantom Powered" series, maintains the basic shape of the current best seller, the U-87, but trims about 15% off its height and bulk. Its totally new and revolutionary condenser capsule for the first time provides exposed capsule elements, including the two gold sputtered polyester membranes, all of which are at zero Volt potential. The result is far greater security against capsule failure resulting from humidity, human breath and accumulating dirt.

The U-89 features five directional characteristics: the three basic ones, cardioid, figure-8 and omni-directional, and the additional hyper-cardioid and wide cardioid. The former is an extra narrow pickup angle at the expense of a small back lobe, while the latter is a very wide-angle cardioid which may best be described as "uni-directional." All of the patterns have a directional integrity previously available only in the miniature KM microphone series. While the U-87 microphone has but one transistor, the U-89 has ten and with it an undistorted sound pressure tolerance that's up 12 dB. There are two selectable low frequency roll-off curves: one at 80 Hz and one at 160 Hz turn-over frequency plus

flat response, of course. A 6 dB overload protection switch completes the U-89's facilities.

The U-89 is available in quantity immediately following the AES Convention in Los Angeles. Accessories such as wind screen, elastic suspension and battery supplies are available.

**GOTHAM AUDIO CORP.**  
741 WASHINGTON STREET  
NEW YORK, NY 10014  
(212) 741-7411

for additional information circle no. 100

**LEXICON ANNOUNCES NEW  
DIGITAL REVERBERATION SYSTEM**

A new digital reverberation system with superb audio quality and extensive control capabilities has been announced by Lexicon. The Model 224 provides a long-awaited alternative to large, cumbersome mechanical reverberators. The 224 provides reverberation with smooth, natural decay without coloration, "twang" or "boing." Its 5" x 8" remote control console puts reverb control right at the producer's fingertips allowing unprecedented control over all significant reverberation parameters. The system is the industry's first reverb with a built-in control memory that provides instant pushbutton recall of previously set effects. Model 224's high speed digital processor accepts up to eight different programs and requires only seven inches of rack space. It not only saves studio space but is fully portable for on-location use.

Lexicon has developed a library of programs including: concert hall programs with stereo input and four outputs that create the space and depth of a live performance with decay times of 0.6 seconds to 70 seconds; acoustic chamber programs that provide sound equal to the best reverberation chamber and pre-delay up to 256 milliseconds; plate programs that out perform the highest quality reverberation plates or other mechanical devices with full control of all parameters including pre-delay.



A basic program is selected by pushbutton and then is tuned for the desired sound by adjusting six slide pots whose parameters are digitally displayed in engineering units. Reverberation times in seconds for both bass and mid-range may be set independently. The bass to mid-range crossover is set in kHz. Depth, a non-dimensional parameter, is set to simulate the position of the reverberant pickup in concert hall programs. Pre-delay is set in milliseconds to create the desired effect in chamber and plate programs.

**LEXICON, INCORPORATED**  
**60 TURNER STREET**  
**WALTHAM, MS 02154**  
**(617) 891-6790**

for additional information circle no. 103

**NEOTEK SERIES III  
RECORDING CONSOLE**

Neotek announces its series III professional recording console. The series III is a full function, state-of-the-art transformerless recording console.

The series III joins the series I and II transformerless PA console that the firm has been manufacturing for the past seven years. It is available in two frame sizes, 28-inputs or 40-inputs with up to 32-track assignment.

Standard features include completely transformerless design throughout, utilizing the latest state-of-the-art high speed circuitry. Each IO module features a full four band state variable parametric equalizer, channel mutes, odd/even track panning, and stereo/mono solo functions. The console status functions are performed by master logic controlled FET switching; group muting and solo-in-place are performed by the master logic.

The light meters are individually switchable between VU and PPM characteristics with an overall dim control. VU meters with peak indicators are

provided on the two mix output. Other standard features include four cue/echo sends with EQ; talkback, slate, and dim logic; alternate speaker switch; switchable pre/post EQ; internal phantom power; a solid hardwood frame; and the slickest functional layout on the market.

Series III is available with automation as an option. The series III with 28-inputs and 24-track assign is available for \$23,000.00.

**NEOTEK**  
**P.O. BOX 11127**  
**CHICAGO, IL 60611**

for additional information circle no. 102

**MITSUBISHI AUDIO  
DA-A7DC AMPLIFIER**

Mitsubishi Audio has announced a new power amplifier. The DA-A7DC which delivers 75 watts per channel (RMS) into 8 ohms with 0.01% total harmonic distortion.

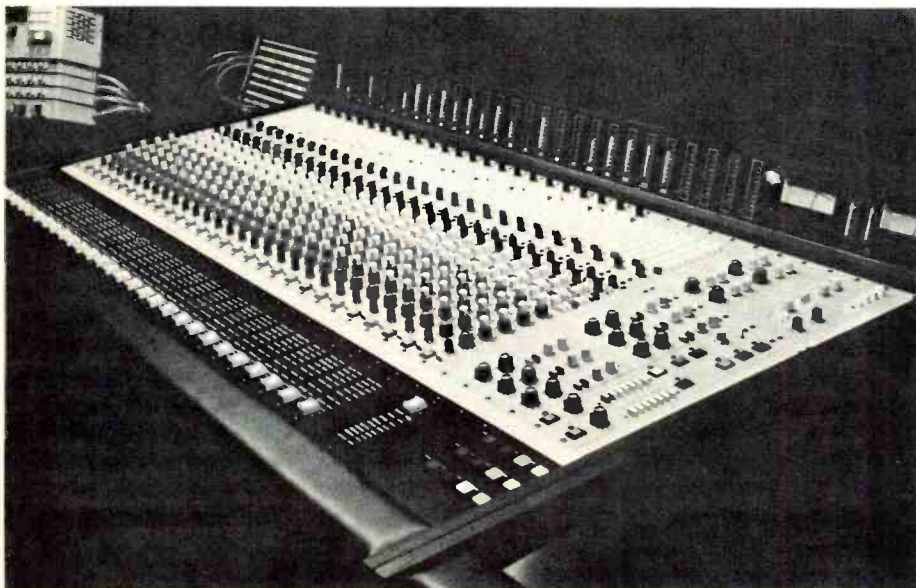
Fred Hartfelder, Mitsubishi national audio director, said the unit's suggested retail price is \$330, and will be delivered in quantity nationally beginning in March.

The unit's highly sophisticated circuitry utilizes state-of-the-art ultra-low noise semiconductor technology, providing a signal-to-noise ratio of 122 dB (IHF A network). The circuitry is entirely direct-coupled resulting in a frequency response of flat to 0 Hz (DC).

Like all Mitsubishi amplifiers, the DA-A7DC utilizes the company's unique "docking," in which any Mitsubishi preamp or tuner-preamp can be joined electrically and physically to the amplifier so that the preamp or tuner-preamp front panel controls regulate all functions for both units.

Reliable, safe operation is reportedly ensured by relay-operated protection circuits which guard the output transistors from overload and isolate the speakers from potential damage.

Other specifications include: frequency response of +0 -0.1 dB from 20 to 20,000 Hz;



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**MICMIX Audio Products, Inc.**  
2995 Ladybird, Dallas, TX 75220  
(214) 352-3811

for additional information circle no. 104

10 to 60,000 Hz power bandwidth; 80 dB channel separation (at 1 kHz). Dimensions are 16¾ wide x 6¾ high x 9¼ deep. Weight is 26 lb., 8 oz.

**MITSUBISHI AUDIO SYSTEMS  
MELCO SALES, INC.  
3030 E. VICTORIA STREET  
COMPTON, CA 90221  
(213) 537-7132**

for additional information circle no. 105

**SPECK MODEL 800-D  
MIXING CONSOLE**

The Speck 800-D is a 16 input, 8/16 output studio mixing console. The console is totally modular with 16 input modules, a master module, and a complete communications module housed in a sturdy mainframe that contains 10 large, illuminated VU meters.

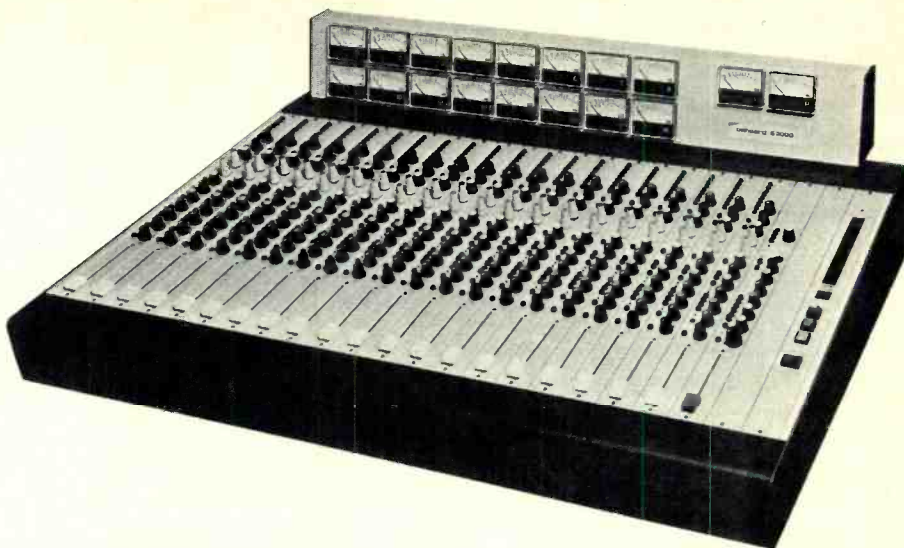
Each input has 8 panable assigns, 3 band parametric equalizer, 3 sends, pan, stereo solo, a long throw slide fader, and most important: a second line input with an independent slide fader, a 2 band equalizer and pan.

Since the Speck 800-D has two discrete line input circuits for each input module and 16 assignable direct outputs in addition to the 8 sub-masters, the 800-D is well suited for 16 or 24 track studio operations. The stereo program buss is independent of the 8 track assign section which allows the console to feed a full compliment of ½-track, ¼-track, and cassette recorders simultaneously during mixdown.

The unit is priced at \$9,800.00.

**SPECK ELECTRONICS  
7400 GREENBUSH AVENUE  
NORTH HOLLYWOOD, CA 91605  
(213) 764-1200**

for additional information circle no. 106



**RAINDIRK CONCORD  
S2000 CONSOLE INTRODUCED**

Raindirk will be introducing the Concord S2000, a new low price mixing system at the Los Angeles AES. The mixer features electronic signal switching and P.R.O.M. controlled status switching to give a flexible, easily operated mixer. It is suitable for a very wide range of applications, including recording and re-mixing, broadcasting and PA work.

Also to be exhibited will be a Series III mixer with a number of new features to further enhance the flexibility of this very popular mixer.

**RAINDIRK, LIMITED  
33A BRIDGE STREET  
DOWNHAM MARKET  
NORFOLK, ENGLAND  
(036 63) 2165-3617**

for additional information circle no. 108

**A NEW 2,048-STAGE BBD  
ANNOUNCED BY PANASONIC**

A new, low-noise 2,048-stage BBD ("bucket brigade device") is now available from the Electronic Components Division of Panasonic Company. Designed as "BBD3008," it comes in an eight-pin DIP plastic package offering a variable delay time of up to 104.8 milliseconds, low insertion loss (0 dB typical), wide dynamic range (signal-to-noise about 78 dB), wide frequency response (about 0.3 of the clock frequency), low total harmonic distortion (0.5% typical), clock frequency range of up to 200 kHz.

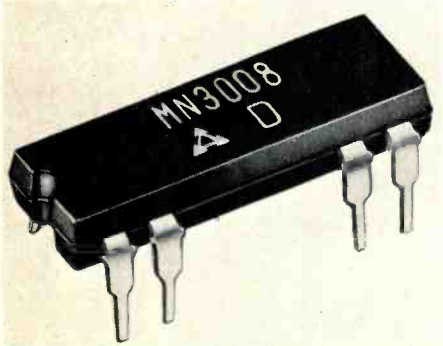
According to Bill Bottari, Panasonic's product manager: "The new BBD3008 offers an inexpensive alternative to a designer of audio and general analog circuits. Unlike conventional BBDs, the BBD3008 is an extremely low-noise device. It can be used to obtain reverberation

The Symetrix CL-100 represents a major step forward in versatility and cost-effectiveness.

Consider these features: D-essing, Independent attack and release controls, Side chain insertion which allows an equalizer to be patched into the control loop for frequency dependent threshold, and LED gain reduction and threshold indication. CL-100: \$299, CL-100B (Balanced): \$349.

**Symetrix, 109 Bell Street, Seattle, Washington 98121 (206) 682-3076.**

effects in electronic organs and other musical instruments; variable or fixed delays of all kinds of analog signals; telephone time compression and delay line for voice communication systems. Of course, the latest addition to the Panasonic BBD family — the BBD3008 — provides the designer with more choice to fit his requirements (other BBDs that were introduced previously are BBD3001 through BBD3007)."



The deliveries of BBD3008 are stock to 8 weeks. OEM discount prices are available on request. In 1,000-piece lots each BBD3008 costs \$14.95.

**PANASONIC COMPANY**  
**ONE PANASONIC WAY**  
**SECAUCUS, NJ 07094**  
**(201) 348-7276**

for additional information circle no. 109

**MUSIMATIC MMX-1800A**  
**SOUND MIXER**

The MMX-1800A is Musimatic's new 18 channel stereo mixer which boasts these features: talkback mike, separate headphone section, 3 band EQ on each input, 4 band monitor EQ, built-in reverb, output VU meters, recording outputs on

each input, line/mike input select switch, input LED clipping light, slide pots and built-in road case.

The MMX-1800A is designed to be highly dependable and functional in any multichannel recording or live PA use.

Suggested retail price is \$2,380.00.

**MUSIMATIC, INC.**  
**4187 GLENWOOD ROAD**  
**DECATUR, GA 30032**  
**(404) 289-5159**

for additional information circle no. 110

**AMBER ELECTRO**  
**DESIGN EXPANDING**

Amber Electro Design, a Canadian based firm, has agreed to allow Track Audio, Incorporated, a U.S. based firm, to continue manufacturing the Model 4550 Spectrum Display. All correspondence relating to this device should now be directed to Track Audio, Inc.

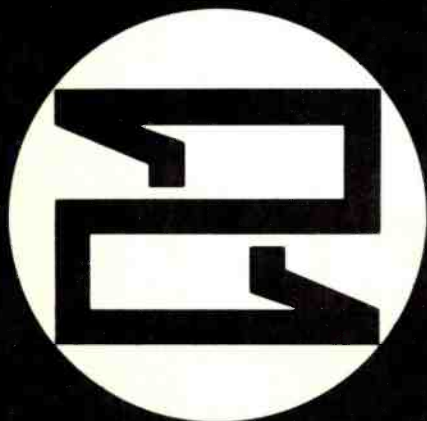
Since the introduction of the 4550, this product has found the pathway into numerous recording studios and broadcast stations around the world. Similar placement has also been found in the sound reinforcement area.

The unit is a full octave device used in the measurement of spectrum content and contains two memories useful in A - B comparisons. Currently, this is the only full octave device on the market in the world.

Track Audio, Inc., is in the process of setting up a distribution network and is open to dealer inquiries. Correspondence should be sent to:

**TRACK AUDIO, INC.**  
**33753 9th SOUTH**  
**FEDERAL WAY, WA 98003**  
**(206) 838-4460**

for additional information circle no. 111



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News

### UCLA SYMPOSIUM HIGHLIGHTS "THE REVOLUTION IN HOME ENTERTAINMENT"

UCLA Extension will provide a forum for demonstration and discussion of "The Revolution in Home Entertainment: New Technology's Impact on the Arts," May 11-13 at the Los Angeles Hilton Hotel.

The symposium will be held on the eve of the 1979 Los Angeles Convention of the Audio Engineering Society. It will bring together experts in technology and arts programming to demonstrate and discuss new tools and systems of communication and the new dimensions in multi-media arts events they make possible.

Martin Polon, chairman of the 1979 AES Convention and director of Audio-Visual Services at UCLA, will conduct the symposium, presented in cooperation with the AES and *Audio* magazine.

The Friday, May 11, evening session deals with "Sound: Recreating the Live Concert in the Home." Demonstrations will include new speakers, amplifiers, disk, tape, and digital delay.

The Saturday, May 12, morning session features "Sound: Capturing the Live Performance for the Home," with demonstrations of digital recording, direct-to-disk, microphones, and computer mixing. The afternoon session "Video in a Multimedia Arena" will feature demonstrations of cable TV, motion picture, home video tape and video tape and video disk, stereo projection TV.

The final session, Sunday morning, May 13, "The Information Connection: Broadcasting into the Home," will feature demonstrations of electronic literature, visual arts inventory, TV newspaper, radio TV, shortwave, computer graphics. In the afternoon, "Home Entertainment: Visions of the Year 2000" will feature demonstrations of laser or coherent light communication and satellite transmission.

Featured speakers are John M. Eargle, vice president, product development, JBL; Richard E. Heyser, senior engineer, Jet Propulsion Laboratory, California Institute of Technology; Eugene Pitts, III, editor, *Audio* magazine; Andrea L. Rich, director, Office of Instructional Development, UCLA; and Emil Torick, director, Audio Systems Technology Center, CBS Technology Center, Stanford, Connecticut. Other speakers will be announced.

All sessions will take place in the Golden State Room and the Pacific Room of the Los Angeles Hilton, 930 Wilshire Boulevard.

The \$85 fee includes admission to all exhibits and general sessions of the AES Conception, May 15-18, at the Hotel.

For enrollment information, write The Arts, UCLA Extension, P.O. Box 24902, Los Angeles, California 90024, or call (213) 825-9064.

### BEE GEES RESPONSIBLE FOR MANY "GIFTS OF SONG"

The latest in a succession of Bee Gees' "song gifts" to underprivileged children stems from the group's fourth Ampex Golden Reel award, presented by the magnetic tape manufacturer in honor of the brothers' new single, "Too Much Heaven." The award carried a \$1,000 cash donation to a charity of the artist's choice.

This gift, the fourth Ampex has presented to children's agencies on behalf of the Bee Gees, will go to the Sunrise School for Retarded Children, in Miami, Florida. Miami is now home base for two of the brothers and the site of Criteria Recording Studios, where the Bee Gees record their hits.

The Bee Gees received the Golden Reel award January 12th in Los Angeles during a week of heightened musical activity. The occasion was proclaimed "Bee Gees' Day" by mayor Tom Bradley and included appearances by the Bee Gees on two network television shows. The brothers also became only the fifth singing group ever to

be honored with the Chamber of Commerce "star" on Hollywood Boulevard's prestigious Walk of Fame.

Three days earlier, the group was at the U.N. in New York taping "A Gift of Song," the internationally televised benefit concert for UNICEF. Conceived by the Bee Gees to celebrate the International Year of the Child, all proceeds derived from the original songs aired on the program will flow to UNICEF to provide basic care for children in over 100 developing nations. Income from sales of the Bee Gees' "Too Much Heaven" and the songs of ten other entertainers on the program are estimated to top \$100 million.

In addition to Golden Reels for "Too Much Heaven" and "Saturday Night Fever," the Bee Gees have two others to their credit. No other group has won more, and in every case the brothers designated children's agencies as recipients of the donation.

The Ampex donation for the album "Main Course" went to the Children's Health Council, in Palo Alto, California, and the contribution for "Children of the World" went to "Jerry's kids" — the Muscular Dystrophy Association.

The innovative program is the only recording industry award that carries a charity donation, and is the only award to recognize the entire recording team,



including the recording studio, engineers and other technical personnel, as well as the artists.

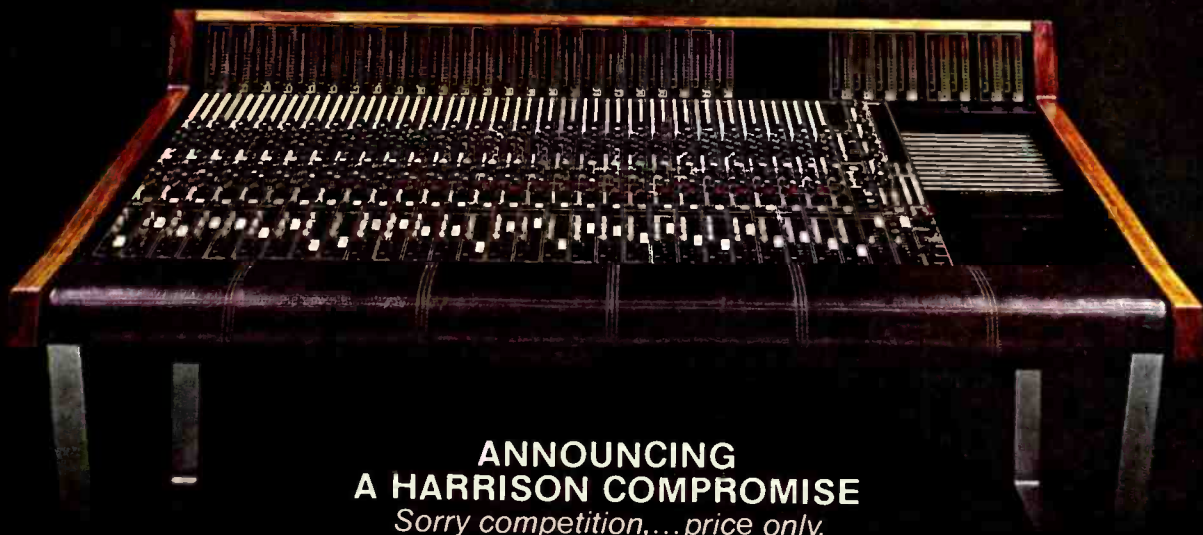
With the program now in its third year, more than 450 award plaques have been presented and over \$80,000 has been given to worthy causes — most of it to non-profit child care organizations.

### QUAD-EIGHT DELIVERS A NUMBER OF FILM RE-RECORDING CONSOLES

Quad-Eight, the North Hollywood, California, manufacturer of mixing equipment, has recently supplied two large automated consoles to Nippon TV, in Japan; acquired a contract from Norsk Film, of Oslo, for a customized QE-2441S film re-recording console, and has also shipped a QE-2441S unit to Romania Films.

The academy award winning company

# GREEN BACK



## ANNOUNCING A HARRISON COMPROMISE

*Sorry competition, ... price only.*

Affordable automation is now even *more* affordable. The Harrison 3624 and 2824 are now available at 10% off for a limited time. Not a quality cutback, but a price rollback so you can put some of the long GREEN... BACK in your pocket.

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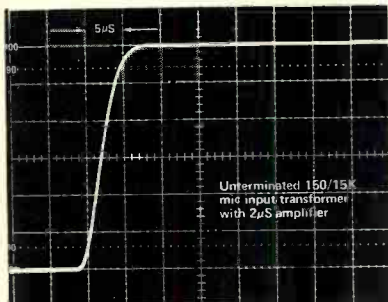
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still receives orders from major Hollywood concerns:

— Universal Studios: A 76-input custom Compumix III film system; a QE-2441S re-recording console and a custom electronic looping console.

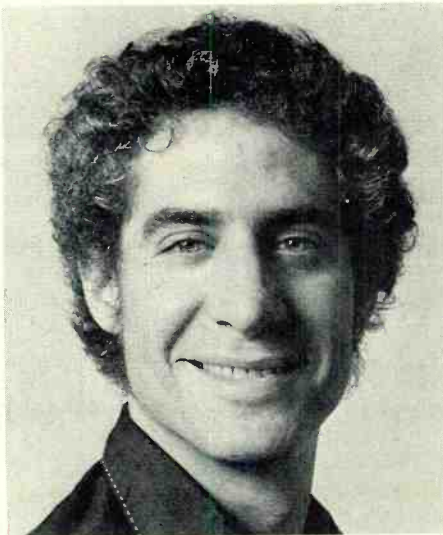
— Robert Altman's Lion's Gate Films: 45-input Compumix automated re-recording and turnkey package.

— Ryder Sound Services: Installation of a 45-input Compumix III automated system has just been completed with a custom electronic looping console to follow.

— Todd-AO: Quad-Eight has re-equipped the facility at Todd-AO, finishing refurbishment with the installation of a 96-input, 6-track re-recording console in Studio "A" and a 24-input, 4 buss stereo re-recording console in Studio "B."

### FANTASY NAMES NEW V.P.

Jim Stern has been named vice president of engineering/studio operations for Fantasy/Prestige/Milestone/Stax by label president Ralph Kaffel.



Stern was well-known as a drummer in the Bay Area when he joined Fantasy in 1969 with an in-house rhythm section backing a busy schedule of R&B sessions.

F/P/M/S chief engineer since 1971, Stern heads a staff of 15 and supervises three recording studios. He is currently overseeing the preparation of a new state-of-the-art fourth studio and disk mastering studio in the seven-story tower now being added to the Fantasy building.

### BTX ESTABLISHES WEST COAST OPERATIONS

Opening of West Coast operations of the BTX Corporation is announced by Ronald C. Barker, general manager of the Weston, Massachusetts, manufacturer of SMPTE time code systems.

The new BTX operations are located at 6255 Hollywood Boulevard, where the telephone number is (213) 462-1506. Jerry Hudspeth has been named manager for

BTX. He came from Pacific Video Corporation, where he was responsible for marketing and sales.

### NEW SPECTRA SONICS BUILDING COMPLETE

Spectra Sonics president, Mr. William G. Dille, with understandable pride, announced recently that their new building, constructed to his design and specifications, is completed. The new factory is situated across the road from Ogden's Municipal Airport where the company airplane is hangered. The two story structure, constructed of white brick and steel, reflects the clean design aesthetics that are immediately apparent in the audio products that are manufactured by Spectra Sonics.

The new factory site was selected for easy access to surface and air transportation facilities. The air terminal is a ten minute walk from the factory and the Interstate Highway is within a few minutes drive.

The factory is located on a bluff overlooking the city of Ogden, and enjoys an impressive view of the Rocky Mountains of Utah. The building is constructed to improve production through a logical traffic flow. In addition, a distinctive and impressive demonstration area provides a suitable setting.

The new Spectra Sonics address is: 3750 Airport Road, Ogden, Utah 84403. The telephone remains the same: (801) 392-7531.

### NEW TOLL-FREE SERVICE FROM AMPEX

Ampex Corporation's audio-video systems division has inaugurated a 24-hour toll-free telephone system for ordering spare and replacement parts for the division's professional audio and video products.

Parts orders will be placed the day they are received, and a follow-up service is provided to insure prompt delivery.

The toll-free number for California is (800) 982-5875. The toll-free number for the remaining contiguous states is (800) 227-8402.

Headquartered in Redwood City, California, the Ampex audio-video systems division manufactures audio and video recorders, cameras, systems and related equipment for commercial and educational broadcasters and for closed circuit TV applications in medicine, education, industry, science and government.

### QUAD-EIGHT EXPANDS FACILITIES AND INCREASES NUMBER OF DEALERSHIPS

Facility expansion has begun at Quad-Eight, the North Hollywood [California] based manufacturer of professional mixing equipment. To meet the increased demands for their products, the company has

# Let's Talk About AUTO-SET

Auto-Set is a complete self-contained automation programmer made by Harrison Systems. It is specifically designed to interface with all Harrison consoles ever built. Interface is quick and simple through the use of multipin connectors.

Auto-Set is a simple piece of equipment to operate. It can operate as simply and with as little facility as the other available automation systems. All that is required is the pressing of one button.

Auto-Set can also be a very powerful tool to the experienced operator, and that experience can be had very easily. The Auto-Set commands have been written in such a way that an inexperienced operator can gain operating expertise in small steps. There is no need to know the complete instruction set in the beginning as features can be learned one at a time.

## WHY DOES AUTO-SET LOOK LIKE A COMPUTER?

Because it is a computer. Auto-Set contains two Z-80 microprocessors operating under firmware control to make your life easier and your final product better. There is no need for you to be a computer programmer as all programs are supplied, safely locked away in non-volatile memory.

## HOW DOES AUTO-SET STORE DATA?

It can store data in two different ways because Auto-Set is in reality two separate automation programmers living in one box.

**Normal Automation Data** is stored on a standard studio tape machine. This is a very good way to store automation data as it is not necessary to purchase

an expensive mass storage device and a time code system. Also, you never run out of data storage space as the data space increases with the length of material to be mixed.

Auto-Set allows the storage of four separate and independent mixes on one channel of a standard audio tape machine. Two channels of a machine must be allocated to automation for bouncing the data back and forth as a mix is built. Auto-Set allows you to independently select any one of the four mixes for each console fader. This selection process can be repeated 10 times for different parts of a mix and the selections recalled sequentially in a real time as the final mix is recorded.

**Pre-Set Automation** data is stored on special certified data cartridges which plug into the front of the Auto-Set. Preset automation is a totally different way of storing automation data. The previously described dynamic automation stores continuous changes in real time. Preset automation stores "snapshot" mixes only when you press a button, up to 630 of them on one data cartridge. Likewise, when you are ready to use the "snapshot" mixes they can be recalled one at a time with the simple push of a button.

The uses of preset automation are many and varied. It can be used for direct to disc recording using mixes taken in rehearsal and recalled by the mixer as needed. Also, it can be used in broadcast, live performance, theatre, or any other application where mixing is not from a prerecorded multitrack.

NOW, GC TALK TO THE OTHER GUYS.



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Passive Direct Box SM-1A	Active Direct Box SM-2
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acquired an additional 11,000 square feet of room adjacent to the existing facility. The area will be customized for specialized Digital Research and Development and to house modular console production.

Coupled with spatial growth, three new dealers have been added to carry Quad-Eight's products. In Los Angeles the new dealer is *Everything Audio*, in Northern California *Accurate Sound* and in the New York area, *Martin Audio* will have Quad-Eight's line.

### SEX DISCRIMINATION SUIT AGAINST MAJOR SOUND REINFORCEMENT COMPANY

Linda Joyce Wheatcroft filed on December 1, 1978, a suit against Clair Brothers Audio Enterprises, Inc., of Lititz, Pennsylvania, charging sex discrimination in hiring practices with their sound company.

The suit, filed in the United States District Court for the Central District of California, is to redress deprivation of rights secured by Title VII of the Civil Rights Act of 1964, which stems from an incident during the spring of 1976 Peter Frampton Tour.

Linda Jouce Wheatcroft seeks permanent injunctive relief from discrimination against her with respect to employment because of her sex, an accounting for loss of earnings by her resulting from Clair Brother Audio Enterprises, Inc., unlawful refusal to hire her, and money damages resulting from the unlawful employment practices.

The Equal Employment Opportunity Commission, Philadelphia District Office, found reasonable cause to believe the charge of sex discrimination and issued a "Notice of Right to Sue" on September 8, 1978.

Linda Joyce Wheatcroft and her legal counsel, Laura Goldin, of Goldin and Goldin, believe it is the first such suit in the sound technician area of the music industry.

### BANFF CENTRE OFFERS RECORDING FUNDAMENTALS, 1979

This year's course will take place from Monday, June 3rd to Friday, June 8th and will again be under the direction of Stephen F. Temmer, president of Gotham Audio Corporation, New York/Hollywood. This is the fourth year that the course has been given.

The fee for this week-long, 45-hour course is \$225.00. Single accommodation is \$21.50 per day; shared is \$19.50. This includes full meal service in the cafeteria.

Selection of applicants will be made as applications are received. There is an absolute application deadline of May 15th, but it may well be that all available space has been booked by that date. Prompt return of application forms is encouraged.

The week following the seminar, Mr.

Temmer will be working with music students at the Centre, indoctrinating them into the philosophy of recording and actually putting students on tape, doing re-takes, editing, etc. Mr. Temmer will also be giving a 1½-hour daily course for second year Theater Crafts students on sound reinforcement for the legitimate stage. There may be a possibility of accommodating a small number of seminar students for the second week.

For further information, contact Lorraine Schindel, Theater Arts Division, The Banff Centre, Box 1020, Banff, Alberta T0L 0C0, Canada.

### NEW ENGLAND CONSERVATORY OFFERS COURSE IN AUDIO

The New England Conservatory of Music will hold a Summer Session from June 25 - August 3, 1979, featuring workshops, courses, and master classes. Among the numerous offerings of special interest is the Electronic Music Workshop with Robert Ceely, June 25 - 29.

The workshop will be divided into two sessions. Mornings will include lectures and demonstrations of the hardware and software of Electronic Music and discussions of how and why synthesizers work, and the theory behind their sounds. The afternoon sessions will be individual hands-on experience with the ARP, MOOG, BUCHLA, and EML Synthesizers. Studio technique covering multichannel recording, sel-sync, overdubbing, reverberation, etc., sophisticated sequencing techniques, and unusual patch configurations will also be explored and demonstrated.

### REQUEST FOR COURSE INFORMATION FROM INSTITUTIONS & INSTRUCTORS OF AUDIO EDUCATION PROGRAMS

R-e/p is interested in obtaining information from schools and other organizations that are involved in education as it relates to the recorded art.

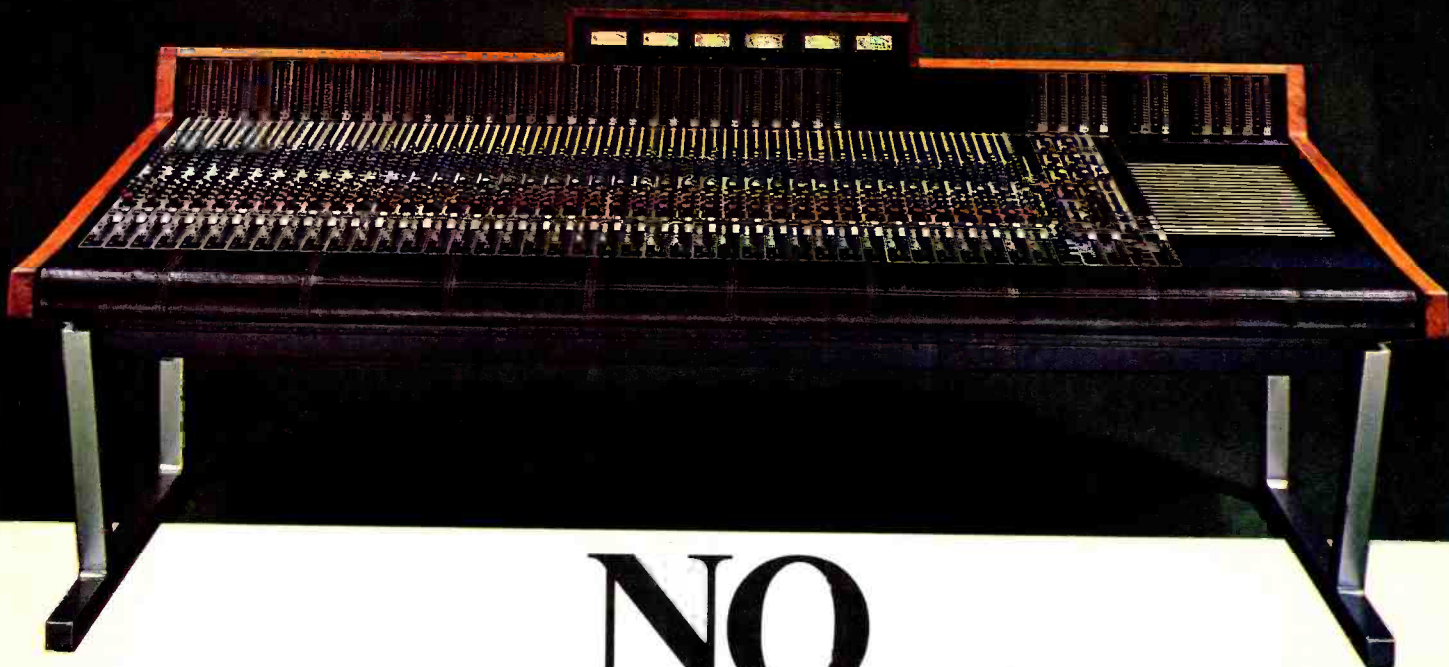
Such information will be included in a listing which will be prepared, to be sent in response to the mounting number of requests for such information.

reply to:

**Curriculum List**  
**Recording engineer/producer**  
 P.O. Box 2449  
 Hollywood, CA 90028

### SONY/RCA IN DIGITAL RECORDING SESSION WITH DALLAS SYMPHONY

Sony's new PCM-1600 digital audio processor was used in March to record three classical works performed by the Dallas Symphony Orchestra which are



# NO COMPROMISE

Two nice sounding words, just like a lot of other nice sounding words that manufacturers and suppliers use to describe their products and services.

Talk is cheap and so are words, so in order for words to have any true value they must stand for something of value.

At Harrison Systems *No Compromise* means something very real to us, to our dealers, and to our customers. *No Compromise* is a way of doing business, a philosophy that we believe in, a standard by which we can measure our every decision and endeavor, not just pretty words.

The *No Compromise* philosophy is with us every minute of every day. It is the dominant factor in the design, the manufacture, and the after sales support of every piece of equipment that we build.

To our dealers it means that they are representing and delivering the very best recording consoles available in the world. They are proud of the fact and we are proud of them. Without exception Harrison dealers world wide are the finest, most knowledgeable, most honorable audio professionals to be found.

Harrison customers have the *No Compromise* philosophy, also. In most cases the decision to purchase a Harrison console has not been made on price, for there are many consoles that sell for less. Harrison owners know that they have purchased the finest consoles for their studios. That goes a long way toward the making of a *No Compromise* studio. Interestingly, most Harrison owners have found that the choice of a Harrison console has in the long-run been the most profitable for their operations. The care and expertise in the design of the consoles have made their clientele very happy and supportive. The quality of construction and check out have meant minimum down time and start up problems. Harrison consoles have a history of very good retained value which means that the cost of ownership can be quite reasonable.

Many years ago one of the smartest men I have known told me that if you take care of business, then business will take care of you. Taking care of business... I guess that is what *No Compromise* is really all about.

*David Harrison*

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BY THE FOLLOWING LIST  
OF ADVERTISERS**

A&R Record Mfg. Co.	48
Allison Research	88
ALTEC Corporation	7
Amber Electro Design	164
Amek	inside front cvr-3
Ampex Corporation	38-39
Aphex	99
Atlas Sound	43
Audicon Marketing	156
Audio & Design Recording	42
Audio Associates	65
Audio Concepts/Dave Kelsey	126-A-B
Audio Distributors, Inc.	101
Audio Industries Corp.	73
Audio Kinetics (UK), Ltd.	135
Audio Services	138
Audio-Technica, US	69
Audioarts Engineering	118
Auditronics	35
Auratone	17
BGW Systems	155
BTX Corporation	119
Rudi Breuer	154
Canyon Recorders	32
CETEC Gauss	144-145
Community Light & Sound	153
Countryman Associates	166
Crown International	128-129
dbx, inc.	25
DeltaLab Research	117
EXR Corporation	49
Eastern Acoustic Works	103, 169
Eastman School of Music	171
Electro-Media Systems	152
Electro-Voice, Inc.	44
Everything Audio	inside front cvr-3
Hammond Industries, Inc.	37
Harrison Systems	173,175,177,179
Hidley Design Services	4-5
Inovonics, Inc.	147
Interface Electronics	150
Ivle Electronics	85
JBL	111, 172
Jensen Transformers	174
Klark-Teknik	37
Klipsch & Associates	133
Lexicon, Inc.	71
Loft Modular Devices	84
MCI	74-75
MRL	64
Magnifax, Inc.	77
Marshall Electronics	158
MICMIX Audio Products	79,167,172
Midas Audio Systems	29
Milam Audio	122-123
Rupert Neve, Inc.	8-9
Northwest Sound	54
Omnicroft	60
Omnisound, Ltd.	120
Orange County Electronics	115
Orban Associates	80, 121
Otari Corporation	66-67, 104-105
Peavey Electronics	86-87
Pro Audio/Seattle	97
Programming Technologies	109
QSC Audio Products	163
Quad-Eight	13, 165
Quantum Audio Labs, Inc.	149
Raindirk Limited	51
SESCOM	176
Saki Magnetics	102
Screen Door Music	176
Shure Brothers, Inc.	bk cvr
Sierra Audio	4-5
Solid State Logic, Ltd.	55-56, 57-58
Sony Industries	63
Sound 80, Inc.	19-20, 21-22
Sound Technology	151
Sound Workshop	14-15, 53
Speck Electronics	174
Spectra Sonics	26-27, 77
Stanton Magnetics	12
Stephens Electronics	157
Studer ReVox America	125
Studio Supply Company	91-92, 93-94
Symetrix	168
TDK	113
Taber Manufacturing Co.	78
Tangent Systems	10-11
TEAC/Tascam	46-47
Telex Communications	59, 141
UREI	131
URSA MAJOR	61
Valley Audio	40, 139
Valley People	107
Westlake Audio	82-83
White Instruments	137
Yamaha International	31

intended for RCA Red Seal release, according to Roger Pryor, digital audio division manager for Sony.

Conductor Eduardo Mata led the Dallas Symphony's performance of Stravinsky's Firebird Suite and Symphony in Three Movements, as well as Ravel's Daphnis and Chloe. The 3/4-inch U-Matic tapes will be edited later this spring using an advanced electronic editing unit to be shown by Sony at the Los Angeles AES Convention. According to Sony sources, the new editor

is capable of precision electronic editing.

It is RCA's intention to release three classical albums from the Dallas Symphony session. Pryor noted that Sony's advanced editor will be used for the first time here for the RCA project. "From what our engineers in Japan have told me," noted Pryor, "we should have no difficulty editing up to RCA's standards."

The RCA/Dallas Symphony session was recorded at Mt. View College, in Dallas. Peter Delheim produced for RCA.

**BENJAMIN B. BAUER, NOTED  
SCIENTIST AND MICROPHONE  
PIONEER DEAD AT 65**

Benjamin B. Bauer, former head of CBS Technology Center, Stamford, Connecticut, died of a heart attack on Saturday, March 31, 1979. He was 65 years old. A towering figure in the audio and acoustics field, he had remained a consultant to CBS following his retirement in July of 1978 after 21 years of service.

Mr. Bauer's first invention came shortly after his graduation from college in 1937. It was the single transducer cardioid dynamic, or directional, microphone whose acoustical phase shift principle is to this day used most universally in commercial microphones for broadcast and public address systems. At that time a novice development engineer for Shure Brothers, Incorporated, manufacturers of microphones and phonograph pickups, he was to become Shure's director of engineering and vice president. He joined CBS, Incorporated, in 1957 where he assumed responsibility for audio technology development at the then CBS Laboratories, in Stamford, Connecticut.

Many contributions in the ensuing four decades followed Mr. Bauer's landmark 1938 microphone invention. Spanning a broad range of technology disciplines, he was awarded 75 U.S. Patents. Foreign Patents swelled the total to more than a hundred. His long list of achievements included microphones created for acoustical measurements, piston phones, heartbeat measurements, hearing aids, public address systems, broadcasting, sound ranging, and civil and military communications; headphones, and artificial voice and ear devices, loudspeakers and loudspeaker enclosures, vibration measuring instruments, stereophonic test records, and transducers for phonograph recording and reproduction. Magnetic recording heads and transports, directional hydrophones, and hydrophone calibrators. Devices for automatic level control in broadcasting, psychoacoustic research related to the measurement of loudness and to the directional hearing in air and under

water, and techniques and instrumentation for reproducing and broadcasting quadruphony.

Mr. Bauer was born in Odessa, Russia, in 1913 and spent his youth in Cuba. Coming to the U.S. in 1930, he earned a degree in Industrial Engineering from Pratt Institute, in New York City, before attending the University of Cincinnati where in 1937 he received an Electrical Engineering degree. Post graduate studies included Physics, Mathematics, and Acoustics at Chicago and Northwestern Universities.

Dedicated to learning and scientific education, Mr. Bauer authored nearly 100 technical papers; lectured widely in this country and abroad; contributed to technical acoustical subjects; was technical editor and publisher of a textbook, "Acquisition, Reduction, and Analysis of Acoustical Data," for the U.S. Navy, and was visiting professor of engineering acoustics at Pennsylvania State University.

He was elected to the National Academy of Engineering in 1974, and was a member of the Naval Studies Board from the National Academy of Sciences. He was a Fellow of the Institute of Electrical and Electronic Engineers, of the Acoustical Society of America, and the Audio Engineering Society. He was an honorary member of the latter organization as well as a past president and recipient of its Gold Medal award. In 1977 the Acoustical Society presented Mr. Bauer with its' silver medal in acoustics, only the third scientist so honored "for his contribution to engineering acoustics, particularly in the development of techniques and devices used to pickup, record, and reproduce sound."

Recently, in March 1979, Mr. Bauer had been inducted into the L'Ordre de Chevalerie de L'Etoile de la Paix — a *chavalier* of the Order of the Knights of the Star of Peace — an international non-denominational organization founded in 1229, and dedicated to peace and which recognizes heads of state and leaders in the field of government, international relations, diplomacy, the arts and sciences.