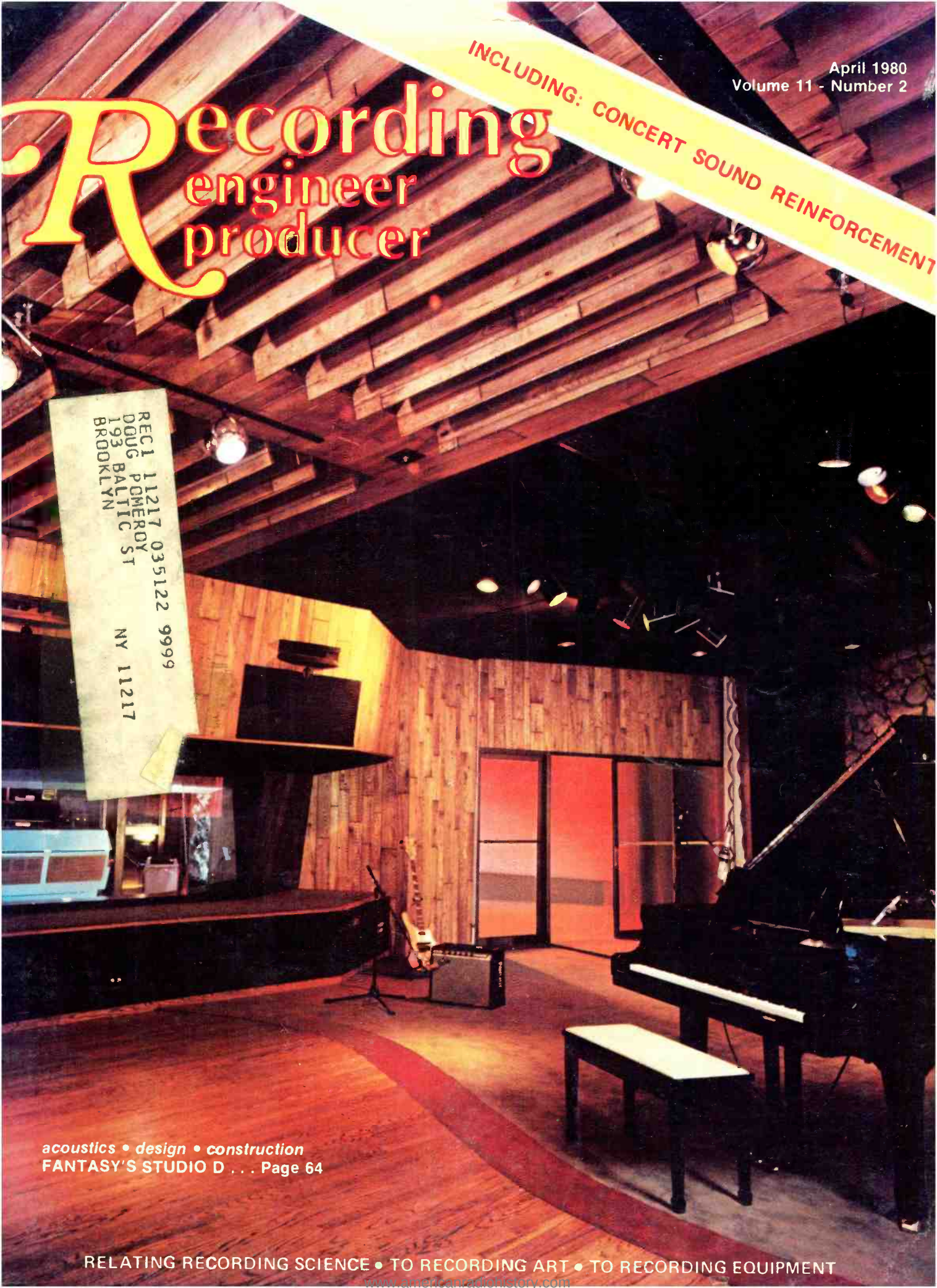
April 1980
Volume 11 - Number 2

Recording engineer producer

INCLUDING: CONCERT SOUND REINFORCEMENT



acoustics • design • construction
FANTASY'S STUDIO D . . . Page 64

RELATING RECORDING SCIENCE • TO RECORDING ART • TO RECORDING EQUIPMENT

TECHNOLOGY

Compatible with Auto-Pak (see information at right) or Tape-Pak, Amek's low-cost computer system ($6,253.) Call or write for more information.

Stock frame size: 36 in/24 out

Amek M-2000 A

$80,000

INTRODUCTORY PRICE
until June 1, 1980:

$62,000*

Call for color brochure

$25,000

Auto-Pak

Auto-Pak is Amek's computer editing and mass storage system. It is the only console computer that can vocalize all commands when entered and all information as it appears on-screen. The master keyboard selectively lights the correct keys for each function group. The computer also performs as a tape locate and motion control unit, employing the SMPTE time code.

Auto-Pak's storage has three times the capacity with none of the problems inherent in floppy disks. Memory consists of 4k pages of high-speed Random Access Memory (RAM) and is used only when required by fader action. Mixes can be edited and stored on tape or in RAM.

EVERYTHING AUDIO

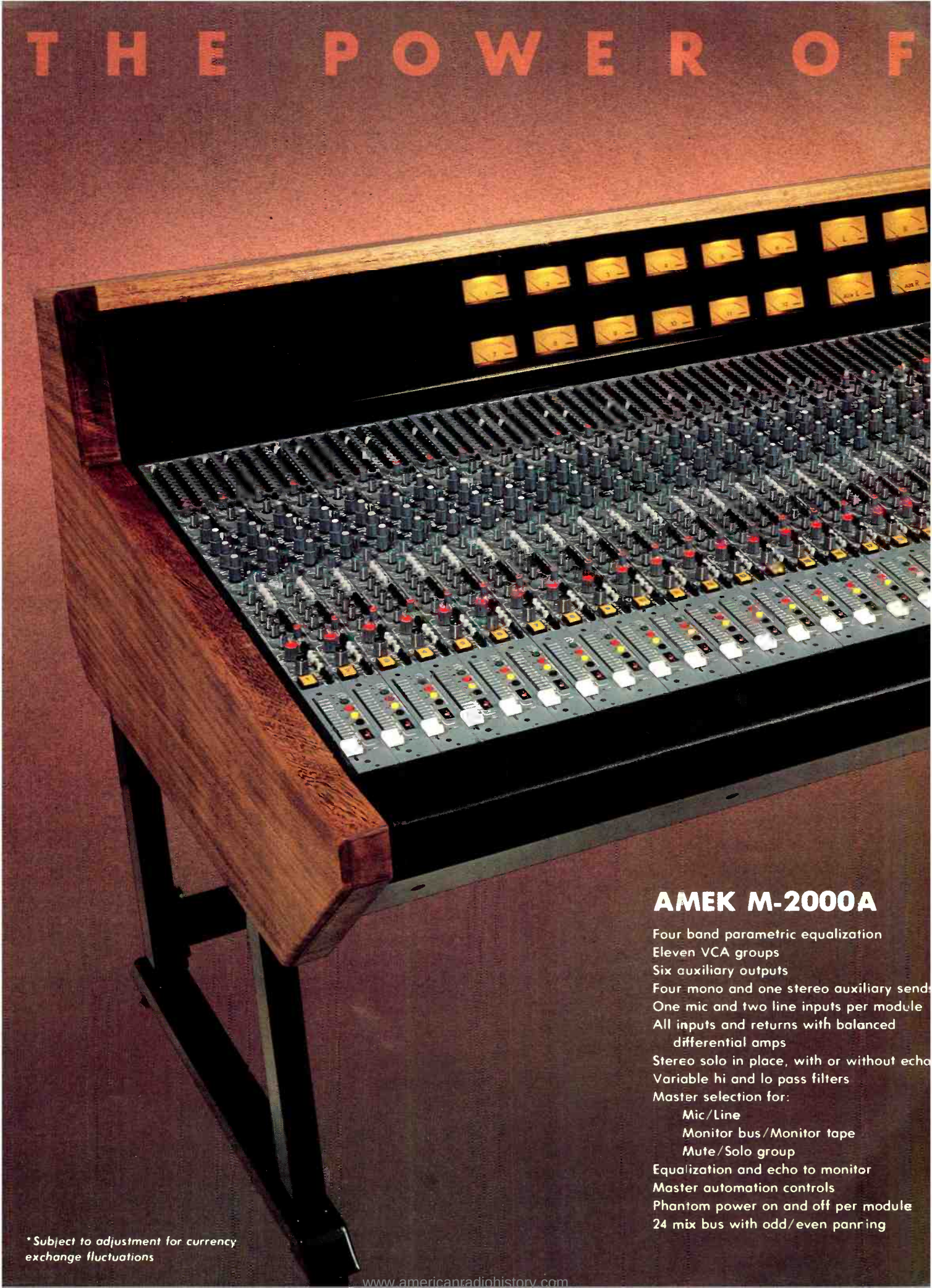
16055 Ventura Boulevard, Suite 1001
Encino, California 91436
Phone (213) 995-4175 • Telex 651485

MARTIN AUDIO

Courtney Spencer or Bruce Martin
423 West 55th Street
New York, New York 10019
Phone (212) 541-5900

VISIT US AT AES - BOOTHS 6 & 7

THE POWER OF

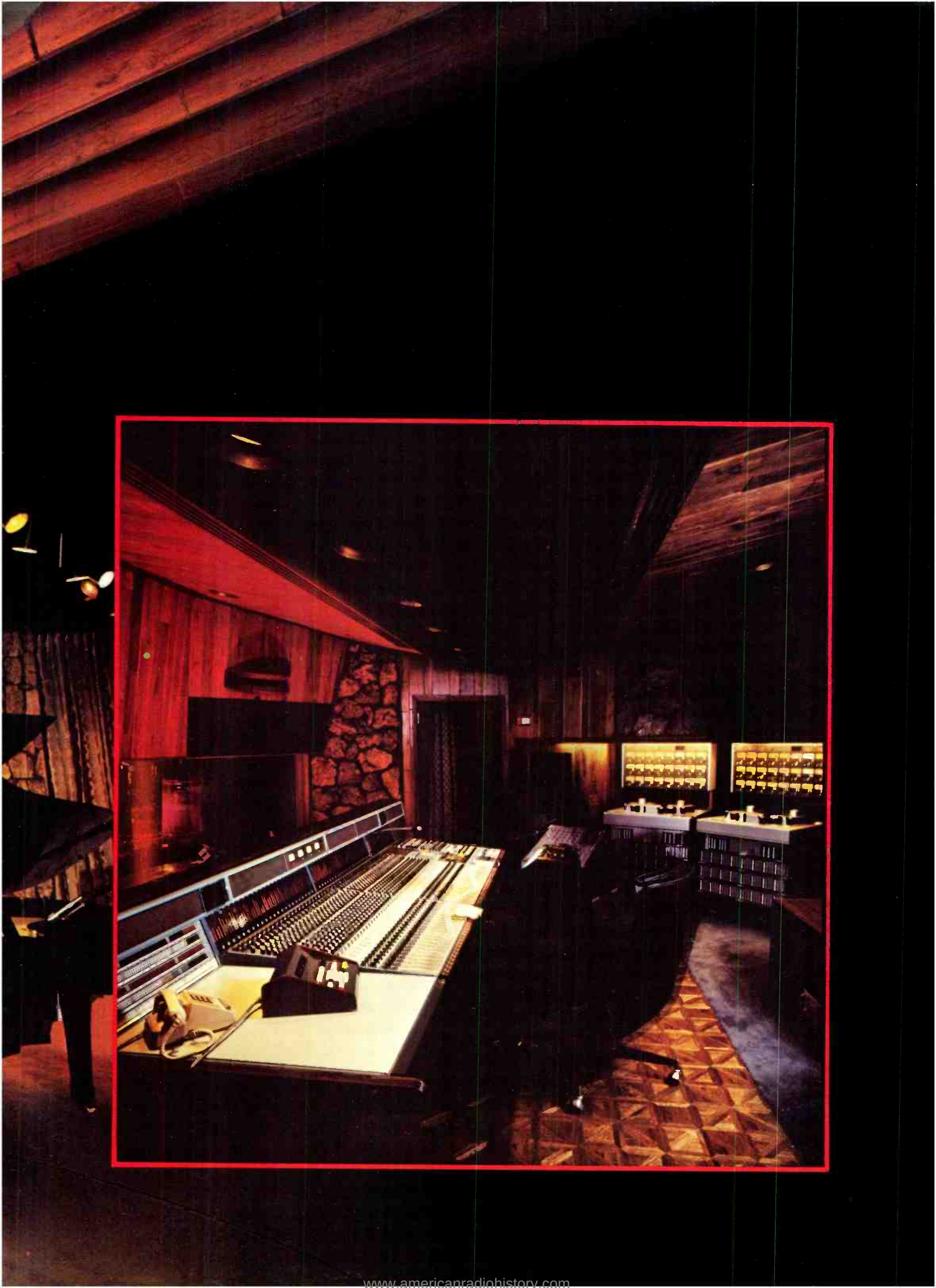


AMEK M-2000A

Four band parametric equalization
Eleven VCA groups
Six auxiliary outputs
Four mono and one stereo auxiliary send
One mic and two line inputs per module
All inputs and returns with balanced differential amps
Stereo solo in place, with or without echo
Variable hi and lo pass filters
Master selection for:
- Mic/Line
- Monitor bus/Monitor tape
- Mute/Solo group

Equalization and echo to monitor
Master automation controls
Phantom power on and off per module
24 mix bus with odd/even panning

*Subject to adjustment for currency exchange fluctuations



THE TOTAL ENVIRONMENT CONCEPT

A top-notch acoustic designer: One who is devoted to his craft, one of the best. A top-notch architect, a specialist in recording studio construction. A top-notch interior designer—a Hollywood set designer—one whose imagination is unbounded.

We have these designers on our new staff. Guided by your desires and tastes, they will create a combination of color, texture and sound that is perfectly suited to your needs. You'll be recording in a total environment. Totally original.

Totally yours.

DAVID GATES, Los Angeles, California

LATEST PROJECTS

SOUNDSATIONS (one studio), San Diego
DAVID GATES (one studio), Los Angeles
DISCOS DE CENTRO AMERICA (studio and disc-mastering), Guatemala City
MUSIC ANNEX (one studio), San Francisco
THE CUTTING HEAD (disc-mastering), Los Angeles
UNITED ARTISTS MUSIC (one studio), Hollywood

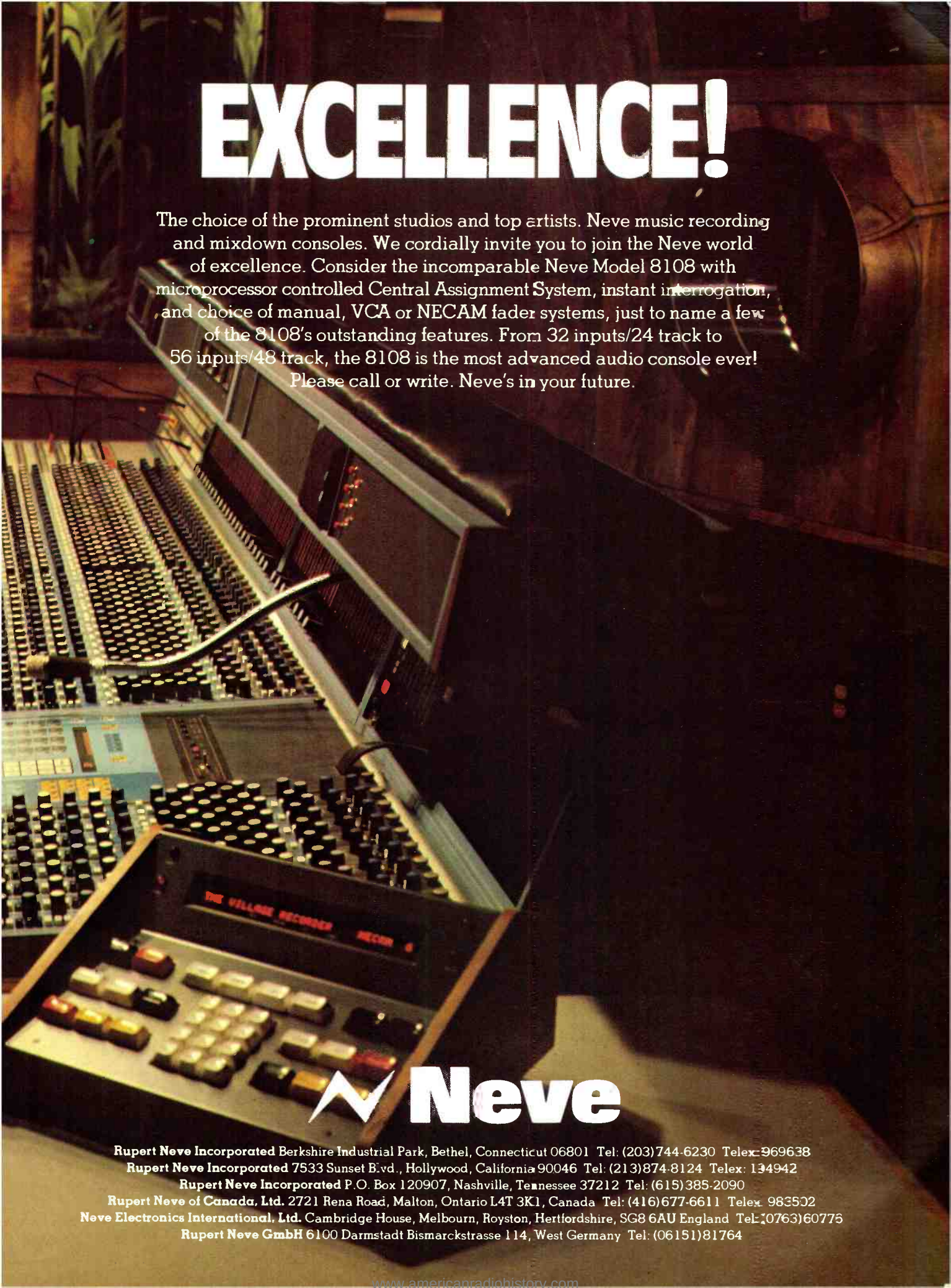
EVERYTHING AUDIO

VISIT US AT AES—BOOTHS 6 & 7

16055 Ventura Blvd., Suite 1001 • Encino, CA 91436 • (213) 995-4175 • Tlx 651485

European Representative: Nick Franks, Amek Systems and Controls, Ltd., Islington Mill, James St. Salford M3 5HW, England • (061) 834 6747
Australian Representative: Con Psorakis, Audio Controls, 22 Finniss Street. North Adelaide, S.A. 5006 • (08) 267 4529
Latin American Representative: John Moore, P.C. Box 89 F, Guatemala City, Guatemala • (011) 502-2-316319

Picture shows Model 8108 console fitted NECAM Computer Mixing System at Studio B, The Village Recorder, Los Angeles. Their Studio D is equipped with a Neve Model 8078 and NECAM.



RECORDING engineer/producer

— the magazine to exclusively serve the Recording Studio market . . . all those whose work involves the recording of commercially marketable sound.

— the magazine produced to relate . . . Recording ART to Recording SCIENCE to Recording EQUIPMENT.

Editor/Publisher ..... **MARTIN GALLAY**
Managing Editor ..... **TOM LUBIN**
Consulting Editors ..... **PETER BUTT**
PATRICK MALONEY
MARTIN POLON
Operations Manager .. **D. KEITH LARKIN**
Business Manager ..... **V.L. GAFFNEY**
Advertising Services and
Circulation Manager ... **PATTY COLLINS**

"RECORDING Engineer/Producer"
(USPS) 768-840)
is published six times a year by GALLAY COMMUNICATIONS, INC., 1850 N. Whitley Avenue, Hollywood, California 90028, and is sent to qualified recipients in the United States. One year (six issues) subscriptions for other than qualified individuals and companies may be purchased at the following rates:

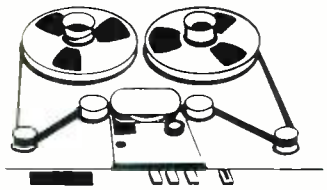
United States (surface mail) $10.00
United States (air mail) ... $17.00
All Other Countries $19.00

Foreign subscriptions payable in U.S. funds only by bank check or money order.

Controlled Circulation Postage paid at Los Angeles, California

Postmaster: Send form 3579 for address correction to:

RECORDING Engineer/Producer
P.O. Box 2449
Hollywood, California 90028
(213) 467-1111



APRIL 1980
VOLUME 11 — NUMBER 2

— Contents —

Cover photography: **Phil Bray**
Cover art direction: **Phil Carroll**

How To Recognize a Sierra Audio Studio:

It's busy
People like Sierra Audio rooms. On six continents of the world the leading studios in each market are of Sierra/Hidley design. Artists are keenly aware of the number of hits produced in Sierra rooms.

It's accurate
Producers and artists request the Sierra SM III Monitor System. Our new two-way system dramatically outperforms older three and four way concepts, and extends the range past 20 kHz.

It's beautiful
Sierra's designers and decorators know what creative people like, what makes them comfortable, and what makes them come back.

It's state of the art
Research in the art and science of studio design is continuous at Sierra. Our experience is greater. We've built more rooms. What we know today won't be learned by other designers for a couple of years yet.

It's successful
Of 245 studios the people at Sierra have designed over the last ten years, 245 are still in business. Every single one.

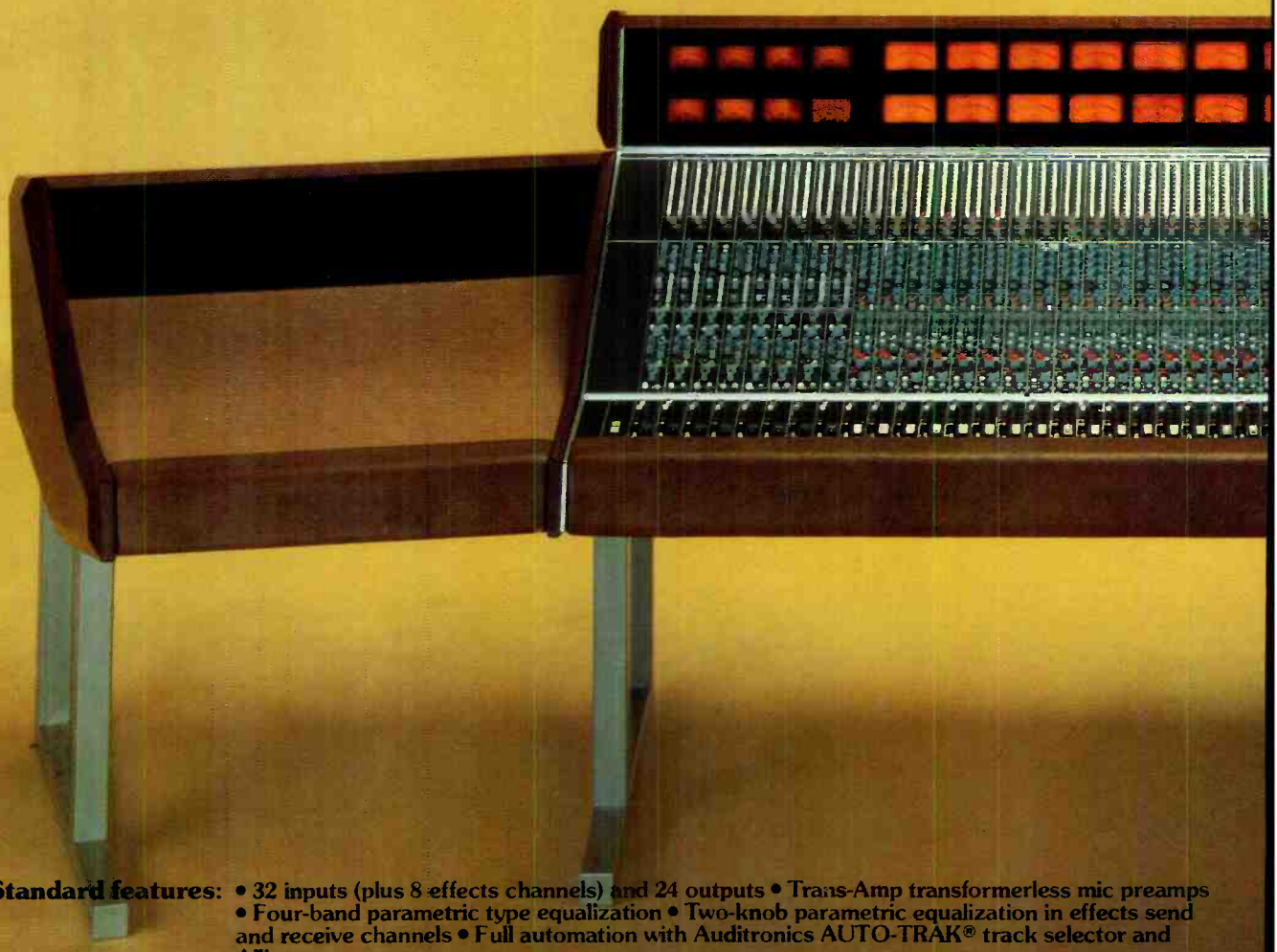
CBS/SONY
Shinanomachi, Tokyo (12 studios)
VIDTRONICS/TECHNICOLOR
Los Angeles (Video Sweetening Room)
FANTASY RECORDS
Berkeley (Studio D and new Disk room)
MR. "D's," KENDUN RECORDERS
Burbank (Super Studio)
SOUNDMIXERS
New York City (Redesign and Rebuild Studio C)
JEM RECORDS
Manila (2 studios)
RECORD PLANT
Los Angeles (Stage Studio C)
SOUNDS INTERCHANGE
Toronto (Overdub and Mix)
STUDIO SIX
Montreal (Control Room)
ARMSTRONG AUDIO/VIDEO
Melbourne, Australia (1 studio)
CINEMA AUDIO
Manila (2 studios)
PIERCE ARROW STUDIOS
Chicago (1 studio)
KITTY RECORDS
Tokyo (2 studios)
MASTER SOUND
Atlanta (1 studio)
CBS/SONY
Roppongi, Tokyo (2 studios)
BIAS RECORDING
Virginia (3 studios)
KUANGCHI PROGRAM SERVICES
Taipei (1 studio)
PARADISE STUDIOS
Sydney (1 studio)
WING HANG RECORDS
Hong Kong (1 studio)
THUNDER ROAD
Calgary (2 studios)
PECAN STREET STUDIOS
Austin (2 studios, 1 cutting room)
ARTISAN SOUND RECORDERS
Hollywood (2 studios, 1 cutting room)
WAREHOUSE RECORDING
New York City (1 Control Room)
SMOOTH ROCK STUDIOS
Calgary (1 studio)
ALFA RECORDS
Tokyo (1 studio)
FANTASY RECORDS
Berkeley (Studio B)
SOUNDMIXERS
New York City (Studio B)
AUDIO INDUSTRIES CORP.
Hollywood (1 studio)
GROUP IV RECORDING
Hollywood (Control Room Monitors)

Sierra Audio Corporation
721 South Glenwood Place
Burbank, California 91506
(213) 843-8115 • Telex 691138

We won't promise the world, but we will deliver what we promise!

Before you buy any automation console, test drive Auditronics 532 Memphis Machine...

Exclusive western distributor
Westlake Audio
(213) 655-0303



Standard features: • 32 inputs (plus 8 effects channels) and 24 outputs • Trans-Amp transformerless mic preamps • Four-band parametric type equalization • Two-knob parametric equalization in effects send and receive channels • Full automation with Auditronics AUTO-TRAK® track selector and Allison programmer

... it's the best you can buy for under 100 grand

Exclusive eastern distributor
Valley Audio
(615) 383-4732

• Automated sub-group master capability on all channels including effects returns • Auditronics patented high reliability coffee-proof faders

auditronics, inc.
3750 Old Getwell Road, Memphis, TN 38118
(901) 362-1350

for additional information circle no. 1

views letters news

from: **Chuck Hansen**
Creative Concepts
Matawan, NJ

I read with interest the February 1980 article on modifying the U47 microphone for line level output. I have some question as to the choice of electronic components for the modifications, which I feel compromise the line amplifier.

The 741 type of op amp is not a very good choice for audio use because of its low loop gain. With the amplifier schematic shown the 1 MHz 741 fields 20 dB gain to 10 kHz. Above 10 kHz the gain falls off at 20 dB/decade, and would be down 6 dB at 20 kHz. A 10 MHz op amp is a better choice for a 20 dB line amplifier, since the low open-loop frequency response of the 741 presents a real limitation for high quality audio applications.

An additional problem with the 741 is its high slew induced distortion and non-linearity at high frequencies. While a 20 dB 741 inverting amplifier can probably achieve .004% distortion at 1 kHz, the distortion at 10 kHz would be nearly 1%! This problem could be avoided by using a wide bandwidth, high slew, low distortion op amp such as the NE5534 or LM318.

A dual-tracking regulator IC such as the LM125 should be used in the power supply rather than the LM320/340 combination. This would improve the voltage imbalance between plus-minus supplies from a worst-case ±1 V to ±0.15 V. Any imbalance in supplies results in a DC component in the output which reduces headroom and, in the case of the 741, increases non-linearity distortion.

reply from:
David Coe

In reply to Mr. Hansen's letter, I would like to say that while I agree in general that a 741 op amp is less than ideal for audio use, his figures quoted seem to show some confusion in his understanding of its characteristics in actual use. As for advocating the use of a "20 dB 741 inverting amplifier" as implied in the letter, please read the article on Modifying the U47 for Line Level Output, *in the February 1980 issue of* R-e/p. *Nowhere is any amplifier shown in an inverting mode.*

His suggestion on using an LM318 or an NE5534 is equally as valid as using the MC-17415 that I specified in my article. Please do not confuse a 741 op amp and Motorola's MC-17415 op amp. Also, his suggestion on using a dual-tracking regulator is helpful.

At this point I would like to state that at Salty Dog Recording Studios we do not use any of the above circuits because of coloration of the audible signal. My intentions with the article are more to present the microphone changes as a concept and a step towards better sound, rather than this one thing being the answer. The audio chain is only as good as the weakest link, and line level ability from microphones is a good first step.

I would like to encourage correspondence with anyone with questions.

There is an error on page 98 in the February issue in the labeling of the output transistors. The 2N3906 shown should be the 2N3904 and vice-versa.

from: **Stephen F. Temmer, President**
Gotham Audio Corporation
New York, NY

This is a letter in response to the Peter Butt article, *"The Fuss About Plus,"* in the December 1979 issue of your fine magazine.

I am all in favor of Mr. Butt's quest and I think that his article indeed does a great public service by calling attention to this problem which has vexed our industry for so long.

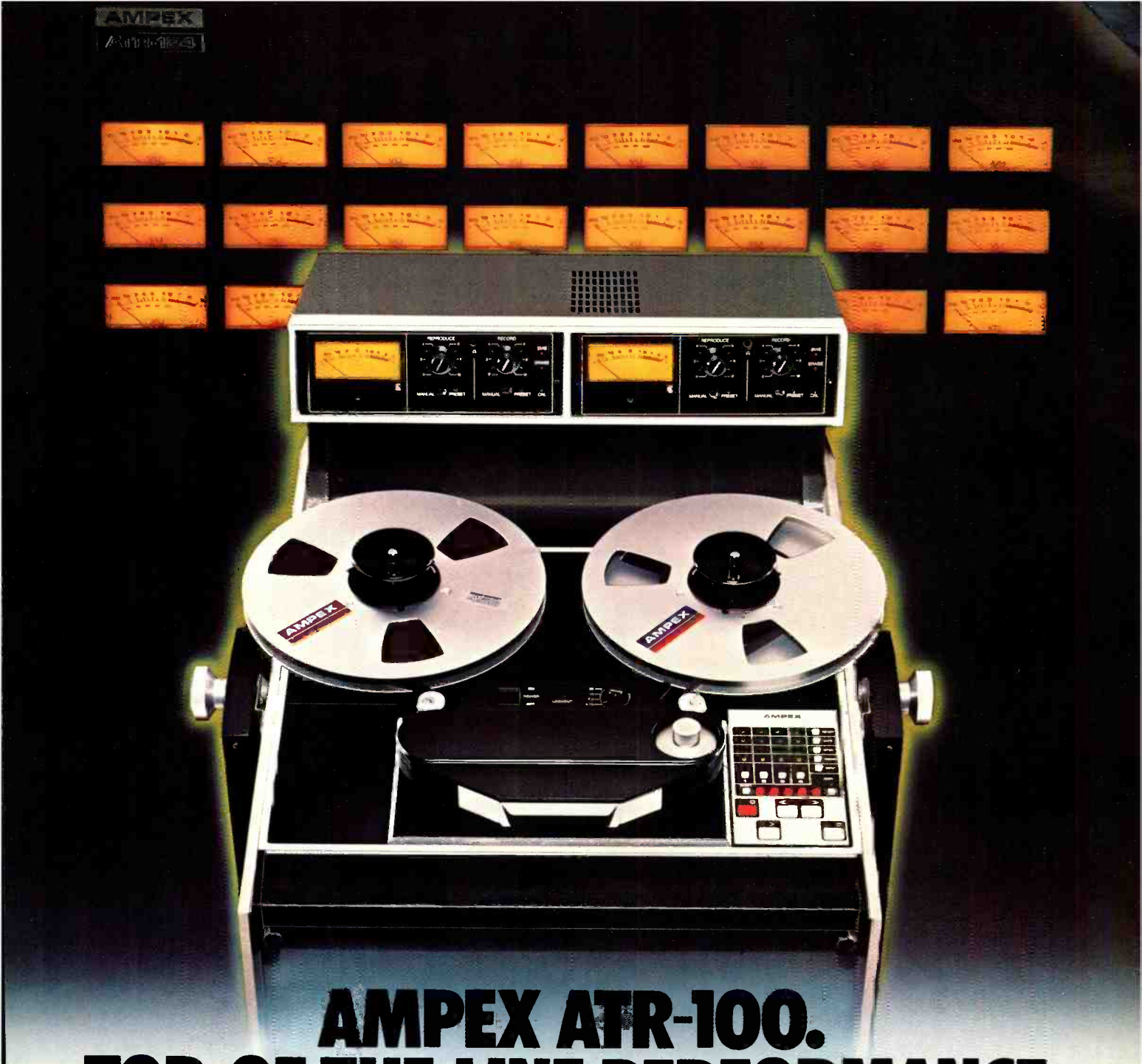
Permit me to try to fill in some important points. I believe the most important point which was missed is that there is an international standard which has existed for many, many years issued by the IEC (International Electrotechnical Commission), under number 268-12, which clearly defines what's plus in every conceivable connector, including the so-called "XLR" type, which bears the IEC number 130-X-IEC 02. It's clearly *pin 2* and all of the equipment which Gotham imports has adhered to that for many, many years. The USA is a signatory to the IEC standards and the one in question was passed with the United States' clear "yes" vote. The German DIN goes a bit further and states that in any connector, no matter how many pins, if they are numbered then the *lower number* of any pair is the PLUS pole. That could, for example, be pin 34 if the other pin in that pair is pin 67. Isn't that simple? Incidentally, you may buy the IEC 268-12 Standard from ANSI in New York (very inexpensive). It may be of interest to note here that the polarity on a disk, namely whether the groove excursion for a positive signal at pine 2 of the input goes into the lacquer or retreats from the lacquer is of grave importance in using Tracing Simulation, the system of pre-distortion used in Neumann cutting systems to counteract the tracing distortion caused in playback. Reversing polarity here would double the distortion instead of cancelling it.

Only one more point: Mr. Butt makes light at the end of his article of my own efforts in making sure that standards are not written for technology of the future. The determination of which pin in a connector should carry the plus pole can never restrain or hamper competition. So let's try to keep things in persepctive. Standards have their important place in all areas. They also should be kept out of areas which have not yet reached the marketplace; i.e., while innovation is still in progress and competition is needed to advance the state-of-the-art.

from: **Greg Juchem, Engineer**
CEC Recording Studios
Franklin, NC

Kudos to your magazine and Wieslaw V. R. Woszczyk for the publication of his paper, "Improved Instrument Timbre Through

— *continued overleaf . . .*



AMPEX ATR-100. TOP-OF-THE-LINE PERFORMANCE IN A 2 OR 4 TRACK RECORDER.

When your mastering job requires a lot of performance, the Ampex ATR-100 is your logical choice. The ATR-100 has the same unsurpassed ATR series electronics and tape transport system found in the most advanced multitrack recorder on the market today, our new ATR-124. You get sound quality for mastering and playback unmatched by any competitive recorder.

Features and specs you'd expect from Ampex. You also find specifications that have made the ATR-100 a recognized standard of excellence for the industry. Extremely low distortion, exceptional electronic headroom, low wow and flutter, and phase corrected record equalization pushes the performance of any tape to its maximum. And that means better sounding results.

When time is of the essence, ATR-100 gives you more time. ATR-100's quick start and stop transport time lets you go from rewind (2400 ft. in under 45 seconds) to play mode in 4.8 seconds. And up to 20 cue locations can be programmed onto the tape with the optional multi-point search-to-cue accessory for additional creative time savings. The transport system of the ATR-100 is unsurpassed by any competitive model in terms of accuracy and precision. Feature after feature that makes outstanding performance an everyday occurrence. The Ampex ATR-100. Contact your Ampex sales representative for complete details.

AMPEX MAKES IT EXCITING

Ampex Corporation
Audio-Video Systems Division, 401 Broadway
Redwood City, CA 94063 415/367-2011

for additional information circle no. 3

Microphone Placement," in Volume 10, Number 5. To see a lucid, thoroughly researched paper on this topic was gladdening, as the topic is one which many feel to be elemental, but in reality deserves a broad forum. There are a great many people in our business, myself included, who can learn a great deal from Mr. Woszczyk's work and experience, and who do not have the means to experiment with such a degree of accuracy. I feel fortunate to have any opportunity to elevate my abilities in the art of recording, and am glad to see there are still people such as Mr. Woszczyk who will share their findings to everyone's benefit.

I feel we are rapidly approaching the point where technology and software could become a substitute for acoustical science instead of supplementing it. We are obviously at the beginning of exciting times for the recording arts, and while there may be many facets to what is "state-of-the-art," I can see where it is possible for what may well be the true art of recording to be engulfed by this technological advent. What Mr. Woszczyk is putting forth in his article is an excellent example of technology supplementing the art, as opposed to superseding it. With the introduction of devices such as the Calrec Sound Field mike system, the importance of acoustical physics in regard to recorded sound will take on new meanings. But what good are such devices to an individual who isn't able to take full advantage of it's abilities? There are a great number of examples one can find that are indicative of this. Why is it one party will spend a vast amount of money for a state-of-the-art studio facility, which should be capable of the highest quality sound, but discovers another smaller studio in town sounds better than theirs? Everyone can think of one pet example of this, I'm sure. In many such cases, this is indicative of technology substituting for a party's weakness in acoustical physics, among other things that I feel one might only learn through a journeyman's apprenticeship in several fields relevant to or directly involved with the art and science of recording.

I say might, because there are people like Mr. Woszczyk, who despite the competitive nature of their field, are willing to share their fine perspective.

Thank you for allowing me the opportunity to air my views, and again, an excellent job done for you and Mr. Woszczyk. I hope to see more from this author on this subject in fugure issues of *R-e/p*.

views

— *The LEDE Acoustical Concept* —

from: **Michael Rettinger**
Counsultant In Acoustics
Encino, CA

At the beginning of radio broadcasting in the late 1920s that part of a recording studio where the musicians were located, and where a reflective environment prevailed, was known as the "live end" and the opposite part with its sound absorbent treatment as the "dead end."[1] In that period, when technical abbreviations were not as popular as they are now with some writers, such an enclosure would have qualified as a LEDE studio. Today, this term has the opposite meaning, particularly in respect to control rooms, where the part of the enclosure containing the monitoring speakers is called the dead end because of its abundance of sound absorbent material, while the opposite part with its reflective treatment is the live end. If consistency with terminology had been retained, the new enclosure would have been abbreviated as DELE room.

The rationale for the new LEDE control room is overburdened with esoteric abbreviations such as PHE (prior-to-Haas effect),[2] DHE (during-the-Haas effect),[2] AHE (after-the-Haas effect),[2] ELA (early late arrivals),[3] TMA (time misalign anomalies),[3] and others.

The concept for the new LEDE control room configuration stemmed from the results of time delay spectrometry. By this system of analysis one may obtain in a confined space the sound pressure variation with frequency at a given distance from a loudspeaker or after a given time interval between the initial loudspeaker output and a given location in the room, inclusive of boundary reflections. According to the inventor of this method of measurement, Richard C. Heyser,[4] a complete pressure-frequency-time profile in three dimensions shows many different spectra, each with the same program content of the primary source.

But this system is a monaural recording device and does not represent what a listener with two ears perceives at a given time or space in the room. Especially it does not provide a qualitative estimation of the music reproduced in the enclosure.

The Haas effect should not even have entered in the reasons for the new LEDE room, because it concerns itself chiefly with source localization and word intelligibility.[5,6] The least that can be said about the effect is Haas' own statement that reflections produce more "liveness" and "body."[6]

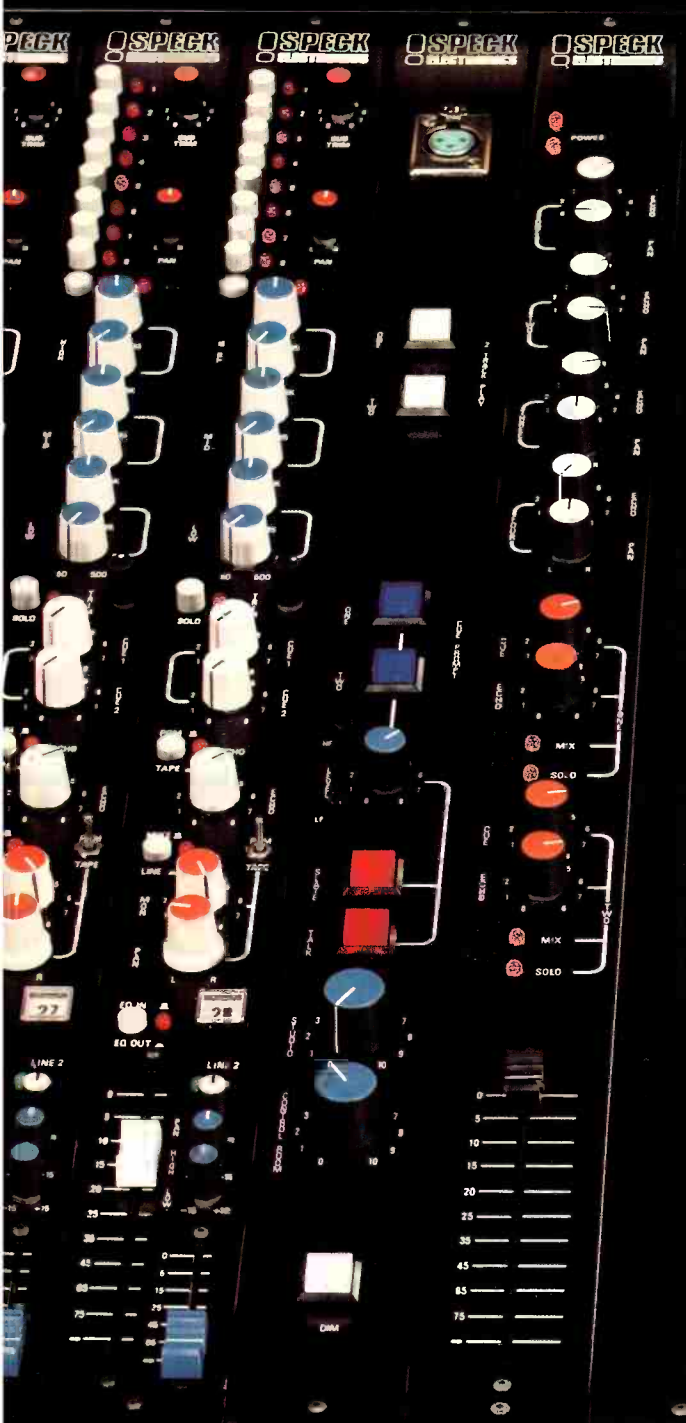
We must not forget the first paragraph in Lord Rayleigh's "The Theory of Sound," in which he says that all questions connected with sound must come for a decision to the ear, and from it there can be no appeal.

To paraphrase the architectural dictum that form must follow function, one may say that for music rooms' form must follow aural judgement.

It is this investigator's belief that in the control room of a music recording studio the sound from the loudspeakersis disadvantageously contained in a highly sound absorbent environment. Quite aside from the fact that it will be a long time before a control room window can be made sound absorbent, these large panes of glass presently constitute bass reflectors for the diffracted sound waves coming from a source with a low Q or directivity factor. Hence, some high-frequency first-order reflections are necessary to obtain at the mixing console a desirable balance for the music.

To allow numerous reflections from the hard rear wall to intermingle with the direct sound at the console merely goes back to the very early days of broadcasting when no effort was made to allocate sound absorbent products at the end of the room opposite to the band.

This investigator has asked the reaction of numerous recording engineers, musicians, and even a violin virtuoso well known in the recording industry, all of which had a chance to listen in a modern LEDE control room. Their reaction was overwhelmingly in favor of the old LEDE enclosure. The violin master said, "The sound in this room is not pleasing, but is



JUST FOR THE RECORD

One of the basic reasons you'll ever require more input modules for your console than tracks on your multitrack recorder is for effects and external processing equipment.

Each input/output module in our "D" series console provides the engineer with two complete line inputs. One for the tape track and one for the effect. This is made possible with a second line input that gives you slide fader level control, equalization, pan, and channel mute. So during a mix, when an effect is returned to the I/O module, it's returned to the second input section on the same module it was sent from.

This keeps you and all that audio very well organized.

SPECK ELECTRONICS

00 GREENBUSH AVENUE (213) 764-1200
ORTH HOLLYWOOD, CALIFORNIA 91605

THE "D" SERIES RECORDING CONSOLE...

...is available with 16, 24, or 28 I/O modules. That's 32, 48, or 56 line inputs respectively, but the mainframe and patchbay for all input configurations are wired standard for 56 line inputs, 32 track tape operation (or two 16 track recorders), and all console connections are accessed via 8 high density gold pin connector blocks.

Please call or write for further details and brochure about the "D" series recording console.

for additional information circle no. 5

views

— *The LEDE Acoustical Concept* —

unnatural, and different at almost every location about the console." But there were some respondents who preferred the new LEDE over the old one. This may prove that there is no disputing about taste, even as some people prefer rock and roll over Beethoven's Seventh Symphony and Richard Wagner's Overture to Tannhauser.

References:

1 - G. T. Stanton and F. C. Schmid, *Acoustics of Broadcasting and Recording Studios*, Journal Acoustic Society of America, Vol. 4, No. 1, July 1932, p 44.

2 - Don Davis, *Initial Time Delay Gap*, Synergetic Audio Concepts Newsletter, Vol. 6, No. 4, July 1979, p 17.

3 - Cecil Cable and R. Curtis Enerson, *Those Early Late Arrivals! Mr. Haas, What Would You Do?*, Journal Audio Engineering Society, Vol. 28, No. 1/2, January/February 1980, p 40.

4 - Richard C. Heyser, *Acoustical Measurements By Time Delay Spectrometry*, Journal Audio Engineering Society, Vol. 15, No. 4, October 1967, p 366.

5 - Anna K. Nabelek and Larry Robinette, *Influence of the Precedence Effect on Word Indentification By Normally Hearing and Hearing-Impaired Subjects*, Journal Acoustic Society of America, Vol. 63, No. 1, January 1978, p 187.

6 - Helmut Haas, *The Influence of a Single Echo on the Audibility of Speech*, Journal Audio Engineering Society, Vol. 20, No. 2, March 1972, p 145.

— *part 2 in the series* —

What The

AUDIO/VIDEO fusion

Can Mean To The
RECORDING STUDIO INDUSTRY

by Steven Barnett

As we continue to await the industry and consumer verdict on home video entertainment, and in particular, video music, there are current avenues for the recording artist and the recording studio to take in exploring video: the video promotion and the video demo.

The latter, as an industry marketing tool, tends to align itself with production companies supplying high-end broadcast quality equipment, while the production of video demos can be seen as within the economic range of the moderate sized studio wishing to become involved in actual video production.

It may be helpful in this discussion to refer back to the three video packages outlined in the February issue of *R-e/p*.

Using television as a marketing tool for recording artists has been a standard industry practice since Ed Sullivan said, "Good evening, and welcome to our show," but a development in recent years has been the artist and/or record labels taking over production of these video segments themselves.

This shift can be seen in the longer running, more established rock shows such as Don Kirschner's "Rock Concert" and "The Midnight Special."

Both programs still primarily rely upon performances of artists recorded by the programs themselves before a live audience, but with ever-increasing frequency, these shows are utilizing video and film pieces supplied by record labels, artists, and management firms.

Neal Marshall, producer of the Midnight Special, observed this phenomenon some time ago.

Neal Marshall

"We are dependent on outside material now because many of the bands have taken television into their own hands.

"Rather then coming into a television studio and taping under the kind of time pressure they feel that if they go out with them for a day or day-and-a-half, they will get what they like."

This practice has developed to the point where there are several syndicated rock shows, such as "Hollywood Heartbeat" and "The Rock Show," relying almost exclusively upon material supplied by the artists and labels.

The arrangements work out rather well for all parties concerned.

The audience gets rock and roll, the programs get free material with which to fill their shows, the labels get free air time for their artists, and, along with other related sponsors, the labels also get a specialized television audience receptive to their paid advertising.

The labels, artists, and/or management firms must underwrite the production costs, which can run as high as $20,000 per song, but

— ***continued on page 21*** . . .

Total Recall ™

from Solid State Logic

TOTAL RECALL™

The Solid State Logic Master Studio System is now available with TOTAL RECALL, an extraordinary system which monitors and stores the position of *each and every control* on the SL-4000 E Series Console.

With a single command, the engineer instructs the TOTAL RECALL computer to scan and remember the entire console status. Complete details of input selection, routing assignments, monitor and foldback levels, panning, equalization, echo sends, and dynamics modification are permanently recorded on floppy discs.

Another one-word command initiates recall of this information. The computer compares the positional data previously stored against the current physical position of each control, and generates a high-resolution colour display indicating which controls do not match the TOTAL RECALL memory store. By simply touching any switch or knob, the engineer activates a detailed display of its console subsection, which provides for a nulling accuracy of ¼ dB. Once the entire console has been reset, a Full Scan Verification function provides further security, by searching for any controls which are not set within specified tolerance, and displaying them for adjustment.

TOTAL RECALL fulfills the major promise of studio computer technology. Using the entire console as an "input terminal," it preserves *all* of the progress made at each stage of the recording and overdubbing process, so that it may be directly applied to each subsequent session. TOTAL RECALL eliminates duplication of effort, and enhances creative continuity throughout the production. It gives each of your clients "lockout" security over the console, so that they may return to your studio at any time and pick up exactly where they left off. And, of course, TOTAL RECALL provides the ultimate in mixing memory.

Most importantly, TOTAL RECALL is accomplished without any sacrifice to the impeccable audio quality and creative flexibility which have become hallmarks of the Solid State Logic Master Studio System. Rather than use multiple VCAs or stepped digital switching, TOTAL RECALL employs a network of microprocessor-controlled data busses which carry only low-voltage analogue information addressed to each I/O module switch and potentiometer. The full use of all continuously variable controls is retained. *No* additional audio pass elements have been introduced to the signal path. Consequently, TOTAL RECALL adds **absolutely no distortion and absolutely no noise**.

The Solid State Logic E Series Master Studio System is one of the most exceptional products of recording technology ever offered. A limited number of the systems equipped with TOTAL RECALL are available for delivery during the balance of 1980. If you would like to join that select group of discerning studios and broadcast organizations who are dedicated to the highest order of engineering excellence, we invite you to contact us at your earliest convenience.

THE AMERICAS
Washington Musicworks Inc.
3421 M Street N.W.
Washington, DC 20007
Doug Dickey
East Coast (202) 333-1500
West Coast (213) 464-8034
TLX 440519

Solid State Logic

Master Studio Systems

UK and EUROPE
Solid State Logic
Stonesfield
Oxford, England
Colin Sanders
099 389 324
TLX 837400

. . . continued from page 16 —

What The

AUDIO/VIDEO fusion

Can Mean To The
RECORDING STUDIO INDUSTRY

Levy, general manager of Lorimar Records.

"Sometimes it just doesn't pay to put a band on the road promoting their first or second album.

"You know there's a point where you go on the road where you lose money, and maybe the band isn't being as effective as it could be. They're opening for another act, and they don't get the sound check they should have, and they really don't come over as good as they should.

"Whereas in video, the band, in conjunction with the director, can really control how they come across."

"There was a statement in variety awhile ago," adds Bill Seal, of Aberdeen Video, "that a band can get more exposure through just one video tape than they can in a year of one night stands.

"Through one cablecast you can reach thousands of people in a shot."

This video synergy can also be exploited by the unsigned band, says Seal.

"We feel that many bands will become known through both their club and video exposure, and it will create a demand for them which they can, in turn, take to the record labels."

Although national exposure is usually preferable, a regional following for a band could conceivable be built with assistance from the group's appearances on local TV over air and cable television programs.

Again, depending upon the television stations policies, the video package described in the last issue as suitable for cablecasting, may suffice for local programming of music acts.

Seal relates that one new wave band in particular is specifically performing only on video, no club dates or touring, with the goal of attaining a large enough following to attract a label's attention.

"Generally," says Tony Zetland, associate director of product management at Columbia Records, "we use a media mix. I don't think you can sell anybody visually through video alone. Though video has a specific advantage because you can't put the band on the road all the time.

"What we try to do, as with Elvis Costello or Journey, when they're touring, is to tie everything together [TV, concerts, radio, album release]."

As in the case of video music for consumer distribution, these video promotions can be straight performance, visual poetry, or a combination of both, depending upon the artist, the producer, and, most importantly, the budget. In production, making the most of the time available is an important consideration in the latter factor.

"Generally," says Zetland, "once you've gotten to the stage where you've got the lighting and the sound system set up, you may as well record three songs or so. We've had shoots vary from $15,000 to $60,000."

Along these lines, "Hollywood Heartbeat" was able to record a number of segments for its program in only a few taping days. Executive producer Larry Smith and producer Richard Mann wished to present a number of bands from the Los Angeles club scene which had not yet done video work.

The two set up a series of shoots at Gazzarri's on the Sunset Strip and shot several bands on each day. The segments were basically straight performance which helped to keep the costs down.

By shooting in this fashion, "Heartbeat" was able to essentially spread the costs of production per band.

American Mobile Video provided a 40-foot trailer for these shoots.

"We used three Ampex cameras and one hand held Ikagami," says Smith. "These fed a ¾" VTR and a 2" quad head RCA VTR machine. Both machines had SMPTE time code recorded on them during taping."

The ¾" tape was used in workprint editing prior to the final cut on the 2" with CMX (computer controlled) equipment.

An audio feed to the stage was provided from a ½-track playback machine. Lip sync techniques were sometimes used, and on other occasions the band sang to pre-recorded music tracks.

Smith also had a lighting designer come in to light the stage, and general TV make-up was used on the artists.

"Hollywood Heartbeat" is broadcast in Los Angeles and other markets with a simulated stereo simulcast over FM radio.

Eldorado Recording Studios, in Hollywood, was the site of the audio post-production for these segments, as well as the location for most of the introduction shots.

The latter's involvement as a post-production facility is one example of where the recording studio may best fit into this world of video music.

In this instance again, all the parties involved benefited. The viewers got rock music, the program got material, the bands got exposure, and the recording studio did work in a visual medium.

For the label produced material, there is another benefit, the use of the video recorded material in television advertising for the artist's product. Video as a marketing tool is becoming more-and-more cost effective. It is a market that is here now, and it is one which the recording studio would be well advised to explore, even if only in the post-production area. Also, looking into the future, involvement in video at this stage of the game can give a studio a step ahead when and if video music becomes a consumer product.

The Video Demo

Another area of activity in video that can be currently explored is the video demo. As with video promotions, this field can be considered an inroad into the area of video music, but in this instance, actual video production by the video studio is economically feasible (refer to package three in the previous issue).

For now, the video demo is a tool with some specific limitations, but it is a quite useful tool nonetheless.

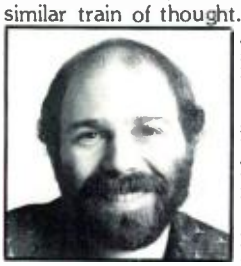
"I'm trying to find music that works for me," says Levy, "and you have to start from square one: Is this music exciting? Can this band make records?

"Sometimes a visual performance can affect your judgement, so I would rather hear the music first, then see the video demo, and then see the band live in person."

Keeping these observations in mind, a video demo can be a critical element in a band's attracting a label's attention.

"If a band from Ohio, for instance," says Levy, "sent me a tape, a sound tape as well as a video cassette, and I was impressed with the material that I heard, the video could clinch it, and I'd get on a plane to Canton, Ohio."

Bruce Botnick, of Columbia A&R, follows a similar train of thought. Botnick is currently aiding Eddie Money in his career, and his background includes producing and engineering such artists as The Doors. "I do like seeing a video of a band," he says. "It's an easy way to see how progressed the group is." He adds, however, "Nothing beats seeing an artist live. It [the video] wouldn't make us sign them, but it could interest us into going to see them."



Botnick

To this end, both men agree that a video demo should be a simple performance in nature.

"If you're looking to sign a band," says Botnick, "that is what you want to see. If the tape is produced aurally and visually, you don't know if you're seeing the real thing."

Video demos can also work on a local level, as well.

Joe Phelps currently works in advertising in Los Angeles, but earlier in his career, he was a booking agent in the Southern United Sta he says, "were incredible for a booking agency whose sales were concentrated in a club circuit situation where the owners were buying relatively unknown bands. An 8x10 glossy and an audio tape don't tell it all, so video tape worked great."

Phelps

Phelps used two black and white video cameras along with a ¾" reel-to-reel video tape recorder for his work. Audio was handled by a custom mixing panel and Shure mikes. Taping was usually done in a converted club that served as his studio.

"But if a live recording situation seemed right," he adds, "and we knew that the crowd was going to be particularly responsive to this group, and the club had the ceiling height necessary for the right lights, we would video tape it there."

Phelps usually lit the club with extra lights to get the picture he required, and he notes that an on one hand the big plus in the studio situation was control. But on the other hand in the live concert taping, he got the spontaneity and energy of the event.

"A good situation for an unknown band to take advantage of is when they might be the opening act on a college campus concert. Then you have the super troopers and the hot lighting and you can use it just as it is and produce some terrific stuff. "The tapes also proved to be good therapy for a lot of the groups who were musically oriented rather than visual performers. Many times this would drive home the fact that they needed some help visually."

These tapes also went beyond their original local purpose.

"We produced some tapes for a couple of Memphis groups who, in turn, approached

— continued on page 198 . . .

the New Workhorse

MTR-90: The Machine You Helped Design.

After extensive consultation with you, the people who depend on professional audio machinery for their livelihood, we found that a new generation of two-inch master recorder was required to meet your demands. You wanted better tape handling, increased performance, greater creative flexibility; you needed adaptation to multi-machine interlock, compact design, better serviceability and the number one priority—greater reliability. You felt that contemporary technology could be incorporated into an affordable machine. We felt the same way.

Here is the result of a collective vision—our engineering and your current and future needs—THE OTARI MTR-90.

The OTARI Optimal Tape Guidance System

Research has proven that impeccable tape handling can be achieved by a servo-controlled, symmetrical, and uniformly distributed constant tension tape path utilizing a wide diameter (60 mm) pinch-rollerless capstan. This elegantly simple method of controlling tape movement eliminates the problems of stretch and wear, which are generic to many conventionally designed 2″ pinch-roller type transports. With the MTR-90 the only tape drive contact is on the tougher tape backing, thus allowing for the first time, virtually unlimited safe passes with your valuable 2″ master tape.

The OTARI Unitized Transport

The integrity of the entire tape machine is dependent on the long-term stability of the top plate, its supporting frame and the integration of its head assembly. OTARI engineers felt it essential to mate a super-rugged, precision top plate directly to a unitized, welded steel chassis to make it strong enough to withstand the most rigorous studio or remote work.

Electronics

By engineering single card circuitry, OTARI has refined "state-of-the-art" electronics by reducing the complexity and expense of multiple card assemblies. Active mixing of audio and bias in the record circuitry and proper utilization of high slew rate integrated op-amps and discrete components at critical stages are your best assurance of aural success.

The modular approach of the MTR-90's digitally controlled transport logic achieves a higher level of reliability along with the "real world" considerations for rapid diagnosis and serviceability.

The Man/Machine Interface

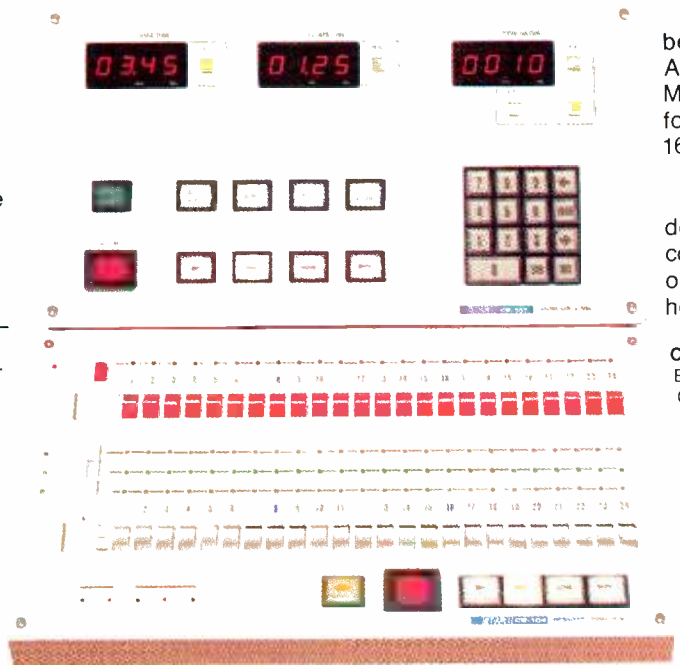
Included with every MTR-90 is the CB-104 Remote Session Controller. Offering total flexibility while providing immediate understanding on your first session, the CB-104 accomplishes mode selection faster than any other remote available. There's "positive feel" switching—important under session pressure; flexible standby mode monitoring, master switching, single control simulated punch in/outs and more.

The optional CB-107 Memory Locator, which physically mates with the CB-104 Session Controller maximizes your efficiency and creativity with your clients' time. It features ten keyboard assignable memories, shuttle function, and independent, built-in stopwatch.

Factory support through a large domestic parts inventory, thorough documentation and communicative personnel versed in all aspects of studio equipment, are integral parts of the MTR-90's presentation to the professional. A network of the finest and most experienced audio dealerships is the final link in your assurance of OTARI's comprehensive approach to the professional recording community.

The OTARI machine has become *The New Workhorse*. And now, the advanced MTR-90: *The New Workhorse* for two-inch, multi-track 16/24 channel audio production.

Contact your nearest dealer for a demo and detailed color brochure. Get your ears on the tape machine *you* helped design!



The CB-107 Memory Locator and the CB-104 Remote Session Controller.

CALIFORNIA
Express Sound
Costa Mesa
Sound Genesis
San Francisco
Westlake Audio
Los Angeles

NEW YORK
Martin Audio
New York

TENNESSEE
Valley Audio
Nashville

TEXAS
Westbrook Audio
Dallas

The New Workhorse

OTARI®

Otari Corporation, 1559 Industrial Road, San Carlos, CA 94070, (415) 592-8311
In Canada: BSR (Canada, Ltd.), P.O. 7003 Sta. B, Rexdale, Ontario M9V 4B3

STUDIO UPDATE

Canada

■ **SMOOTH ROCK STUDIOS** (Calgary, Alberta, Canada) will be opening this Spring featuring 1,100 square feet of recording area in a facility designed by **SIERRA AUDIO,** and re-designed by **RUDI BREUER.** The control room will be equipped with an MCI 636 console, MCI 24-track and 2-track recorders, and a Sierra Audio monitoring system. Outboards will include Lexicon digital reverb, a Marshall Time Modulator, and a full compliment of compressor/limiters, and microphones. The studio's owner is **STEVE GRAUPE.** *#1-D, 624 Beaver Dam Road North East, Calgary, Alberta T2K 4W6, Canada. (403) 275-6110.*

England

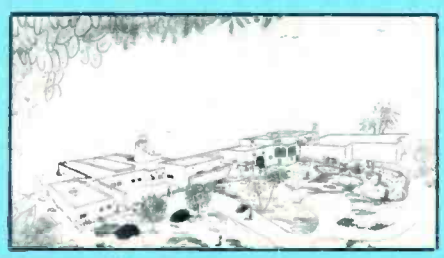
■ **SARM STUDIOS** (London, England) has taken delivery of a new Lexicon 224 digital reverb to supplement its other sideboards, which include dbx compressor/limiters, EMT 140 echo plate, Audio & Design Vocal Stresser, and Aphex Aural Exciter. The studio is equipped with a Triad TSM 40x24 console, Studer 24-track recorders, Dolby noise reduction, and monitors by Eastlake, Auratone, Tannoy, and JBL. A complete array of mikes is available. *Osborne House, 9-13 Osborne Street, London E1 6TD, England. Telephone: (01) 247-1311.*

■ **SOUTHERN STUDIOS** (London, England) is now taking commercial bookings, according to owner **JOHN LODER,** with the addition of recording engineer **SIMAEN SKOLFIELD.** The 16-track studio features a Raindirk Series III 18x16 console feeding an Ampex MM-1200 recorder. Among the sideboard equipment are an AMS 15-80 digital delay line and pitch shifter, a BEL flanger, and Aphex Aural Exciter, dbx 160 compressor/limiters, and an EMT 140 stereo plate. *Wood Green, North London, England.*

■ **REDAN RECORDERS** (London, England) has been in operation for two years since its re-opening as a 24-track facility. The studio floor measures 42' x 25', and the control room features a Neve console coupled to a Lyrec TR532 24-track recorder. Tannoy monitors powered by Amcron amps, a Lexicon digital delay line, and an Eventide Harmonizer and Instant Flanger. A purpose-built drum booth and a Beckstein grand are also available. The studio manager is **DEREK SODEN.** *West London, England.*

■ **BATTERY STUDIOS** (London, England) is locted in Morgan Studio's old number four room inside the shell of two terraced houses on Chaplin Street. The operation features a CADAC 28x24 console linked to a Studer A-80 recorder. Monitors are JBL 4350s and Tannoy Buckingham's powered by Crown DC300A amps. Other gear includes an Eventide H949 Harmonizer, an URSA Major Space Station, dbx 160 compressor/limiters, and an Audio & Design Vocal Stressor. Up to 60 musicians can be accommodated on the studio floor, according to chief engineer **MIKE SHIPLEY** and studio manager, **JOYCE MOORE.** *Chaplin Street, Willesden, North London, England.*

Spain



■ **IBIZA SOUND STUDIO** (San Juan, Island of Ibiza, Spain) is now open offering both living and recording space for its clientel. The main control room features an MCI JH-556-56 LM 56-channel in and out automated console equipped with a sound analyzer and plasma display peak/VU meters. The board feeds two 24-track MCI JH-114 recorders with AutoLocators and synchronizer AutoLock. MCI 2- and 4-track recorders are also on hand, as is 52 channels of Dolby noise redcution. Outboards include an AMS digital retarder/harmonizer, an AMS phaser/flanger, Mayer voice gates, and dbx limiter/compressors. Eastlake custom monitors are driven by H/H amps, while microphones include units by Schoeps, Neumann, and AKG. Acoustic design was by **EASTLAKE SOUND'S TOM HIDLEY.** Instruments offered include a Yamaha grand, a Fender Rhodes, and a complete drum kit. **DENNIS J. HERMAN** is the studio manager. *c/o Singleton Productions, Via Augusta, 59, Desp. 804 - Edif. Mercurio - Barcelona 6, Spain. Telephone: 228-3800 or 228-7602.*

Switzerland:

■ **BRUNO SPOERRI RECORDINGS** (Zurich) have recently completed a comprehensive updating program with a new MCI-536 computerized console, the new Studer A800 24-track recorder with AutoLocator, and an MCI JH-110A 2-track with AutoLocator. New equipment also includes the AMS digital delay and pitch changer, and a Lexicon 224 digital reverb. The studio has the widest variety of synthesizers in Switzerland, including the EMS Synthi 100, Prophet-5, different Lyricons, ARP, and Moog synthesizers, etc. In the planning stage is a new large studio to be built in a farmhouse in the Swiss countryside near Zurich. Complete residence facilities will be provided for clients during their use of the new studio. **BRUNO SPOERRI** and **IRMIN SCHMIDT** have recently been working on a new synthesizer record, and almost completed is the new Infra Steffs' **RED DEVIL BAND** LP. Both productions are being engineered by **RON KURZ.** *Schneckenmannstr. 27, CH-8044 Zurich, Switzerland. Telephone: 01/47 99 12.*

have you?
• increased track capacity — gone to 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
P.O. BOX 2449 • HOLLYWOOD, CA 90028

MIDAS The professionals' choice

Abe Jacob, top American theatre sound designer, with the MIDAS 32 into 8:2 VCA controlled Live Sound Console and 12 into 2 sub-mixer he specified for EVITA on Broadway. Abe has earned his reputation from shows like JESUS CHRIST SUPERSTAR, CHORUS LINE, AND BEATLEMANIA. Why MIDAS? Because MIDAS experience and design philosophy provide highest quality signal processing in a compact and rugged modular frame built to withstand years of use. Abe Jacob is a professional. MIDAS is the professionals' choice.

for additional information circle no. 8

MIDAS AUDIO SYSTEMS LTD. DAVID SOLARI, 54-56 STANHOPE STREET, EUSTON, LONDON NW1 3EX. Tel 01-388-7060, 01-387-7659
MIDAS CANADA. BOB SNELGROVE, GEAR-ELECTRO-ACOUSTICS, 363 ADELAIDE STREET, TORONTO, ONTARIO M5A 1N3, CANADA. Tel 416 868-0528

Catch the new Sound with the French Infernal Machine

DHM 89 B2 stereo

The D.H.M. 89 B2 is a stereo audio computer, which allows :

Dual digital delay :
In quasi-stereo mode, two independante delays operate on the same sound from 1 ms to the maximum value.
In true stereo mode the two channels are completely separate.
The maximum value of delays depends upon selected bandwidth : 1200 ms for 5 KHz, 600 ms for 10 KHz, 300 ms for 20 KHz.
In option additive memories can upgrade delay up to 5000 ms» The D.H.M. 89 B2 offers an unique feature which allows a continuous variation of delay without doppler effect nor switching noises. So that it is possible to change delay during operation without audible effects.

Dual echo :
By association of dual delay and feedback.

Dual pitch shifting :
From – 2 to + 1 octave. Sophisticated micro-computer operates phase coincidence of joining points and eliminates «glitches». The serial delay is adjustable.

Dual automatic arpeggio :
is a pitch-increasing or decreasing echo.

Dual reversed sound :
Electronic equivalent of a magnetic tape running reversed. Reversed sound itself can be pitch-shifted.

Dual memory latch-mode :
memorised sound can repeat indefinitly. The two borders of repeating sound are continuously selectable, as wall as reading sense and pitch ratio.

Principal technical features :

- 16 bits flying comma A/D converter allowing a 95 dB dynamic range, without use of an analog compressor/expander technique.
- **Distorsion :** 0,1 % for delay mode, 0,2 % or pitch shifting mode.
- **Memory capacity :** 210.000 bits.
- **Sample rate :** 52,91 KHz (for 20 KHz bandwidth).
- **3 dB bandwidth :** Selectable, 5, 10 or 20 KHz.
- **Printed boards :** Easily removeable for maintenance.

Publison Audio Professional

5,7,9, Il rue Crespin du Gast 75011 PARIS

Put any sort of Sound in memory and Tame it!

KB 2000

KB 2000 is an external programmation unit for the audio computer DHM 89 B2. It includes a three octaves piano keyboard, and a control panel for setting the following functions :

Three voice chorus :
By adding to original sound two pitch shifted voices. The resulting chord is controlled by the keyfingers. A serial delay can be added, which is continuously adjustable.

Reverse synchronisation :
The reverse mode of DHM alone affects the original tempo in a random way. The «Reverse synchro» mode synchronises this effect with attacks of the sound, so that reversed sound has the same tempo as original. The added delay is adjustable.

Biphonic memory synthesizer :
Any existing sound, supplied by a tape recorded or by a microphone, is memorised in DHM by simply depressing the «memory latch» button. The length of memorised sound is 1,2 s for DHM 89, 5000 ms for option. Then the KB 2000 synchronises memory reading with attacks of the notes. «Attack point» sets the part of the sound at which each note begins, «End point» and «Return point» select the part of memorised sound which is repeating continuously when the note is sustaining. This sustain can be very clean, for example on a bell resonance or a human voice vowel, by means of the internal phase tracking computer of DHM. «Speed» sets the reading speed of memorised sound.

Two envelope generators :
Drive two VCA to control the envelope of the notes. They are adjustable in attack time, hold time and release time.

Dual evolving vibrato :
Three basic parameters : frequency, sharpness and depth are modulated function to time by a form generator initialised by attacks of the notes.

Glissando time :
From a note to the following note is adjustable.

Sustain mode :
Once a keyfinger is depressed, the note starts and continues, even when the key is released. The real duration of note depends upon settings of envelope generator.

Push-play mode :
The notes are heard only if the corresponding keyfingers are continuously depressed.

Trimmer :
Adjusts the fine tune of the whole keyboard. It is a general adjustment, the notes are always in a good ratio together by means of a digital generation.

COME LISTEN TO IT AT AES IN LOS ANGELES — BOOTH 98-99

Tél (33.1) 357 64.08 Telex 250 303 Publi paris

for additional information circle no. 9

STUDIO UPDATE

Hitokuchi-Zaka

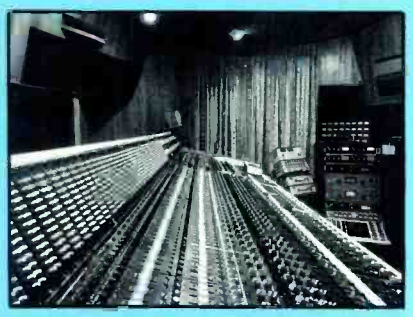
Japan

■ **HITOKUCHI-ZAKA STUDIOS** (Tokyo, Japan) has just celebrated its first anniversary of operation, according to engineering director **YASUJI ONO.** The three room facility was designed by **TAKAMICHI SUZUKI** and built by the **KAJIMA CORPORATION** for the **NIPPON BROADCASTING SYSTEM,** which owns and operates the studios. Each studio is equipped with ARL 32x24 mixing consoles which feed a choice of the operation's four Studer A-800 24-track recorders or four Studer A-800 16-track machines. Two track units by Studer and Ampex are also available. A 36x4 API auto-mix console is also on hand. Other gear includes Dolby and dbx, Orban compressor/limiters, and Eventide Harmonizer, and Lexicon Prime Time 93. Monitors are Super Red double woofer speakers powered by McIntosh amps, and mikes are by AKG, Neumann, Sennheiser, and Shure. The general manager is **KOOICHI WATANABE.** *4-3-31 Kita Kudan Chiyoda-Ku, Tokyo, 102, Japan. Telephone: (03) 263-1097.*

Northeast

■ **ROAD 80 RECORDING** (Scarsdale, New York), along with its move to New York, has completely refurbished its mobile unit including the addition of a Trident custom 48-input console, dual MCI 24-track recorders with SMPTE interlock, and Time Aligned™ monitors. The announcement was made by **TOM JUNG,** of Road 80. *44 Farley Road, Scarsdale, NY 10583. (212) 664-0015.*

■ **JMM STUDIOS** (Metuchen, New Jersey) is open for bookings in its 8-track facility. Equipment includes dbx on its 8- and 2-track recorders, a 20x8 mixing console, JBL monitors, and microphones by AKG, Electro-Voice, and Shure. A Hammond organ and a grand piano are also available according to owner **JERRY MANNO.** *87 Isabelle Street, Metuchen, NJ 08840. (201) 494-9240.*



Soundmixers

■ **SOUNDMIXERS RECORDING STUDIOS** (New York City) has acquired a fully automated Trident 40x32 T.S.M. console for their recently re-designed Studio "B," according to studio president **HARRY HIRSCH.** The studio re-design was handled by **TOM HIDLEY** and **KENT DUNCAN** of **SIERRA AUDIO.** *New York, NY.*

Eastern Artists

■ **EASTERN ARTISTS RECORDING STUDIO** (East Orange, New Jersey) has completed its new 24-track facility with the installation of a new APSI 3000 console. Other featured equipment, according to owner **BILL GALANTY,** includes 3M and Studer recorders, a full complement of microphones and outboard gear, dbx noise reduction, Altec monitors, a stereo EMT reverb plate, and a variety of keyboards and amplifiers. *36 Meadow Street, East Orange, NJ 07017. (201) 673-5680.*

■ **SOUND IDEAS STUDIOS** (New York City) will take delivery in April of the 3M 4-track digital recorder and preview adaptor for use in mastering, and in May, the facility will receive the 3M 32-track digital machine. The recorders will be installed in Studio "A," which was completely remodeled this past Fall. The new API 32x32 console with Allison Fadex automation is currently being upgraded to 40-input. Chief engineer **JIM MC CURDY** headed two years of sessions previously with the Denon PCM 8-track digital system for a special audiophile series and chief maintenance engineer **PAUL HULSE** also has digital experience from his time with L.A.'s Record Plant and their 3M digital system. The studio manager at Sound Ideas is **BOB SCHAFFNER.** *151 West 46th Street, New York, NY 10036. (212) 245-8221 or 575-1711.*

— continued on page 33 . . .

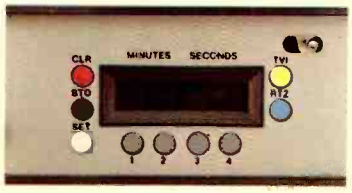
JH-45 AutoLock

A microprocessor based synchronizer/generator utilizing SMPTE/EBU or video drop frame code. Will slave any MCI JH-110 Series, JH-16, or JH-24 Series Tape Recorder to an audio / video / or film master machine. Locks two tape transports with extremely low displacement (typical ±50 μsec absolute). Features 10 memories, programmable user bits, MCI AutoLocator and shuttle functions, programmable record punch in / out, a high speed reader for "chase" function (no wideband amplifiers required), odd and even field, and vertical serration, user programmable for video use. Displays master or slave position and offset in real time. May be interfaced to virtually any professional recorder / reproducer.

In the Autolocate function the tape position and 10 memories can be transferred to tape for permanent storage.

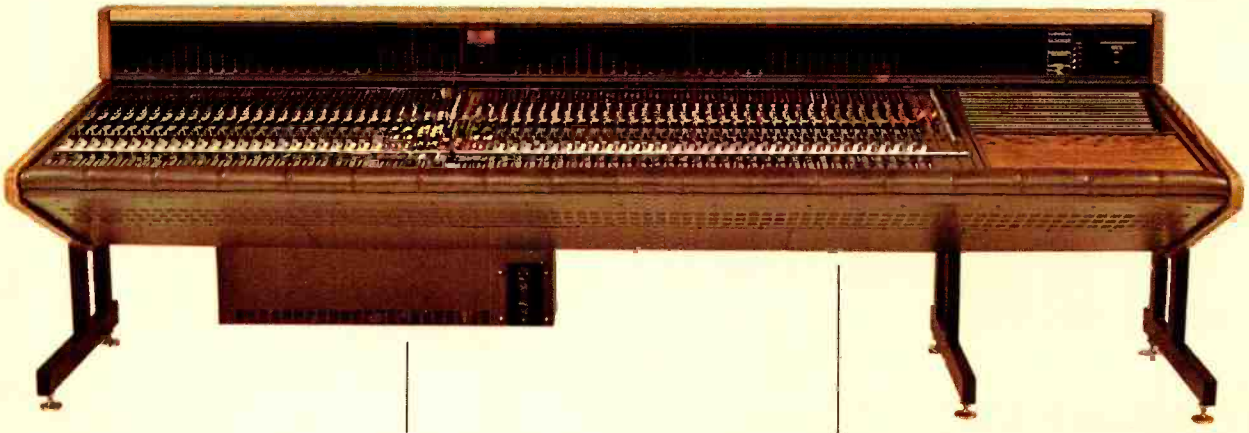
RTZ III

An optional microprocessor based locator for the JH-110B transport series. Features include the return to zero function, four programmable memory locations, presettable up/down real time counter reading in minutes and seconds, tape speed indicator in ips, and the ability to locate from positive or negative domain. The RTZ III is standard on all JH-110B recorders. A special version, the RTZ III/M is standard on the JH-110M mastering machine. Features include 20 memory positions for banding/ spiraling, expand/echo "leadout" lathe functions, plus 4 addressable tape position memories, the RTZ function and tape velocity indication in ips.



AutoLocator III

The optional AutoLocator III, with microprocessor based electronics, is the newest in the MCI AutoLocator line. New features include increased autolocate speed, increased functional capability and microprocessor reliability. The AutoLocator III includes a tape velocity indicator reading in ips and 1/4 semitones, 10 memory locations, presettable up / down counter, real time display in minutes and seconds, flashing decimal point for a negative domain indicator and "shuttle" or repeat function. It is available in the same mechanical wrap with electronic and transport motion remote controls and includes a 35 foot cable.



JH-500C Series Automation Ready Recording/Remixing Consoles

The most widely accepted consoles in the industry, the MCI automation ready JH-500C Series of recording/ remixing consoles are available in six sizes, 28 to 56 channels with Plasma Display meter panels, models and options for all applications. JH-50 Automation is available for automation of Level, Mute and Grouping Functions. The JH-556C, the Ultimate Console, is designed for use with dual synchronized multi-track recorders. Options available include stereo Spectra Vue realtime analyzer, additional equalizers and up to 12 echo returns, built in send and phase meters. Transformerless line input is standard.

The Differential Team:

The MCI JH-600 Series Consoles and JH-24 Series Master Recorder

JH-600 Series
Automated Recording/Remixing Consoles

Available in the following configurations: Factory automated with light meter panel (plasma display) or VU meter panel, or non automated with VU meter panel or non automated with VU meter panel and VCA grouping. All VU meter panel console versions are also available in the smaller 18 channel maximum frame.

JH-24
Recorder/Reproducer

Total opamp signal processing (no second order harmonic distortion), totally transformer-less differential line inputs, outputs and head coupling for lower noise, increased frequency response and dramatically improved common mode rejection, virtually immune to 50-60 Hz and RF interference.

4007 Northeast Sixth Avenue, Fort Lauderdale, Florida 33334
Phone (305) 566-2853 Telex 514362 MCI FTL

STUDIO UPDATE

. . . continued from page 28 —

■ **THE RECORD PLANT STUDIOS** (New York City) announces the re-construction of its Studio "C," one of the first studios designed by **TOM HIDLEY** in the late 1960s. New construction and additions include an API console and a new acoustic design, according to **MICHAEL GUTHRIE,** director of maintenance. *321 West 44th Street, New York, NY 10036. (212) 581-6505.*

■ **THE RECORDATORY** (Weston, Masschusetts) announces the opening of their new facility featuring a Scully one-inch 8-track machine, Trans-Amp™ microphone preamps, Lexicon Prime Time digital delay, Mayer noise gates, and a MicMix reverb system with Ashly limiters and parametric EQ. Microphones are by Shure, Sennheiser, and Electro-Voice, and a Knabe grand piano is also offered, according to **STEVE IZZI.** *95 Newton Street, Weston, MA 02193. (617) 893-2576.*

The Recordatory

■ **TURTLE BEACH RECORDINGS** (York, Pennsylvania) has upgraded its instrument selection with the addition of a Clavinet D-6 and an Oberheim digital sequencer. Owner **ROY SMITH** reports that the studio is equipped with a TEAC/Tascam 8-track recorder and a Technics RS-1500 2-track machine, both with dbx and bi-amped Altec 604s wit6h 620 cabinets. *1912 Alcott Road, R.D. #22, York, PA 17402. (717) 757-6344.*

■ **SIGMA SOUND STUDIOS** (New York City) has just added another studio to its Broadway complex. The 48-track room, dubbed Studio 8, features an MCI 56-input console feeding two 3M M-79 recorders linked by a BTX 4500 Synchronizer and fitted with Dolby noise reduction. Two Ampex ATR-100s are provided for mastering on 2-track. Allison Research has designed a custom automation system for the room based upon Allison's 65K programmer. Monitoring involves an Audiotechniques Time/Sync crossover system driving a pair of Big Red studio monitors with Altec speakers and Altec sub-woofers in custom cabinets. Amps are by Crown. Among other equipment offered are eight Allison Gain Brains, eight Allison Kepexes, an Eventide Harmonizer, and Lexicon 224 digital reverb. Sigma has also acquired a Publison DHM 89B2 Stereo Digital Audio Computer from Paris, France, for use in all three of its studios. **JAY MARK** is the studio manager and **BARBARA TIESI** is the chief engineer. *1637 Broadway, New York, NY.*

■ **SIGMA SOUND STUDIOS** (Philadelphia, Pennsylvania) has purchased the former NFL Films building at 230 North 13th Street with plans to open its first of three studios there by this Fall. The total investment in the facility according to president **JOSEPH TARSIA** and general manager **HARRY CHIPETZ** will exceed two-and-one-half million dollars. *212 North 12th Street, Philadelphia, PA.*

■ **RPM SOUND STUDIOS** (New York City) has completed installation of a Neve 8068 console with Necam automation. The board is 36x32, and was put in along with UREI Time Aligned™ 811 monitors. And EMT 250 digital reverb is also available. *12 East 12th Street, New York, NY 10003. (212) 242-2100.*

■ **TWAIN RECORDING** (West Milford, New Jersey) has added an Ampex ATR-100 2-track machine for use in mixdown in its 24-track facility along with more dbx limiters for a total of four in the studio. All engineering is handled by owner **BOB BOTH** along with **KAREN KOEHLER.** A recent addition to the staff is **BOB MANNING** as assistant engineer. *18 Hiawatha Pass, West Milford, NJ 07480. (201) 697-7540.*

■ **STARFLEET PRODUCTIONS** (Boston, Massachusetts) a location broadcast and 24-track recording service, announces it establishment of a cooperative relationship with **MULTIVISION** to produce audio/video projects. Multivision has worked with ABC News and the BBC, among others, and together Starfleet/Multivision will offer their services on contract as well as produce their own live concert programs. *520 Harrison Avenue, Boston, MA 02118. (617) 482-4881.*

■ **WIZARD RECORDING STUDIOS** (Briarcliff Manor, New York) is expanding with new office and filing space completed and construction continuing on a "live" room (for drums, vocals, etc.) and a new isolation booth (for grand piano, vocals, etc.). Plans also call for the enlargement of the existing control room. Acoustical consultation is being handled by **ACOUSTILOG,** of New York, and all construction should be completed by early Spring. New equipment includes UREI Time-Aligned™ monitors to complement the Altec Big Reds, and Auratones, and the custom house system, and an Eventide Instant Phaser. *P. O. Box 25, Briarcliff Manor, NY 10510. (914) 762-3015 or 941-9642.*

■ **SCOVIL PRODUCTIONS RECORDING STUDIOS** (Norwalk, Connecticut) announces the acquisition of a new Tangent Model 3216 console. Studio president **GARY SCOVIL** made the release. *69 Main Street, Norwalk, CT 06851. (203) 866-0637.*

■ **KERN RECORDING STUDIOS** (Saint Georges, Delaware) has opened after completion of a full renovation and enlargement of the studio and control room areas. The 16- and 8-track facility features a 30x24 Data Mix customized console, dbx noise reduction, and a variety of outboards. **VIRGINIA KERN** is the studio manager. *16 Main Street, Saint Georges, DE 19733. (302) 834-7250.*

Southeast

■ **THE HOBBIT HOLE** (Saint Albans, West Virginia) has upgraded to 8-track with the addition of a Tascam 80-8 with dbx and variable pitch and a Sound Workshop 1280 console. Other equipment includes a Master Room XL-305 reverb unit, Mayer and Allen & Heath limiters, JBL L-36s powered by Phase Linear amps, and mikes by Audio-Technica, Beyer, Electro-Voice, and Shure. Instruments include a Kawai upright piano and a Ludwig drum kit. The studio is owner and operated by **MARCEL LAZARE.** *919 Hughes Drive, Saint Albans, WV 25177. (304) 722-2787.*

■ **FANTASY SOUND STUDIOS** (Granite Falls, North Carolina) has taken delivery of a number of Omni-Craft noise gates as well as a Symetrix compressor/limiter. Plans are also in progress for further expansion of the facility, according to **GLEN HEFFNER.** *14 Woods Drive, Granite Falls, NC 28630. (704) 396-1188.*

■ **ALPHA AUDIO** (Richmond, Virginia) has added to its equipment package with the purchase of a Delta Labs Acoustic computer and digital delays, Lexicon Prime Time and digital reverb, an Eventide Harmonizer, and a Loft flanger. New mikes are by AKG, Neumann, RCA, and Shure. Currently under construction at Alpha is its new Studio IV. *2049 West Broad Street, Richmond, VA 23220.*

. . . continued overleaf -

to be represented in the next available issue write:
R-e/p STUDIO UPDATE
P.O. BOX 2449
HOLLYWOOD, CA 90028

3

STUDIO UPDATE

■ **PRISMA PRODUCTIONS** (Fort Lauderdale, Florida) has recently completed its new studio designed by **AUDIO ARCHITECTS** (formerly Creative Audio) of Nashville, Tennessee. The room features a Stephens 16-track wired for 24, a Tangent console, and Delta Lab and Eventide digital delays. **ARTHUR GABE** and **MICHAEL FOURENS** are the owners. *Fort Lauderdale, FL.*

■ **THE SOUND ROOM** (Fort Oglethorpe, Georgia) is now in operation featuring a 3M 16-track recorder fed by a Tangent console. Monitors are by JBL, and the studio was designed and installed by **AUDIO ARCHITECTS** of Nashville, Tennessee. The studio is owned by **STEVE MULLINIX.** *Fort Oglethorpe, GA.*

■ **SOUTHERN TRACKS STUDIOS** (Atlanta, Georgia) has recently completed extensive renovation designed by **TRACKSIDE ENGINEERING** of Atlanta, and installed by **STUDIO SUPPLY** of Nashville, Tennessee. New equipment includes a Harrison automated console, 24-track Ampex machines with Dolby, and 2-track machines by Ampex and Studer. A Lexicon 224 digital reverb is among the array of outboard gear offered, according to owner **BILL LOWERY** and studio manager **MIKE CLARK.** Chief engineer is **DOUG JOHNSON.** *Atlanta, GA.*

■ **CRITERIA RECORDING STUDIO** (Miami, Florida) has recorded its first fully transformerless multitrack recording using a new transformerless MCI-636 LM console and an MCI JH-114 transformerless 24-track recorder in the newly re-designed Studio "C." Transformerless microphones from Germany by Schoeps were utilized in the session, which tracked the University of Miami Concert Jazz Band. According to Criteria president, **MACK EMERMAN,** the studio equipment now uses differential circuits in and out to achieve the desired results. Emerman has been experimenting with transformerless recording since 1967, and until digital standards are standardized worldwide, he sees this method as more practical and cost effective. Criteria has also initiated a "Lockout" concept in booking studio time, where the rooms are rented on a weekly basis. Savings are made in set up time in equipment and instruments, and the artists do not have the end time to be concerned about each night, according to the studio. *1755 N. E. 149th Street, Miami, FL 33181. (305) 947-5611.*

■ **JALEX RECORDINGS** (West Palm Beach, Florida) has upgraded from 8- to 16-track utilizing Ampex machines and an MCI console. The equipment was installed by **THE COMPANY** of Nashville, Tennessee. *319 Clematis Street, West Palm Beach, FL 33401. (305) 832-1538.*

■ **CONCERT SOUND STUDIO** (Marietta, Georgia) opened for business this past Fall with an equipment line-up featuring a Tascam 80-8 recorder with dbx, a Sound Workshop 1280B console, and monitors by JBL and Auratone. Owner/engineer **ROBERT PETRECCA** adds that other gear includes UREI compressor/limiters, Orban parametric EQ, Lexicon digital delay, and a Master Room reverb. Microphones are by AKG, Sennheiser, Electro-Voice, and Shure, and among the instruments are a Hammond B-3 organ and a Rogers drum kit in a partially enclosed booth. *116 Holland Street, Marietta, GA 30064. (404) 422-7374.*

■ **CENTURI RECORDING STUDIO** (Coral Springs, Florida) has been upgrading of late with the addition of an Eventide H-949 Harmonizer, a Lexicon Prime Time processor, MicMix XL-305 reverb, UREI compressors and parametrics, and Allison Kepexes and Gain Brains. Thirty-six new mikes have also been added, including units by Neumann, Shure, Sennheiser, and Electro-Voice. General manager **MICHAEL SIMONIELLO** has also announced the groundbreaking for a new studio in Maracaibo, Venezuela, which will feature 24-track facilities and is scheduled for completion this Summer on its beachfront property. *11460 West Sample Road, Coral Springs, FL 33065. (305) 753-7440.*

■ **dgb STUDIOS** (Miami, Florida) has altered its plans to go 16-track and will now be expanding to 24-track, according to its president **DAVE GRAVELINE.** The new Studio "B" will be equipped with MCI and Sound Workshop electronics and will feature a control booth and studio each constructed as separate structures within the building. The facility will be operational this Spring. *1975 N. E. 149th Street, Miami, FL.*

South Central

■ **FALCON RECORDS** (McAllen, Texas) has recently completed the update of their studio from 16- to 24-track, according to owner **MARK RAMIREZ.** The facility features an Otari MTR-90 recorder, Sound Workshop console, dbx noise reduction, and assorted peripherals. Installation was handled by **WESTBROOK AUDIO,** of Dallas.

■ **MOUNTAIN SOUND** (Helenwood, Tennessee) has moved to a new 1,200 square feet facility featuring a Sound Workshop 1280 console, a Tascam 85-16 recorder with dbx, Altec 9846 monitors, a live chamber, mikes by AKG, Beyer, and Sennheiser, and in-house lodgings. **C. B. CLEAR** is the chief engineer, and the announcement was made by owner **CRAIG REED.** *Route 1, Box 540, Helenwood, TN 37755.*

■ **AUDIO CREATIONS RECORDING STUDIO** (Paducah, Kentucky) has recently upgraded its facility with the addition of a custom plate reverb built by manager/chief engineer **GEORGE CUMBEE.** Also added was a Loft Series 440 delay line and a high speed opamp modification to the studio's 3M M-79 16-track recorder. Other equipment at the facility includes a custom Spectra Sonics 24 x 16 console, E-V Sentry III, and Auratone monitors run by Crown and Technics amplifiers, Studer 2-track machines, UREI and dbx limiters, and dbx 216 noise reduction. *4815 Clarks River Road, Route 4, Box 5, Paducah, KY 42001. (502) 898-6746.*

■ **INDIAN CREEK RECORDING** (Uvalde, Texas) announces their opening, according to owner **MARTY MANRY.** The complete 24-track studio is equipped with a Neve 8058 console and Ampex ATR series recorders, along with a complete complement of signal processing equipment. **JOHN ROLLO,** formerly with Konk Studios, London, will supervise recording. Studio design and interface was done by **ABADON/SUN,** of San Antonio, Texas.

. . . continued on page 162 —

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
P.O. BOX 2449 •HOLLYWOOD, CA 90028

Soundcraft 1624

Manufacturing:
Soundcraft Electronics Ltd
5-8 Great Sutton Street
London EC1V 0BX
England
Telephone: (01) 251 3631
Telex: 21198

US Distribution:
Soundcraft Inc
PO Box 2023
Kalamazoo
Michigan 49003
Telephone: (616) 382 6300
Telex: 22-4408

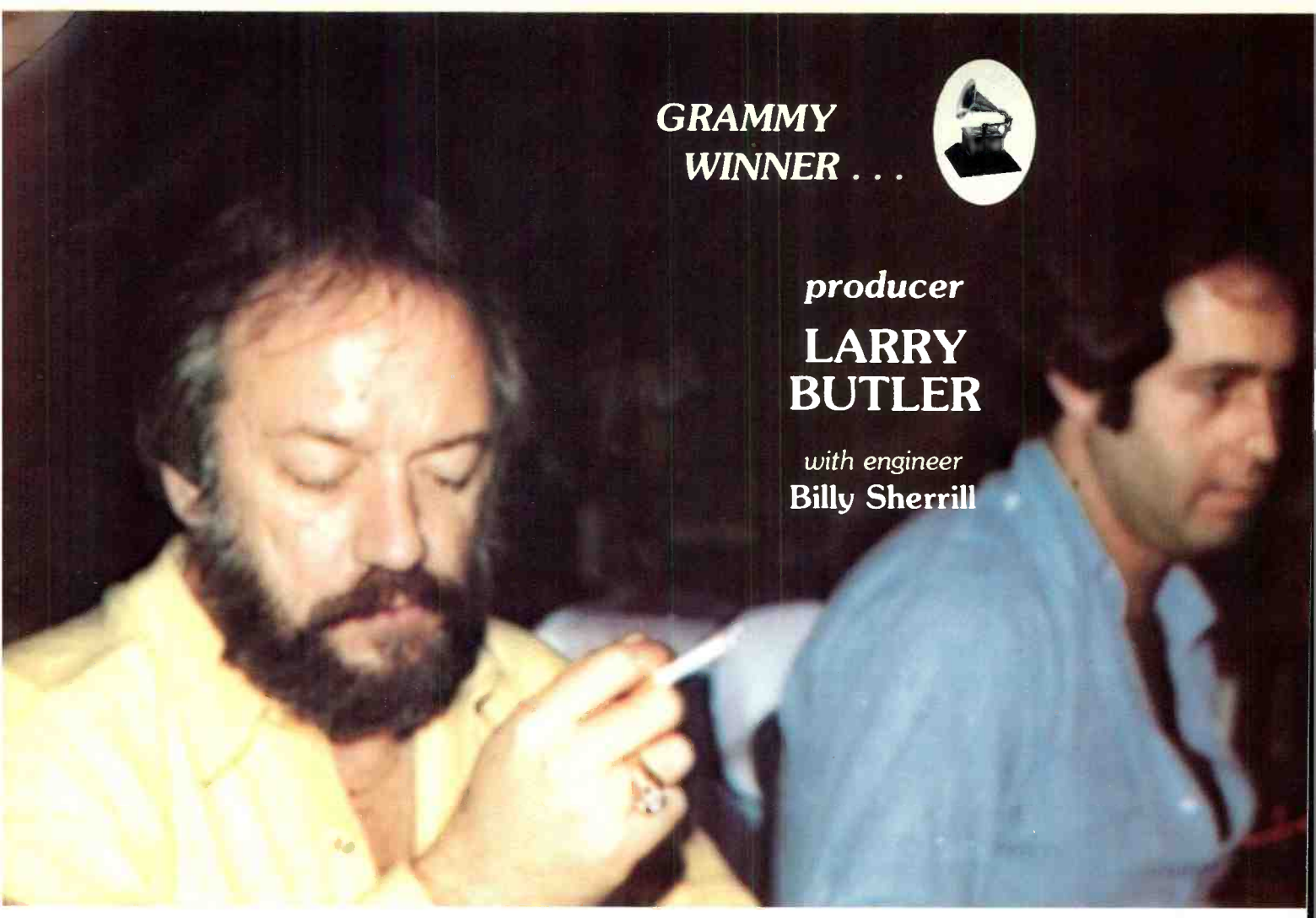
West Coast:
Westlake Audio
6311 Wilshire Boulevard
Los Angeles
California 90048
Telephone: (213) 655 0303
Telex: 698645

Canadian Representation:
McKeen Productions Ltd
PO Box 4054 Station E
Ottawa
Ontario K1S 5B1
Telephone: (613) 236 7242
Telex: 053-3381

SOUNDCRAFT ELECTRONICS LIMITED

for additional information circle no. 11

Brandon Wade's Crosstown Recording, Kalamazoo, Michigan.



GRAMMY WINNER . . .

producer LARRY BUTLER

with engineer Billy Sherrill

by **TOM LUBIN**

R-e/p (Tom Lubin): With the distinction of "Country Music Capitol," how different are Nashville studios compared to those in California and other locations?

Billy Sherrill: The studios are basically the same as the ones we've seen in L.A. and in other places. Studios don't change that much, except for design, equipment is the same. We generally have all the usual gimmicks, but we don't use them as much as L.A. does. I think it's more the songs and that everything is very honest, and pretty straight ahead, and we try to keep it that way, without using a lot of effects that might change that.

R-e/p (Tom Lubin): Country music seems to rely heavily on the strength of the material.

Larry Butler: I'm a believer that the song is the most important element of a record. I think a few years ago you could sell records with gimmicks or unreal guitar licks or effects. I think people today are becoming more conscious of what the song is saying, and I say give me a good song, I'll cut you a good record. Give me a great song, and I'll cut you a great record.

I do look very hard for good material. I don't do any favors, I don't do aunts' and uncles' songs, or whatever. I go for the ten best songs that I can find. Then, as far as the techniques that I use in producing and recording those songs, whatever I feel that song is asking for, is what I put on the record. I believe that is the best way to cut records, because when you walk into the studio with great songs, then 90% of the battle is won.

R-e/p (Tom Lubin): How do you go about the selection process?

Larry Butler: It's just the old fashioned method of sitting down and listening to them — demos from publishers and writers. I probably listen to anywhere from 700 to 1,000 songs before I do an album. I select the ten best out of those.

R-e/p (Tom Lubin): Do you collect a file of songs, or do you usually pick songs with a particular artist in mind?

Larry Butler: I used to pick songs with a particular artist in mind. I wouldn't listen to songs until it was time to work with somebody, then I would start listening. But now I'm listening all the time. I'm stockpiling songs, and so far I've had a good knack for figuring out which songs are best for which artist. If I have seven or eight people I am working with and I hear a particular song, I can usually figure out which one of those seven people is best suited for that particular song.

R-e/p (Tom Lubin): How fast do you guys work on production?

Billy Sherrill: It takes us sometimes as much as four or five days to do an album.

R-e/p (Tom Lubin): I see.

Billy Sherrill: We work quick once we get started. We cut tracks and overdub as we go. We cut a song, work on it, go to the next song, work on that. It takes us about five days to complete an album.

Larry: Complete, start to finish. I don't believe in losing momentum. I think once you get started, once you have mentally prepared yourself to do an album, and you walk in the studio that first day, then I believe that you should continue until you finish. Because I believe in momentum, I believe in the groove, so to speak, and I believe that when you get started, go ahead and complete it, go ahead and go through with it.

I don't know how some guys do it when they go in and lay one or two tracks down and then a month later do a couple of more tracks, and then a few months later do an overdub of a guitar lick or something, and then a month after that the singer will come in. I couldn't do that. I really couldn't and still have my type of feel for that album, any type of consistency for it.

— continued overleaf . . .

Ron started as a singer in Philadelphia. He worked the board at several major festivals during the late '60s before entering the studio in England during the early '70s. Along the way, he began producing. As a producer and/or engineer, Ron has worked with The Who, Led Zeppelin, Bad Company, Dave Mason, The Babys, UFO and many others. His most recent project was with The Jefferson Starship.

ON MULTI-TRACKING

"I go for the whole thing. I would rather not do anything for two days than have to take the band down to three pieces and have to build it back up again. I'd rather piece the tracks together than piece the band together. I mean, there'll still be overdubs and things like that, but rock'n roll is so much a feel situation, you know?"

ON DIPLOMACY

"A lot of times, people will stand around and everybody will think the other guy likes it. Nobody will say 'Well, I don't like it.' It won't be till after a while that they find out that nobody ever liked it. They just never wanted to say anything. Now, I'm the guy who goes in there and gets it all out of them—what they like and what they don't like—so there's none of that. I can be the bad guy, sometimes. I'm just real frank and rough. If somebody's not doing something, I like to say it right then and there, so one of the band members doesn't have to say it. It might be a shock, but none of it is taken out of the studio."

ON MUSICAL STYLES

"You know, hard rock stuff is the hardest thing to record. People whacking the hell out of the drums. Guitars turned up to ten. Everything is distortion. People screaming down microphones. The harder the rock, the harder it is to record."

ON TAPE

"Consistency. That's the most important thing. You know, you can work all day for that one thing and you put that tape on and it drops out or it does something. You stay with it until it cracks up. Then you use somebody else's. And I did that a lot. I've used everybody's tape. I've been using 3M tape for five or six years, exclusively. They happen to use the same tape I do, here at The Record Plant. But if they didn't, I would have my own tape in in a second."

SCOTCH 250
WHEN YOU LISTEN FOR A LIVING.

GRAMMY WINNER

LARRY BUTLER

with engineer
Billy Sherrill

R-e/p: You'll try to work with one artist all the way through?
Larry: Absolutely.

R-e/p: What sort of hours do you work?
Larry: We usually work 6 'til 12 in the evening, and then we start the next night at 6 and go on. I enjoy working at night, and I think it's better for singers. Singers usually are used to working at night in clubs or whatever and sleeping late, and I try to give them the same working hours they would have if they were doing concerts. Let them sleep in the daytime, relax in the afternoon, kick the songs around in their hotel room for awhile, and then come to the studio at 6 o'clock and we work straight through.

R-e/p: Do you jump around from song-to-song?
Larry: No, we'll start with a song, and as Billy said awhile ago, we'll get the basic track down. Ninety per cent of our vocals are live vocals so we're working with the artist right on the spot.

Billy: What we do if they miss a line or blow a word is to generally fix the lead vocal right then.

R-e/p: When you record basic tracks how many instruments are you working with?
Larry: About seven or eight with drum, bass, piano, rhythm guitars, bass guitar, electric guitar.

R-e/p: Do you use two guitars?
Larry: I'll use two rhythms and a lead.

R-e/p: So there's three guitarists.
Larry: Right, but it depends. The type of strings might be different. Sometimes we'll use gut string, at other times metal ones. We've used banjo strings that are an octave higher for the G-string on acoustic guitars.

There is another thing that I'll do sometimes, too. Once we get the — THE — track, I will immediately have the acoustic guitars Capo up and overdub, the same two Martins, playing the same chords they played, but Capo'd up in a higher position. It gives you a sort of 12 string guitar effect, but I like it a lot better because it is thicker. And there are four of them playing instead of one, or two. It gives a real rich, rhythm sound. The guys will tune slightly sharp, just a little bit. Especially if there's an acoustic lead part that's going to be doubled. It makes a very good effect and makes the note six feet wide.

R-e/p: In recording the basic tracks what sort of set-up do you use?
Billy: We work at Jack Clement's in a very tight little room. Musicians love it because they just sit in a big wad out in the middle of the room. Because the room is so small we use the drum booth. It would be almost impossible to get the drums out of everything if we didn't use it.

R-e/p: It's an enclosed booth?
Billy: Right. I usually use Sony ECM 50s on acoustic guitars just to cut down on that leakage. And everybody else sits around in a circle. The ECMs are right inside the body. I use a lot of different kinds of mikes depending pretty much on the song. I use 87s, 47s, and a lot of AKGs.

R-e/p: The snare drum jumps out on your records.
Billy: That varies, too. I use ECM-22P sometimes, or an AKG D224E. We usually put a lot of snare in the final mixes.

R-e/p: What is the best sounding acoustic guitar you think you ever recorded?
Larry: Probably a Martin.

Billy: Yes, most of the rhythm pickers use the old D28.

R-e/p: Is there one that stands out? Someone that owns one that is particularly noteworthy?
Larry: There are several. The guys in Nashville are very conscious about the sound of their instruments. They put a lot of time into looking for them until they find the one that is not only comfortable to play, but also records well.

Billy: They'll come in and say, "I've got a new guitar, let me know what it sounds like." If it doesn't sound right, they'll change it since they often have five or six in the car.

Now I think Ray Edenton and Jimmy Capps have the best sounding acoustic guitars of the guys that we work with.

Larry: A lot of them do. Jerry Shook does; Pete Wade has a good sounding guitar. But, as I said, they are very conscientious about their instruments. They want them to sound good.

R-e/p: How often will they replace strings for a guitar that is used mostly for recording?
Billy: You see, sessions in Nashville are set up a lot differently than in L.A. In L.A. a session can be called anytime. In Nashville they are always 10 o'clock to 1, 2 o'clock to 5, 6 to 9, and 10 to 1 a.m. So a musician can play four sessions a day, and many of them do. The better players that work all the time will change their strings once a day, or once every two days. I know a lot of them change every day.

R-e/p: When you're miking an acoustic guitar, by itself, and you don't have to deal with leakage, what would you use?
Billy: I use the Sony ECM 50 again. Sometimes I'll use 87s, but if it's an overdub situation where I am recording just a guitar, I've been using PZM plate mikes. They're fantastic. I have recently started using them. I place it four or five feet away and just set it there on a chair or something. We have them mounted on a piece of plywood just to give it more resonance. The result is a full, roomy sound of the guitar.

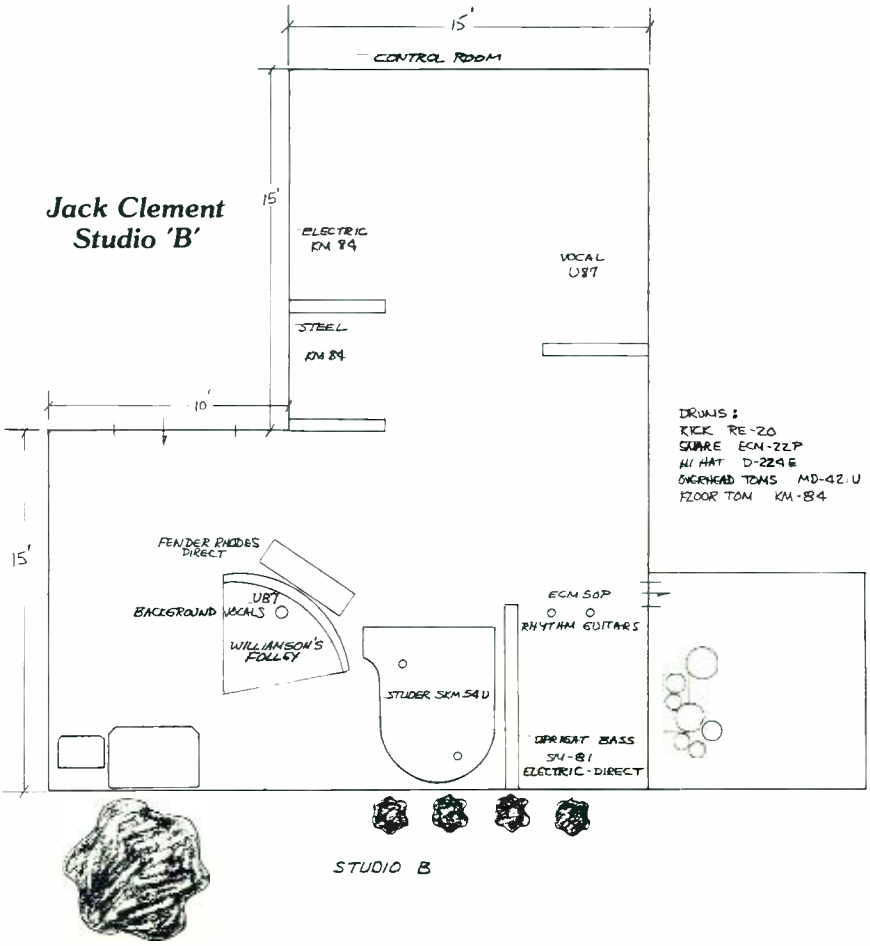
R-e/p: How much do you have to move it around to get what you want?
Billy: Not that much at all. Generally you can just sit it out there somewhere and it just picks up the whole thing. It's really nice. But, of course, you can't use it live because it picks up everything else as well. That's the only time you really can't use it.

I am going to start using them on the strings, which I have not done as yet, but I want to experiment with that the next chance I get.

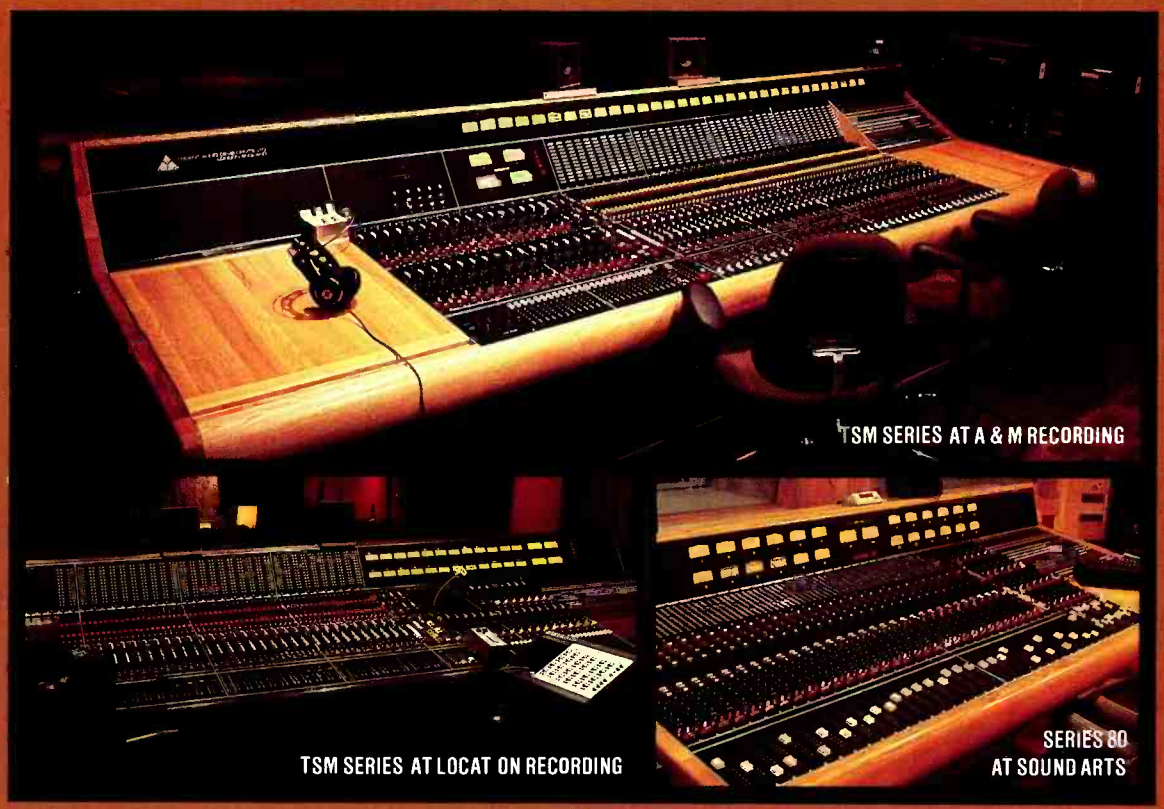
R-e/p: When you cut basic tracks, how elaborate are your charts? What sort of freedom do you give your players?
Larry: Total freedom.

Billy: No charts.

R-e/p: What do they have to work from?
Larry: They write down their own chart as



Three good reasons to demand Trident and Studio Maintenance Service, Inc.



TSM SERIES AT A & M RECORDING

TSM SERIES AT LOCAT ON RECORDING

SERIES 80
AT SOUND ARTS

Our Products

TSM SERIES CONSOLES, the ultimate in professional recording and mixing, featuring:

Standard 56 and 72 channel remix capabilities • 4-band parametric EQ with switcheable Q • 2-band parametric filters • Modular plug-in PC patch bay • 6 aux send with stereo cue • Solo mute — auto mute • Independent AFL/PFL monitor override • Monitor EQ-solo-muting-cue and echo • Complete automation facilities

SERIES 80 CONSOLES, utilizing most TSM features; outstanding mixing capabilities in a compact form.

Our Services

Complete sales, service and maintenance for professional recording studios, including:

Sales and installation of audio and video equipment • Custom studio design and construction • Technical consultation and engineering • Full-service capability for repair, modification and updating

Our Clients

Studios featuring TRIDENT consoles, including TSM and SERIES 80, from STUDIO MAINTENANCE SERVICES, INC:

The Automatt • A & M Recording
Chateau Recorders • Location Recording • Mars/Fiddlers
The Mix Room • Randy Bachman Studios • Redwing Sound
Sound Arts • Villa Recorders
Wizzard Recording Studios

TRIDENT

TSM SERIES

SERIES 80

Studio Maintenance Service, Inc.

12438 Magnolia Boulevard North Hollywood, California 91607
(213) 877-3311 • TLX 674901 SMS INC LSA

for additional information circle no. 14

". . . everybody contributes their ideas . . . in the final analysis I'm the one who says 'yes' or 'no' . . . but I say 'yes' . . . more than I say 'no' . . ."

R-e/p: Does your nucleus vary much? Or are you always able to get the people you want?
Larry: I've got several people that I can call, but the nucleus is pretty much the same. There are certain variations at times because of not being able to get a particular player I'd like to have. But when I say that there is someone I would like to have, there is always someone else I can get that I would feel just as comfortable with in that position.

R-e/p: Is there a "country sound?" What do you think the essence of the country sound is?
Billy: It's the musicians.

Larry: I think it's the musicians and I also think that it's the rhythm. There is a lot of concentrating on the rhythm in a country record. And I am probably more of a rhythm freak than a lot of the other guys I know in Nashville. And it is the simplicity of the recorded song, and the tremendous rhythm foundation. The guys who play on the record . . each is an important part of the Nashville sound. However, the Nashville sound can be very deceiving. There are a lot of records you hear today that you would never guess came from Nashville but they do. In fact, anybody who would like to record, no matter what area of music they are in, can make a damn good record in Nashville, any type of record.

Billy: It has changed a lot. There's a lot more rock and roll, R&B, disco. I've been there about ten years and right after I came to Nashville it really started changing drastically. It is now a whole music community.

R-e/p: When you're cutting tracks do all the players use earphones?
Larry: Some of them do.

R-e/p: What sort of feed do they like to get? Do you give a variety of mixes?
Larry: That's the most time consuming thing that happens in the studio when we are cutting records . . . getting everybody satisfied with what they've got in their earphones. If you have nine people, then you have nine different settings. The drummer will want this; the bass player will want that. I am not putting them down for that — that's fine. It's no problem. But I swear to you, that takes more time than cutting the track.

Billy: Generally what we do is give them two different feeds, if they want it. We'll put the vocal on one side and the rest of the band on the other, and then I'll put their boxes on mono. That way they can turn the vocalist off. Most of them don't like to hear much of the singer. Just enough so they know where they are, and what feel that artist's going for, and they play with it. Whereas the singer usually wants himself — loud.

Larry: Right! "Give me more echo!"

R-e/p: Have you found a distinct difference between a board with transformers and one without them?
Larry: I like the transformerless much better . . . it's more transparent, cleaner. In the big studio, they have a Harrison that's older with transformer preamps and there is quite a difference. But I'll tell you one thing, I don't know a damn thing about the technical aspects of a studio. You start calling out microphones and numbers and I don't know anything about that stuff.

It's the feel that counts, and the people at Clement's have been very good about getting me the sound that I want. And it's not just me — any of the clients that come into that studio. I don't care what it takes, they will deliver. If you need a piece of sidegear that is not there, you'll have it in fifteen minutes. It's a very, very tight operation, and everybody there gives a damn. They all care. The woman who answers the phone cares. Everything from top to bottom is very professional and very thorough.

Billy: It's a good atmosphere.

Larry: It's a great atmosphere, and I've never heard one person there say, "that's not my job." They all do everything including the receptionist making tape copies. That's not her job, but she does it from time-to-time.

Billy: Plus, it's a couple of miles off of Music Row, which is two streets with music publishing companies, recording studios, record comanies, and everything else. So we don't have constant traffic coming in and out. You don't have the interruptions and so forth that a lot of studios have. I used to work at a studio on Music Row before I came to Clement, but it was just a constant flow of people. A lot of times it becomes difficult to work when five people walk through the control room wanting to know what is happening.

R-e/p: How comfortable do you think a studio should be?
Larry: Do you know what a chameleon lizard is?

R-e/p: Pardon me?
Larry: A chameleon lizard.

R-e/p: Yes.
Larry: It crawls out of the ground and then it turns brown. Well, I think a studio should be like that and applicable to any producer who walks in to it. That's how comfortable I think it should be. Whatever his needs or desires are, I think should be incorporated into the structure of that studio. And if it is a R&B producer, classical producer, country producer, Top 40 producer, they should all be comfortable in that room. That's what I think a studio should be.

Billy: Both of the studios at Clement are real homey looking. Earthy colors . . . things like that . . . so it's comfortable. There is a lot of wood and rock, and solid oak floors. A comfortable atmosphere.

Larry: And the thing that is exciting about it is that as comfortable as it is, and as small as it is, you're inspiration comes from your first playback because it sounds so damn good. Everybody gets up; everybody gets enthusiastic. That's very important. I've worked in studios where the guys will come in and we'll have a playback, and I'll sit there and listen along with them, and it doesn't sound worth a shit, and we'll say, once we mix it it's going to sound great. The hell with that. I want to hear it right then. And they do, too. A good playback is very important because that gives you the ambition — the desire — to play even better. If you can hear yourself playing, then you'll play better.

Another thing is getting a good playback mix. I have seen engineers go and fix themselves a cup of coffee during a playback. Well, at Clement's, you'll watch the engineer sitting there during playback and he'll be bringing up the lead instrument when it is doing a particular lick. And, again, it's psychological; but hell, it works!

R-e/p: When you're cutting live vocals, what microphones do you use?
Billy: It depends on the singer. Usually I use a Neumann U87 or an AKG 414, and a lot of times I use an EV RE-20. I might change microphones several times during the rundowns of the first song. I like the 414 and the 87, or the old U47. I've got four of them.

R-e/p: What kind of leakage problems do you have when you are cutting vocals live?
Billy: About the only time we really have a problem with leakage is where the band quits and the singer has maybe a bar alone . . . and that is about the only time we really have a problem. And how much leakage there is depends on where they are placed in the room, but it's never that bad. If they do any overdubbing, as long as they phrase it the same, it is all right.

Larry: And they usually do. These singers usually sing a song basically the same. It would really surprise you if you looked in the room and saw seven or eight musicians working in there and you sit there and watch the singer sing a strong vocal, and you hear Billy turn the vocal completely off. There is minimum leakage, there really is.

R-e/p: How much track gets in the vocal mike?
Billy: Not that much.

Larry: Unless Sanford, the electric guitar player, decides he wants to play a little louder than normal.

Billy: He kicks the pedal to full and goes @#$%¢&*%$@*!

R-e/p: Well, you always have a problem with leakage because when you EQ a particular microphone you end up EQing the leakage.
Billy: That does present a problem, but I can usually fix it.

Larry: Have you ever heard of a producer that

EASY DECISION.

When you want to expand to 16-track and money is a real consideration, you have two choices: our new 85-16 or a used machine.

The 85-16 gives you sixteen tracks on one-inch tape with integral dbx**. S/N performance is better than 87dB (WTD, with dbx). Electronics-induced distortion is less than 0.1%—even at 25dB above normal operating level. And you have 28dB of system headroom.

We're using a newly designed transport for greater speed accuracy and long-term dependability. There's servo control throughout. And an internal micro-processor for the transport controls.

With a used machine, you may get 2-inch compatibility. But no warranty, a heavy refurbishing bill, out-dated technology and no investment tax credit.

So why buy someone else's headache? Check into the new 85-16 for results you can bank on day in and day out. It's a decision you can live with.

*Retail prices are determined by individual TEAC TASCAM SERIES Dealers.
**dbx is a trademark of dbx, Inc.

TASCAM SERIES
TEAC Professional Products Group

for additional information circle no. 16

likes leakage? I do. It gives the cut ambience and creates space behind the track.

That Harrison board is pretty incredible. I've watched Billy EQ echo off a mono track.

Billy: Filters. It's a great console. Ever since it came out I have liked it. Clement originally had Quad-Eight. At the time I was on staff there. When we decided we wanted to remodel the studios, buy new boards and everything, the Harrison console was the one everyone liked.

Larry: It's a great board, but I've heard some people don't like them because they have so many amplifiers in them. But who cares! It's how it sounds.

R-e/p: Have you had an maintenance problems with it?
Billy: No, not really. The only problem we had was the night wine was spilled in the faders.

Larry: We had an artist that knocked over a full glass.

Billy: It burned the mother board. It was a good thing that I remained there after everybody else left. I was sitting there talking to someone and I started smelling something funny. I didn't know that it was anything more than the wine that had gotten in the fader. I started sniffing everything and I figured it just blew a transistor. But a few minutes later I looked around and there was smoke coming out of the console. I almost broke my neck getting back to shut the board down. It was four in the morning, so I left a note on the board and then at 8 a.m. I called the studio manager and said that something was wrong with the console. We had burned the mother board and eight modules. Everything was just fried, and it was a very expensive glass of wine. There is really nothing you can do about it. You can't bill the artists for it, it was just an accident.

The equalizers are very musical. I have worked some on a Neve console, which is a fantastic board but it's a little too clean. You've got to have a little shit in there just to give it some balls, you know. Harrison has got it. The things that I have done on a Neve just seemed too clean to me, even though their equalizers are also musical, too.

R-e/p: Do you use the automation during mixing?
Larry: No. It's kind of like having a robot in there with you. I'd rather do it myself.

Billy: You have more feel for it.

R-e/p: Is there much need for programming the muting sequences?
Larry: Some.

Billy: Yes . . . that's the best thing that I can see for the computer. It's all right. I am not opposed to it at all. But, generally, if we get a mix that we like but there is something that is not quite right, if we have got the feel for it, we will roll it back and do it again. Once you've got the feel for the record, it's not that much of a problem.

R-e/p: Do you mix a tape several times or do you feel once you've mixed it you have gotten all you can get out of it?
Larry: We remix very seldom. Once we do the mixes, that's usually it.

R-e/p: Do you intercut mixes?
Together: No!

Billy: Occasionally we have to take a piece out of one and stick it in another, but not very often.

R-e/p: When you are creating an album, at what point are you starting to plan the sequence?
Larry: Well, whether you believe this or not, each song stands on its own. We are not thinking in terms of the next song; we're not thinking in terms of the previous song. We cut and mix every song on its own, as we feel it should be done. But this goes back to what I said awhile ago about the momentum of recording when you record it all together. If we did a mix and then came in three or four weeks later and did another mix for another song, they probably would be very different. They would probably stand out from one another like a purple chair in a green room. When we go in to mix the album, we mix that son of a bitch. We don't tell war stories and kill time. I don't believe in killing time. I believe in spending money very wisely.

Of course we do rough mixes. I listen to these before we go back in and mix. By then I have it pretty well figured out. But when I talk about going back in, I am talking about probably the next day.

R-e/p: So there is no prolonged anxiety or anguish at all?
Larry: No.

R-e/p: Do the vocalists have the songs before coming into the studio?
Larry: You ask some of the artists that I work with, I scare them to death. Absolutely petrify them. Kenny one time learned a song in a session that he had never heard in his life. Billie Jo Spears one time learned a song in a session because she didn't like the song. I said let's do that song about the blanket. She said, "Well, Larry, I really didn't work on that one." I asked, why not? She said she didn't like it. I said, okay, you'll learn it while the band learns it. She did.

Billy: And it was a number one record!

Larry: Number one record. We did an album with Julie Andrews. She said you can't do it this fast, and I said "watch." I am about to do an album with Hana Miscuri. She keeps asking when I'm going to send her the songs, and I tell her that when she comes to Nashville she can learn them. I believe that if an artist has a song for a month or two months before the session, and they listen to it, and listen to it and work on it, when they go in to sing it, it can come off exactly like maybe a hit record they had two years ago that they have sung every night in their show, and everytime they sing it it becomes a little more boring to them. When you get a song that is fresh, and you have just learned it, that's when you are putting your heart and soul into it.

Billy: The spontaneity is there.

Larry: That's another reason why I don't like Take 15 or Take 27. I like Take 2 or 3. Because the enthusiasm is there with the musicians and the vocalist. You can wear anything out. I don't care how good it is; if you keep doing it it's going to get a little bit old.

R-e/p: Well, there is a certain magic that happens on record.
Larry: Absolutely. There are so many of my records that have "mistakes" on them. I mean absolute mistakes, but the whole feel of the record is right. If the emotion is there I will go with it.

Billy: But you don't really notice the mistakes.

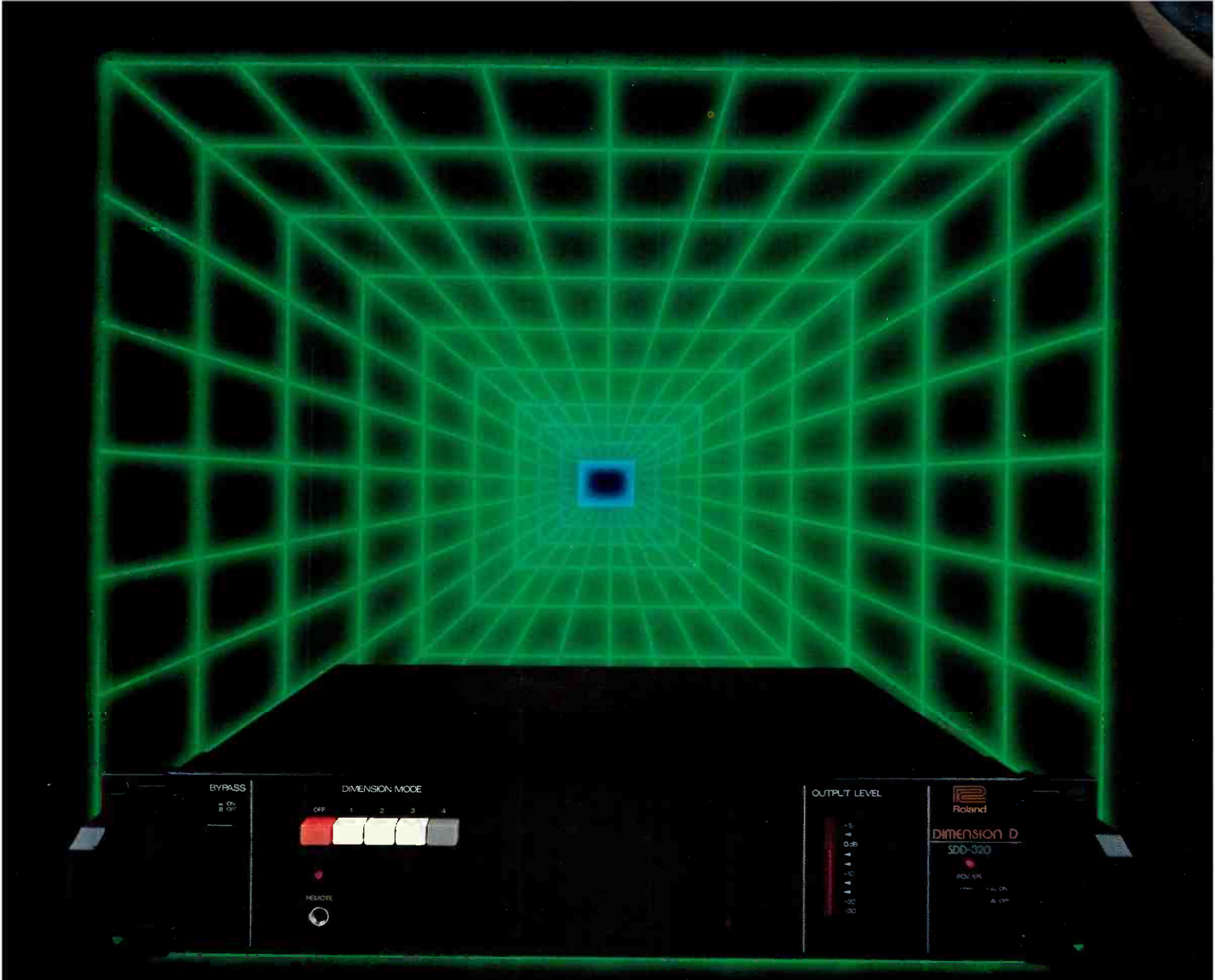
Larry: Now I am not talking about a terrible bad chord, but things that aren't exactly correct. In the final analysis those things don't matter because you must remember that what you're selling is emotion. We are not selling anything else but emotion. A record is an emotional experience, whether it is happy, sad, or whatever. Well, if you don't capture that emotion, you might as well go out and sell cars.

R-e/p: The album, "The Gambler." There are so many great cuts on it. When you are doing a project do you know at the time if a particular album has the magic?
Larry: Yes . . . you can feel it. "The Gambler" is so funny, and a real experience. For instance, the background vocal on the album, with Kenny singing, is Dottie West, Kenny, and

myself. Dottie was there in the control room when we cut the lead with Kenny. So he did his vocal and then he said, "Hey, you and Dottie come out here and let's put the background on!" I said, "What?" And he said, "Come on, let's sing it!" So we did. It scared me to death. Everytime I hear it I think, my God! Can you hear me? I'm flatter than hell. But it felt fine. At the very end of the record the Jordanaires come in — that's when it builds into a sing-along with the strength of a choir.

R-e/p: What techniques do you use while overdubbing strings and horns?
Billy: In the big studio at Clement's there is a separate string room off to the side that opens out into the main room, and that's always set up. The last six months to a year, though, we have been using more strings than ever before. A lot more players on a session, so I end up having to sit some of them out in the room. I usually sit the cellos and the arco bass out in the room itself and then all the rest of them go in the little string room, which is very live.

R-e/p: What do you use for mikes?
Billy: Mostly one 87 over each pair of players, and I mike them pretty high to get the sound of the room. I really like the sound of that room. I've tried cutting them out in the room itself,



The Dimension D

The problem with many special effects is that they have a tendency to become specialized effects. Rather than being integral to a performance. They become simply the frosting on the cake, used only occasionally because their very nature makes constant use tiresome.

But what if the fundamental sound itself is lacking? What if you want to give it some life without having to put it through a wringer for improvement? For you Roland offers Dimension D—the Uneffect.

The Dimension D changes the life of your sound without changing the sound itself. Electric and electronic musical instruments are enriched with a depth and liveness that they never had before...fundamentally the same, but deeper and richer. Likewise, acoustic instruments and vocals are richened and thickened when you amplify or record them. They're given back the brilliance they had live.

The Dimension D is not a device that will be relegated to sitting in a bank of equipment, rarely used. On the contrary, the Dimension D is likely to become as integral to the creation of sound as any other element. Once you turn it on, you won't turn it off.

The Dimension D can work on either a mono or a stereo signal, and also has the capability to generate a stereo field. And if you don't want to turn the Dimension D off, you won't have to, because its signal-to-noise ratio is better than 90 db.

The Dimension D is not an effect, it's really an experience. It won't blow you away—it isn't supposed to. That's because some effects are not measured by their intensity, but by their subtlety.

Enclose $1.00 for a copy of the Roland Rack catalog.

RolandCorp US
2401 Saybrook Ave.
Los Angeles, CA 90040
(213) 685-5141

Roland
We Design the Future

for additional information circle no. 17

". . . I like take 2 or 3 . . . the enthusiasm is there . . . We're only selling emotion . . . a record is an emotional experience . . . if you keep on doing it, it's going to get old . . . little mistakes don't matter if the emotion is there . . ."

and it is just too much air and the sound gets away.

R-e/p: Do they use earphones?
Billy: Yes.

R-e/p: Do you have single headsets?
Billy: They bring their own.

R-e/p: They bring their own earphones?
Billy: Well, we have our own string section. They are called the Shelly Kurland strings, and you just call Shelly and you say, "We need 15 strings," and he shows up at the right time with all the players. They all have their own little headphones, and they come in, plug 'em in, sit down, and play their ass off.

Larry: And, production wise, what we will do is have Monday, Tuesday, and Wednesday nights for tracking sessions. Monday night we are making copies of the tracking that we have done and Bill Justis will come by the studio and picks up his tape. Tuesday, while we're recording new tracks, he is writing the string part for the tracks cuts on Monday night. Tuesday night he comes by and picks up another tape. Wednesday night he is writing the parts for Tuesday night tracks. Thursday we go in and overdub strings. We cut them all.

R-e/p: Ten tunes in one day?
Larry: Ten, and we mix Friday.

R-e/p: Strings and brass the same day?
Larry: Everything.

R-e/p: Are they done at the same time?
Larry: Sometimes at the same time, but each is recorded alternately on the same day. We'll do the string parts, then they'll go get a cup of coffee while we get the brass.

R-e/p: At what sort of levels do you listen in the studio?
Billy: We listen to it at a lot of different levels.

Larry: We don't listen loud all the time.

Billy: We may listen loud while we're mixing, then check it in the little speakers at a medium volume, and then listen at a low volume, just to make sure everything is correct.

Larry: And it will give our ears a break. We also stop for a few minutes and go outside.

R-e/p: When you are cutting basics, you said everybody is close together. Do you avoid goboes?
Billy: Oh, no. We have some that are small. The guitar amplifiers . . . well, you have to actually see the studio to know what I'm talking about. A lot of the furnishings in the studio itself came from a whorehouse in France. It's got chandeliers, and an old mantlepiece from when a Cowboy owned the studio — Jack Clement. He was over in Europe, and he must have gone to a going-out-of-business sale or something, and he brought all these Oriental rugs. And the guitar amps sit in these little things that are actually like hall seats, or hall stands, whatever you want to call them. They're very ornate things and they are flat. So instead of pillows in them they have guitar amps. The piano has a little baffle that comes up just about as high as the lid, and the other side has got a curtain that can be pulled across.

Larry: Which we never use.

Billy: Yeah.

Larry: Never.

R-e/p: Do you ever close the lid on the piano?
Larry: No. We have total visibility. There is nothing that is blocked off.

R-e/p: So your basic attitude is that everybody plays about the same level, so the leakage won't matter.
Larry: Exactly.

R-e/p: Do you have an upright and a grand?
Larry: Just a grand . . . Steinway.

R-e/p: Is the grand always used?
Larry: Yes.

R-e/p: Will you mike it differently to get different sounds, or do you generally mike it the same way?
Billy: Pretty much the same. We use Studer microphones on the pianos in both studios. I generally mike the high and low end, and depending on the lick which is going to be played, may move the mike up or down. The top is near the hammers and the bottom is on the low strings.

Larry: And it is cut in stereo.

Billy: It's a good-sounding piano in the little studio.

R-e/p: What kind is it?
Larry: It's a Steinway.

Billy: We've got a Chickering nine foot in the big room and that is a great-sounding piano.

Larry: Yeah . . . it really is nice. You know, a nine foot piano is usually not a good piano to record with because there is often a lack of presence. But this particular piano is a different instrument. Even though it is a nine foot, it is not mushy sounding at all.

R-e/p: What would you attribute that to — the mushiness of nine foot?
Larry: The length of the strings I think has a lot to do with it. The shorter the strings, the more brilliant the pressure of the hammer on the strings. Instead of like a "bong," sometimes there is a "wong" on a bigger piano. On this particular piano it is as sharp sounding as that six-footer is. The big strings explode, but you still have the presence.

R-e/p: Did they harden the hammers at all?
Larry: I don't think so. Just a freak thing. I am a piano player, and I can appreciate it. Most piano pickers that come in love it, and enjoy playing it.

R-e/p: On many of your records you use a Fender Rhodes, a difficult instrument to record cleanly. Has the Rhodes that you use been modified to get them a clean sound?
Billy: I generally take a guitar cord, plug it into the phone jack, and just turn the Rhodes up — really loud — though it doesn't come out of the speakers, but the band can hear it in the headphones. So when you back the preamps and everything down, the noise goes away. It's still there, but it's so far down in the track that you don't hear it.

R-e/p: Do you mike the drums from the top?
Billy: Again, it depends on the drummer. Sometimes the sound from under the drum is better than that on the top. I never use overheads because the drum booth is so live that all the cymbals are well picked up in stereo by the other microphones on the kit. I use an ECM-22 on the high hat, and I place it above the top cymbal. I like Sennheiser 421s on the rack toms, U87s or KM-84 on the floor tom. An RE-20 on the kick, and very often a Sony on the snare.

R-e/p: Would you comment on the production relationship between the piano and the guitar? Most of your records have these two acoustic elements.
Larry: Well, I think it is part of the system that we have for making records. And that is, if I think enough of an instrument to have it on the record, then I think enough of that instrument to let it be heard. In our mixes you can sit there and hear every instrument. If you are looking at the liner notes — if it is on that particular song — then you are going to be able to hear it. I think that is important.

Billy: Some of the things that the pick and rhythm guitar players do they do together. That is a big part of our rhythm sound. It's banjos and guitars.

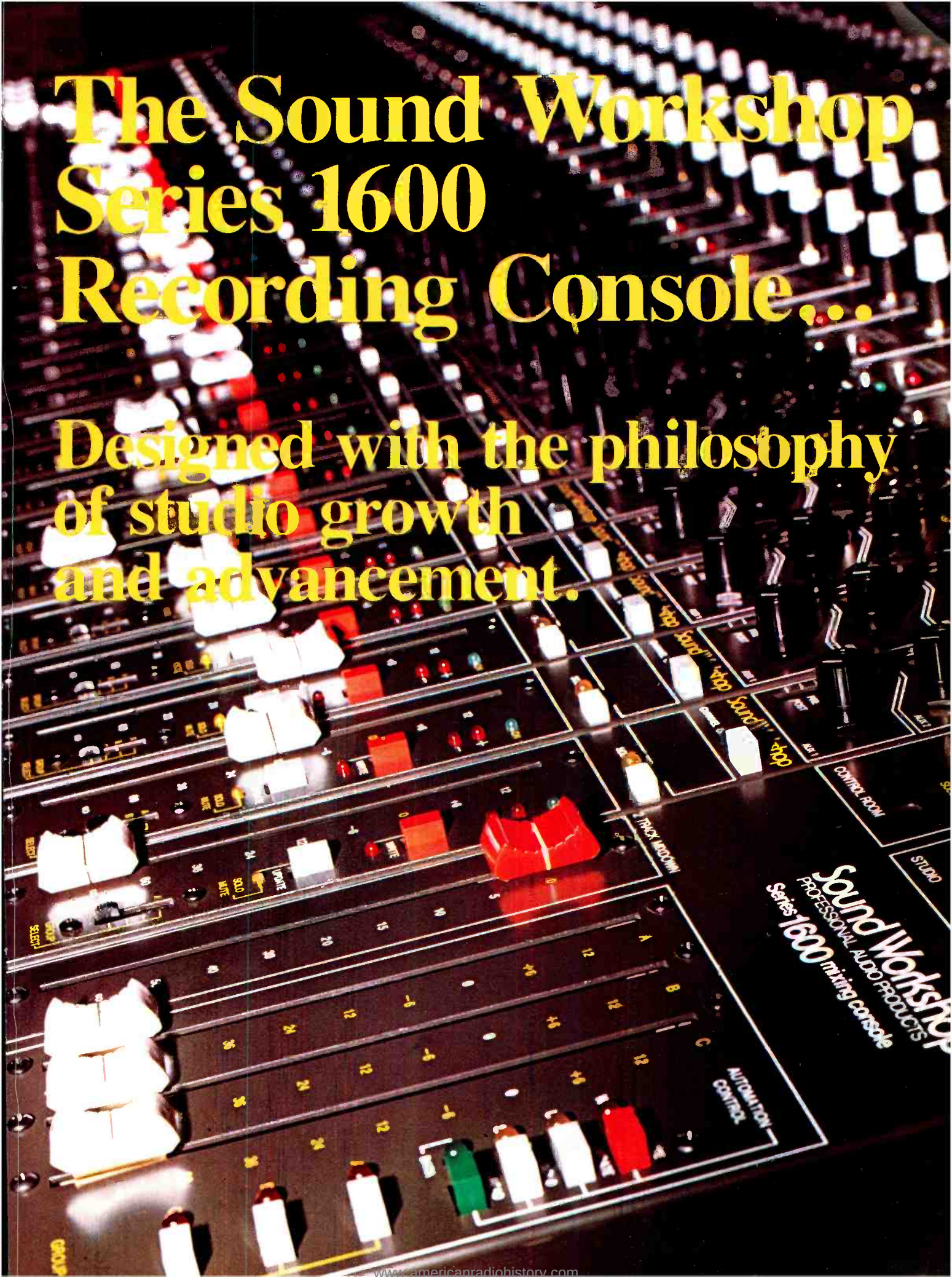
Larry: And the bass guitar. Bass and piano will have a particular bass line and play together with the lead guitar.

Billy: Talk about the "tick tack!"

R-e/p: What's that?
Larry: That's the sound of the electric bass. You have the bottom . . . the balls of the electric bass . . . and you also have a "tick" thing that happens with it. Well, that's the six-string electric bass that is playing note-for-note with the four-string electric bass. It's like a bass guitar. It's played to make a percussion sound more than a note sound. He is playing the notes, but where he gets more of a "tick" sound. Then Bob Moore is playing regular notes.

R-e/p: Is the six- string bass an overdub?
Larry: Plays right along with him, every note together. You see, a six-string bass is in the octave in between a guitar and four-string bass, that is what gives it that sound. Angstrom makes one, and Fender makes one. I am not

— continued on page 53 .



JEL Recording—Newport Beach, CA

RPM Production—Los Angeles, CA

Overland Recording—Costa Mesa, CA

In its first year

The **Sound Workshop Series 1600** has been chosen as the audio control center in over 50 studios around the world. Its modular design philosophy has allowed for a variety of installations ranging from 12 input/4 output production consoles, to 36 input/32 output multi-track recording boards complete with computerized mixdown.

Studio B—Boston, MA

As the most expensive single piece of equipment in the studio complex, the recording console needs not only to pass the highest quality audio with a tremendous amount of flexibility. It remains a major investment in the future growth of the studio. The **Sound Workshop Series 1600** can adapt to the changing needs of the studio better than any other console available today. Thoughtful, innovative design allows a wide range of initial console options and configurations. But more importantly, these options can be added later with a minimum of extra expenditure and hassle.

Counterpart Creative Studios—Cincinnati, OH

The 19 Recording Studio—South Glastonbury, CT

The Sound Workshop Series 1600
A new philosophy of console design.

The diverse range of options available for the Series 1600 creates a console tailored to the individual needs of the studio: both today; and tomorrow, as need dictates and cash flow allows—

HIGH RESOLUTION METERING—a multi-colored wide range 40 segment meter with a dynamic range of 40dB and a resolution greater than .25dB at 0Vu. These meters offer 3 modes of operation including average, peak, and peak-hold. A built-in spectrum analyzer permits visual indication of the frequency distribution of any monitored signal. A spectrum analyzer can also be added to the standard 8 segment LED meters, which are available with Peak ballistics. Mechanical Vu meters with Peak indication are also available. Consoles may be configured with varied meter options.

EGC 101 VCA CELL—the state of the art in VCA technology (from Allison Research). Sound Workshop has incorporated the EGC 101 in its VCA grouping package. Studios adding the VCA package to their Series 1600 can take advantage of this sonic breakthrough. Studios with VCA equipped 1600s can retrofit, and offer their clients the current edge of VCA technology.

SUPER-GROUP—this new addition to Sound Workshop's **ARMS** Automation system sets new standards for grouping, flexibility, and ease of operation. No other console offers the visual status indication of group assignment available with Super-Group. "Negative Grouping" permits formally difficult or impossible group structures to be instantly available. In addition, the number of groups available is limited only by the number of input channels. Super-Group is now available for use with ARMS Automation, which features Independent Mute Write with FET-Mute switching, eliminating the sluggish punch-ins associated with ramped VCA muting systems.

Also available are **TRANS-AMP** (Valley People, Inc.) microphone preamplifiers. Sweepable and Parametric Equalization, and many other options. Most options can be added to existing consoles. It's part of the unique design philosophy exhibited in all Sound Workshop products.

The Sound Workshop Series 1600 is sold through a select group of Dealers. See one for assistance, or call Emil Handke at Sound Workshop.

BRINGING TH E TECHNOLOG Y WITHIN EVE RYONE'S REA CH. Sound Workshop

Sound Workshop Professional Audio Products, Inc.
1324 Motor Parkway, Hauppauge, New York 11787
(516) 582-6210 Telex 649230

. . . continued from page 48 —

even sure that Dano Electro even makes them anymore. Most of the ones around Nashville are pretty old. The players have had them for a long time.

R-e/p: How do you create the echo envelope around your vocals?
Billy: Depends. A lot of the more recent stuff has a slap on the echo return. A lot of it is also the way we use the live chambers — two live chambers in the other studio — we just patch them into the little studio.

R-e/p: Large ones?
Larry: Very large ones — silos, uprights.

R-e/p: Silos?
Larry: Yes . . . two of them.

Billy: They really sound great.

R-e/p: Are they round?
Larry: No, they're not round, but they are extremely tall.

Billy: The best sounding live chambers I have ever heard.

R-e/p: Can you change the acoustics of the chambers?
Larry: Just climb up a ladder and move the microphones. But it gets to be a hassle.

Billy: They generally stay pretty much the same. When we first got them in we worked on the decay times, and both of them have different decay times. So they set them up to where everybody was happy. We don't move them a whole lot.

" . . . Nashville, it's not just the country music recording center. It is a recording center. Anything you want to record . . . can be done there!"

R-e/p: Do you use other echo devices or primarily the live chambers?
Billy: We use EMTs, too. On a lot of the early records on Kenny's vocal I used two Quad-Eight spring units.

R-e/p: One each, left and right?
Billy: Yes. They really sound nice. I still get them out and use them every now and then. But you could not use them on a lot of things because they start going "thoiii-i-i-ing" — you know, like a spring. But on vocals they are fine. It was a good sound. People would ask me if I was using a live chamber. And I would say, "You wouldn't believe it if I told you."

R-e/p: Do you have any other outboard gear that you are particularly fond of?
Billy: Yes, I use the Eventide Harmonizer some. I really like the new Lexicon Prime Time. It is probably the best piece of gear that has come out in a long time. It does a lot of things and does it well. You can even get a slap effect on it. We use digital delay some, but sparingly. We use outboard gear, but not much of it.

Larry: They have to sort of gang up on me. Billy and everybody else at the studio have to plan an attack on me because I am very leary of new gimmicks so it takes them awhile to convince me to try something. You should have seen the first time there was a Syndrum on the session. I had made a very profound statement — that there would never be one on any of my records because I thought it was the most ridiculous sounding thing that I had ever heard in my life, because it was not a real drum. It was like an imitation drum. I believe in honesty in records. I had heard them several times and felt they were over-used. Well, one night, we're in the studio and Billy and the drummer conspired.

Billy: The drummer started it. He set it up and I thought — oh, oh! — this is going to be a disaster. The first time he hits that thing Larry is going to go right through the window.

R-e/p: Did you finally use them?
Larry: I think on one chorus I let him play two notes or something. However, I did overdub a real tom with it, which gave it some bottom.

R-e/p: Have synthesizers come to country music?
Larry: Used in the right way they are fine.

R-e/p: Do you play the synthesizer?
Larry: Sometimes. Or Shane . . . or Edgar . . . that is about it.

R-e/p: Do you set the synthesizer up in the control room?
Larry: That is the best way to do it. He sits beside me.

R-e/p: When you are producing do you work in the control room or the studio?
Larry: I spend the majority of the time in the studio, getting the arrangement, so to speak. Getting the record together, then I go into the control room.

R-e/p: Do you play on the date?
Larry: Once in a great while. When I have a particular feel for a piano part, then I'll go out very meekly and ask Pig if it is all right if I sit down and play, because I don't do that very often. He is the king of the keyboard and an incredible musician.

Larry: I prefer to be in the control room, I really do. Once in a while the artist in me takes over, and I "big time" it a little bit.

R-e/p: How did the combination of Kenny and Dottie come about?
Larry: Pure accident. Absolute accident. Kenny was set up for 6 o'clock and Dottie was doing a 2 p.m. overdub. Kenny came in two hours early, just to hang out and say hello to Dottie. On one of the breaks we were sitting there talking and Dottie told Kenny she had something she had to say. She told him she very much wanted to make a record with him; and he said, "Well, let's do it!" She said, "Well, I would really like to someday." And he said, "No, I mean now." So I said if you guys are serious, I've got a track here that is going to be on Dottie's album that we are getting ready to work on, and I think it would be an incredible duet — "Every Time Two Fools Collide" — and it worked out perfectly. They're both pros. They went out there and sang the hell out of it. Kenny did have to reach up there for the high note because it was cut in her key. He grabbed his belt loops on that one a couple of times.

When they sing, Kenny and Dottie inspire each other when they are standing there face-to-face. You can listen to their individual records and then listen to the duet records and you can tell they are performing not only for the consumer, but for each other. They are both pros.

R-e/p: Their records together are much more ballad oriented than their individual efforts.
Larry: Kenny's records are unpredictable even to the point that we had two ballads back-to-back. Everybody said "okay." Kenny had a ballad; the next one is going to be up-tempo. Well, it was a ballad. It felt good, and it was a tremendous song. We decided to release it because we felt people would enjoy listening to it. We treat singles the same way we do album cuts. Matter of fact, we don't go into the studio to cut an album.

If a song is not good enough to be a single, then that son of a bitch is not good enough to go on an album. I don't cut album cuts. I cut singles. If I could cut ten singles it would tickle me to death. That's the kind of material that I am looking for. Not good songs, but fantastic songs. Great songs. I listen to ballads, up-tempos, medium tempos, philsophical songs, funny songs — not funny-ha-ha songs — but unique songs like "Gambler." That is a combination of a lot of ingredients. That is a medium tempo, philosophical, story song.

R-e/p: Does Kenny have a lot of input as to what he wants to sing?
Larry: Well, yes, he does. However, the artists I work with know that I am going to bust my ass to get the best possible song that I can find. They know that I don't have any under the table, or am involved in deals where anybody is paying me money to get that song cut. They know that I work honestly, they know that I cut a lot of hit records, so whenever we sit down to listen to this material the artist knows that I have made an all-out effort to get the best songs that I can possible find them. I have very little problems with artists. The songs that I really believe in, I'll fight for. If an artist says no, then I will argue with him. I will argue 'til I go down for the count if I really believe in that song. If it is a borderline case, and I have a song that I think is of equal merit, then I will let it slide. But if I am thoroughly and firmly convinced that I am holding a hit song, the artist usually knows that I am serious about it.

R-e/p: On the "Every Time Two Fools Collide" album, "On the Loving" . . . what was the percussion sound?
Larry: It's the drummer sitting down playing his legs in real tight Levis. On another song he did a thigh slap, a snare, and like a three and lick with his mouth. He did a sound like a block, and almost a cabassa kind of a sound.

Billy: He set up a mike for his lap, and one on his mouth. We had searched for about thirty minutes for a percussion instrument to get the sound he was making, and just decided to mike him.

R-e/p: Do you see the country artist moving into video as the pop artist has?
Larry: I think that country artists will, but I hate categories. I despise categorizing. I guess

it is necessary, but I don't like it. I don't like people to say, "Well, he is or is not a country artist." He is an ***artist.*** He makes records. And the type of records that are more comfortable for him to make are country oriented. But I do not go into the studio to cut a country record, or cut a pop record, or to cut a disco record. I go in to cut a reocrd. But the categories have been broadening and more-and-more people are interested in different types of music.

If you go to the Speaker of the House of Representatives and have cocktails with him; if you ease over to his record collection and start thumbing through it, you see Grand Funk Railroad. Well, he did not go out to buy a rock and roll record or a country record — he went out to buy a record. He bought what he wanted to listen to. Most people don't put there record collection into categories. It's what they like.

There was a time when you would ask a person what sort of music he liked listening to, and he would whisper that he liked country music because he didn't want to say it out loud. But that's changed.

It's interesting to note that country music is the only form of music that has never decreased in sales. Every single year country music sales have increased.

R-e/p: There also seems to be much more longevity in a country artist's career.
Larry: That's right. If you have a hit as a country act you're going to work a long time because the country fans are a lot more loyal. How many times have pop acts had hits on the charts and in one or two years no one remembers them. I can think of many, many country artists that are making in excess of $200,000 a year and none of them have had a hit in ten years. But their shows are always sold out.

R-e/p: Do you think the Nashville musician has a unique attitude toward the work?
Larry: The musicians don't seem to be working just for the time card. They're working for the record. They know how much it costs, and they know that if they play on this record and it becomes a hit record, then there will be more sessions with that particular artist. In part, they are working from the heart and part from plain common sense.

I'm not putting down any other way of recording. I'm just saying this is the way we do it in Nashville, and that it is different.

The atmosphere in Nashville can let you be real laid back and not have one downer in you. You don't need any dope to be laid back down there.

Billy: It's a slower moving pace, but yet we get a lot done. Because everybody is relaxed and there is no pressure. If we end up getting one or two songs in six or eight hours it's no big deal because the next night we might get five or six tunes done.

Larry: Also, it's a community among producers. If I find a song that I think is great, but nobody that I'm producing fits the song, I'll pick up the phone and call Billy at CBS. We're competitive friends, not competitive enemies, and I'll tell him that I've just found a song that's a killer. Now, I don't publish the song; I didn't write it; I have nothing to do with the song. But I can hear it for a particular artist that he's got. And I've had producers call me to tell me about a song that they feel would be unreal for Kenny.

As an example, I was in bed one night and around 11:30 the phone rang. The guys were in the studio mixing and somehow the piano which was on track 16 got crinkled. They told me that they had to fix it and then mix it that night because parts had to be shipped the next day. So I got up, got dressed, and went to the studio and put the piano part on for them. Now, I'm a producer but they needed a piano player and we help one another. I walked into the studio one time and saw four producers. One of them was in the control room, and three of them were playing instruments for the guy in the control room. That's the way Nashville works.

I'll give you another instance. I was mixing one night and emotionally I had been going through a pretty rough time in my life and I was tired. The album that I was working on had to be done that night. Another producer walked in the back door and stood there watching and listening for two or three minutes. He walked over to me and took me by the shoulder and said, "You got two choices. Go home, or go over there and sit down in a chair." He sat down at the console and mixed two or three of the cuts until I had relaxed. He didn't get paid for doing that, but it's all family.

R-e/p: Do you think that Nashville is musically a boom town?
Billy: I think so. It's spreading out more. I know a lot more people are coming from other parts of the country to record there, and many projects are coming down to overdub strings and brass. When I first came here the string section wasn't that good, but now they're amazing.

R-e/p: Have they become better players or has there been an influx of caliber overdub musicians?
Larry: It's a combination of a lot of things. They are more conscientious; they care more about the sound. Every one of them is constantly improving their instrument and are constantly listening for new things. I have guitar players or dummers that will say something about a thing that I've never heard of. They'll ask me if I want them to get it. I'll ask what it is and they'll start telling me what it does.

It is the total, absolute caring by everyone involved. As Nashville grows I think this feeling will continue because the people who are there spread it to those just arrived, and it's contagious.

R-e/p: Will film and video facilities become a part of the Nashville entertainment community?
Billy: It's already begun. The new Opry Land video installation is really busy. They have three or four trucks for video remotes. When they went in there they saw the future. They have two complete studio facilities for audio and video. A lot of movies are now being filmed in Nashville, and a lot of soundtracks are being done. We did music for "Hooper," and part of "Smokey and the Bandit." Bill Justis was the writer and musical director for the movie. He cut some of it in Nashville, and then took it to Los Angeles and dubbed it onto film.

Larry: Geographically Nashville is ideal.

Billy: Nashville and Florida are really coming on strong. There are studios springing up like crazy. It's great.

Larry: You can talk about how soft the industry is, but the recording industry is doing rather well.

Billy: Well, hell yes! The "Gambler" album is right at four million, the "Kenny" album is right at three million.

Larry: I don't know how they can say the record industry is off that much. There's a lot of records that are selling big. But I do think it's now tougher for new artists.

Billy: I don't think the record business is going to fall on its face . . . not ever.

Larry: It seems to me that in times of tight money you will sell more records. Historically during hard times, record sales go up.

R-e/p: Who does your mastering?
Larry: There's a company in Nashville that does our work. A mastering engineer named Glenn Meadows, he's the best. They've got two Neumanns and a big computer; actually they have two in one room. He is very sharp and very conscientious about the records he does. I went over and watched him. I asked myself what the hell was I doing there? He knows what we want. He will call me and tell me how we sorta went crazy on a particular cut, then tells me exactly what he intends to do with it.

R-e/p: Do you re-mix your singles?
Billy: No.

R-e/p: Boy! Once you are through with a record you are through! What sort of limiters do you use when you do vocals?
Larry: We use the Audio & Design Vocal Stressor.

Billy: About the only thing we ever limit is the vocal.

R-e/p: How far away do your singers stand from the microphone?
Billy: Five inches, maybe.

Larry: We have a couple of artists that have extreme dynamics. Kenny is one of them, Dottie West, and also Billy Jo Spears.

Billy: I spend a lot of time trying to find a happy medium where the limiter is not sucking.

R-e/p: Do you follow a lead sheet for level cues?
Together: We know the song!

Larry: And you can tell by watching them, with one exception. When Billie Jo Spears is singing, she will stand there motionless. Usually if a singer is going to hit a killer note you can see them rear back. She just stands there calm as hell, then hits that note. She has amazing range and power.

R-e/p: Is there any problem in recording in

. . . **concluded on page 198**

Why settle for less?

The new-look Lyrec TR532 24-track studio recorder plus the innovative and compact ATC remote controller will give you incomparable control features such as;

- direct access to 3 search points
- recycling between 2 points
- 32 position memory
- playtime computing for recycling distance
- 5 or 10-second preroll function
- tape speed display in ips
- unique "in-place" SOLO function for each track.

The Lyrec sound recorder provides you with the state-of-the-art technology you'd expect from a company with a 34-year reputation for technical excellence.

By all means shop around. But you'll find you get more for your money from Lyrec.

Don't take our word for it. Mail the coupon and let the facts speak for themselves.

Lyrec OF DENMARK

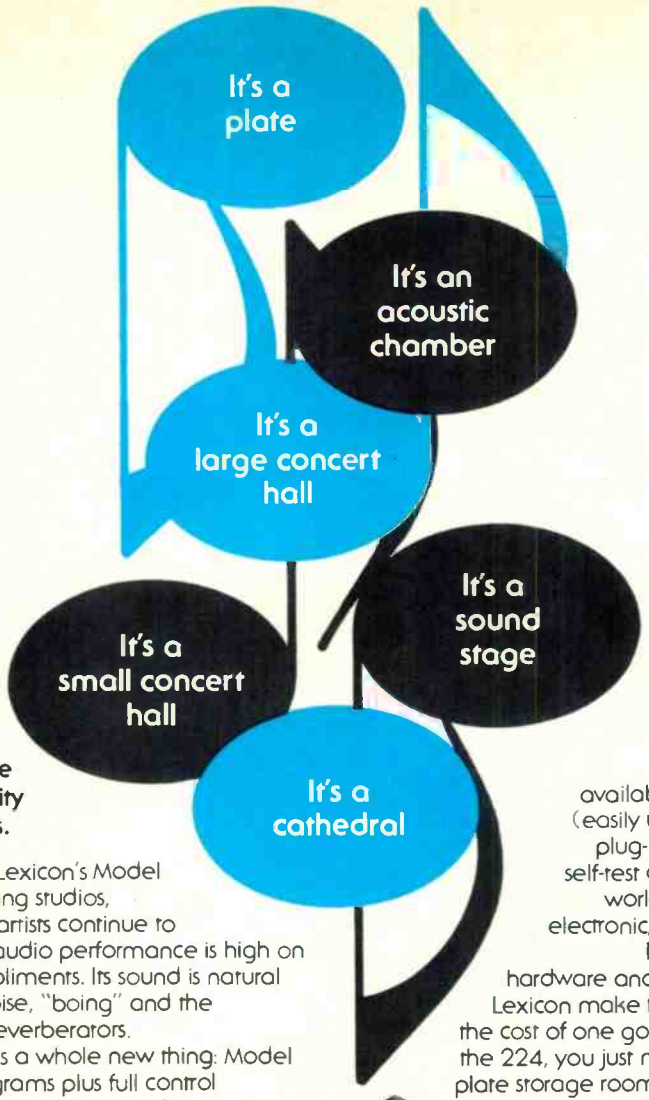
Rupert Neve, Incorporated
Berkshire Industrial Park
Bethel, Connecticut
Tel: (601) 744-6230, Telex 969638

Rupert Neve, Incorporated
P. O. Box 120907
Nashville, Tennessee 37212
Tel: (615) 385-2090

Rupert Neve, Incorporated
7533 Sunset Boulevard
Hollywood, California 90046
Tel: (213) 874-8124

Rupert Neve of Canada, Ltd.
2717 Rena Road, Malton
Ontario, L4T 3K1 Canada
Tel: (416) 677-6611

Neve



... A complete repertoire of the very highest quality reverb at your fingertips.

Rave Notices for Lexicon's Model 224 from the world's leading studios, broadcasters and musical artists continue to pour in. The 224's superb audio performance is high on the list of everyone's compliments. Its sound is natural and completely free of noise, "boing" and the problems of mechanical reverberators.

And its versatility is a whole new thing. Model 224's multiple reverb programs plus full control of all reverberation parameters allow audio engineers to create the sound that "is exactly right for the material." It's a whole stable of quality reverb capabilities in one compact package.

The model 224 Digital Reverb is available with 2, 4 or 6 basic reverb programs (easily updated in the field by simple program plug-in) and comes complete with extensive self-test diagnostic programs that take the guess work out of maintenance. Its mainframe, all electronic, requires only 7 inches of rack space.

If all this sounds expensive, it isn't. Digital hardware and software technology breakthroughs by Lexicon make the 224 surprisingly affordable ... about the cost of one good plate. And after you've experienced the 224, you just might find more productive uses for your plate storage rooms and acoustic chamber!

For full details write or call — better yet contact your leading Pro Audio dealer for a demonstration. Once you've heard it you'll never want to do another session without it.

WORLD CLASS REVERB

Lexicon

Lexicon, Incorporated 60 Turner Street Waltham, Massachusetts 02154/(617) 891-6790/TELEX 923468
Export: Gotham Export Corporation, New York, New York

for additional information circle no. 20

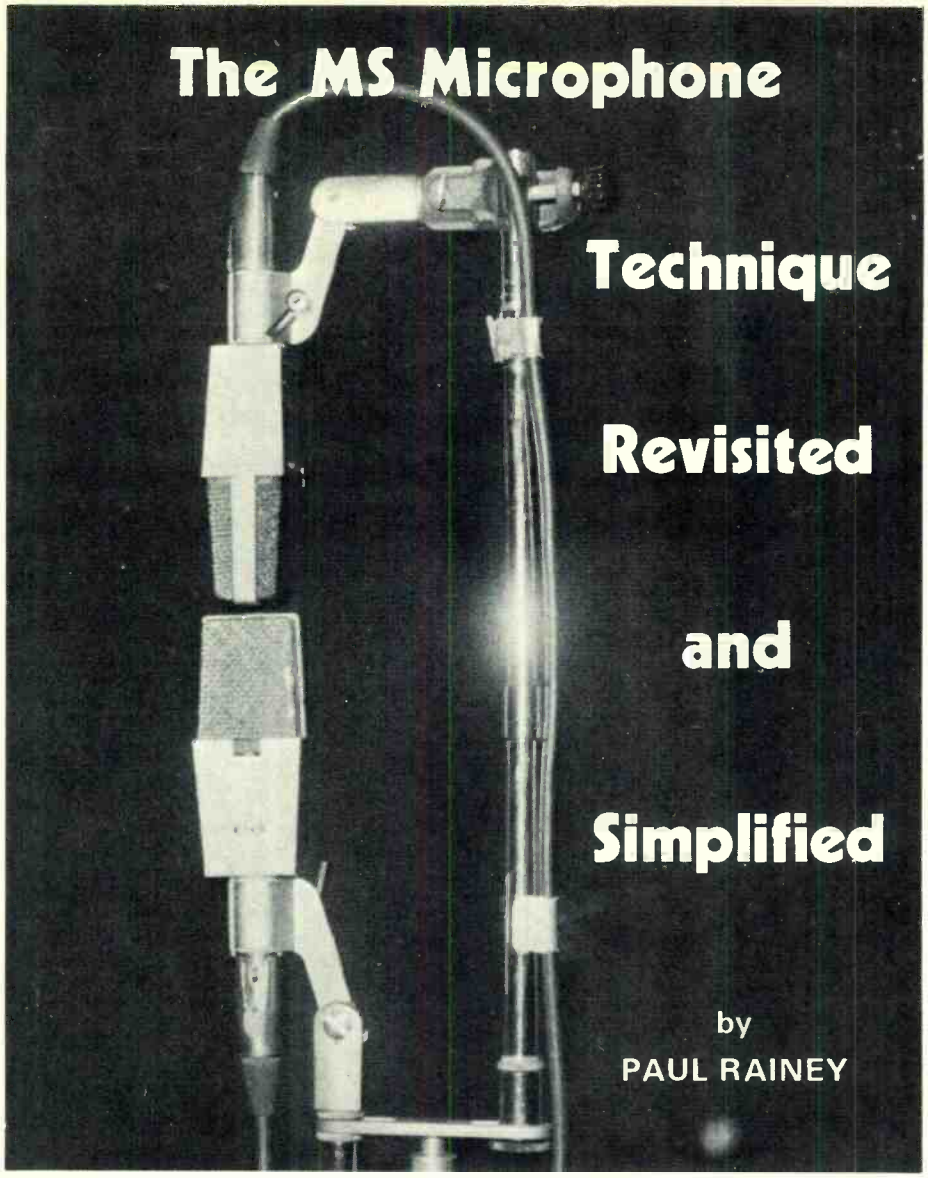
THE CASTLE
NASHVILLE, TN.

DESIGNED AND EQUIPPED BY

STUDIO SUPPLY COMPANY
NASHVILLE, TN.

for additional information circle no. 21

The MS Microphone Technique Revisited and Simplified



by PAUL RAINEY

Unlike studio engineers, location recording specialists face an entirely different set of acoustical and electrical circumstances every time they are called out. Whereas the studio engineer has the stability of a predictable sound from the studio in which he works, the location specialist must walk in to a new auditorium or church and quickly adapt his techniques to the new environment and to the people he is recording. The location specialist can't specify that the drummer set up in the booth or that the piano be placed in a certain area "because that is the way we do it here." Instead, the location specialist must quickly note the sound of the performers in that specific hall, and go about capturing that sound so that the final album will accurately represent what the audience heard. The end result is that one person adapts to many so that they perform comfortably in their usual environment and can proceed instantly to recording.

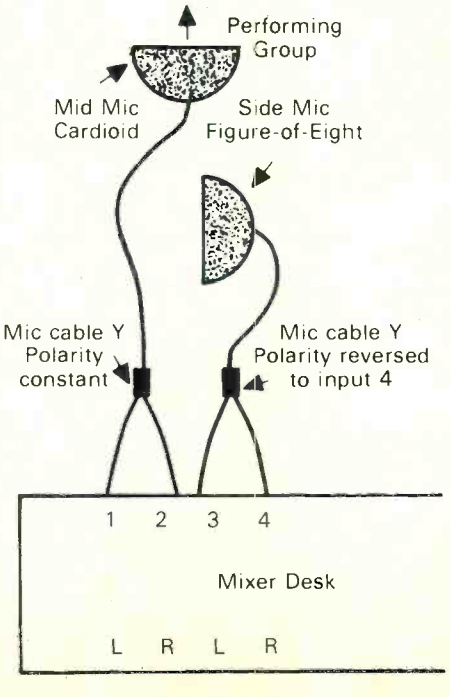
By contrast the studio requires the musicians to adapt to a strange environment where much time is taken up by many minor and sometimes major complications before a satisfactory sound (at least to the producer if not the musicians) is achieved. The end result is that a performing group often finds their recorded sound much different from their concert performance or club date sound.

In thirteen years of location recording, with about forty albums a year recorded for as many very happy groups, there have evolved certain mike techniques that can be relied upon to obtain predictable and necessary results. These were very concisely listed in the *R-e/p* article (April 1979, p. 124) by Carson C. Taylor. The first two listed by Mr. Taylor are good reliables, and after a few years there comes a certain sense of being able to quickly make a decision as to whether a spaced stereo pair, (sometimes with center fill), or the XY coincident pair will be best. An extensive amount of time on both sides of the podium — the ability to judge what the conductor and performer each hear from their undividual perspectives — is probably the most necessary ingredient to this sense. To immediately see what the performers are doing and to perceive the feelings of the conductor is to also put everyone at ease so that they can accomplish their goal of an album that is an excellent representation of what they do.

The third mike technique mentioned by Mr. Taylor, the MS stereo, is one not tried by this location specialist through the years for two reasons. The first involves a minor point: the cost of a single stereo mike of excellent quality such as the AKG C-24 or C-422. A pair of AKG C-12As, and more recently a pair of AKG C-414EBs, were all that was needed to do a most satisfactory job. Granted, a pair of any of the above could have been properly oriented to an MS configuration, but that still left the second reason for not trying it. All existing MS matrix configurations use a pair of transformers with dual secondary windings and a pair of 600-ohm T-pads to vary the mid-level and the side-level. My feeling has always been that another transformer in the recording chain is just not desirable for any reason.

After reading Mr. Taylor's article several times, the determination to try MS without extra transformers was so strong that the design of a solid state circuit was formulated. This circuit would give the necessary sum signal, the phase reversal and difference signal, as well as control of the four necessary parameters: namely 1, the Mid-level; 2, the Side-level; 3, the mixer desk left channel level; and 4, the mixer desk right channel level. Suddenly the realization was that all could be taken care of by properly using four of the existing mixer desk inputs and their usual input module level controls. No additional circuitry is necessary excepting two Y cables to connect each mike to two inputs. The first Y

FIGURE 1



Expression through time delay.

Time delay has become increasingly important to musicians and engineers as a way to color musical sounds and create spatial illusions. MXR's Flanger/Doubler and Digital Delay have proven to be effective tools for the musically creative professional who requires a wide range of performance possibilities from a precise and cost effective time delay unit.

Both the MXR Flanger/Doubler and Digital Delay offer a flexible system of controls which provide ultimate freedom for creative expression. They feature frequency sweep and width controls, a mix control (between the dry and the delayed signals), a regeneration control for additional intensity and multiple repeats on doubling and echoes, and a delay bypass jack which enables the user to employ a footswitch to bypass the unit entirely for instantaneous cut-offs of time delay effects. Both units represent an expandable system, and can be easily ganged together or interfaced with other instruments and recording gear.

The MXR Flanger/Doubler provides a manual control over delay time, and rear panel connections offering full remote delay time adjustments and a VCA output suitable for stereo ganging of two units. The MXR Flanger/Doubler can switch easily between flanging and doubling modes, and two LED indicators are provided for easy visual monitoring of sweep speed and range.

The Flanger/Doubler is capable of producing infinite varieties of flanging, hard reverberation, vibrato, and numerous doubling effects including subtle chorus sounds. It offers a time delay range of .25 to 5 milliseconds in the flanging mode and 17.5 to 70 milliseconds in the doubling mode.

The MXR Digital Delay offers a continuous range of delay times from .08 to 320 milliseconds. This range of delay times is expandable with three optional memory cards, in 320 millisecond increments to 1280 milliseconds, with full bandwidth (20Hz to 20kHz) capability to 160 milliseconds. The Digital Delay features push button controls for varying delay ranges. A level control regulates the input signal to prevent overloading of the unit's circuitry, and LEDs monitor the input level and indicate whether the effect is in or out.

At fixed delay times, the Digital Delay is perfectly suited for "traditional" delay applications such as "slap echo," discrete echoes, and synchronization of speakers in PA applications. By adjusting sweep frequency, mix, regeneration, and level controls, the Digital Delay offers additional effects which include doubling, flanging, pitch alteration (vibrato, pitch bending), frequency modulating, and infinite (non deteriorating) repeat hold.

The MXR Flanger/Doubler and Digital Delay are designed for use in the studio and on stage, with line or instrument levels. They're reliable, delivering a clean signal consistently, with a dynamic range exceeding 80 dB. And as with all MXR Pro Group products, optional road cases are available. For the serious artist, the MXR Flanger/Doubler and Digital Delay are the versatile tools which provide the key that will unlock his creative musical imagination.

MXR Innovations, Inc., 740 Driving Park Ave., Rochester, New York 14613, (716) 254-2910

MXR Professional Products Group

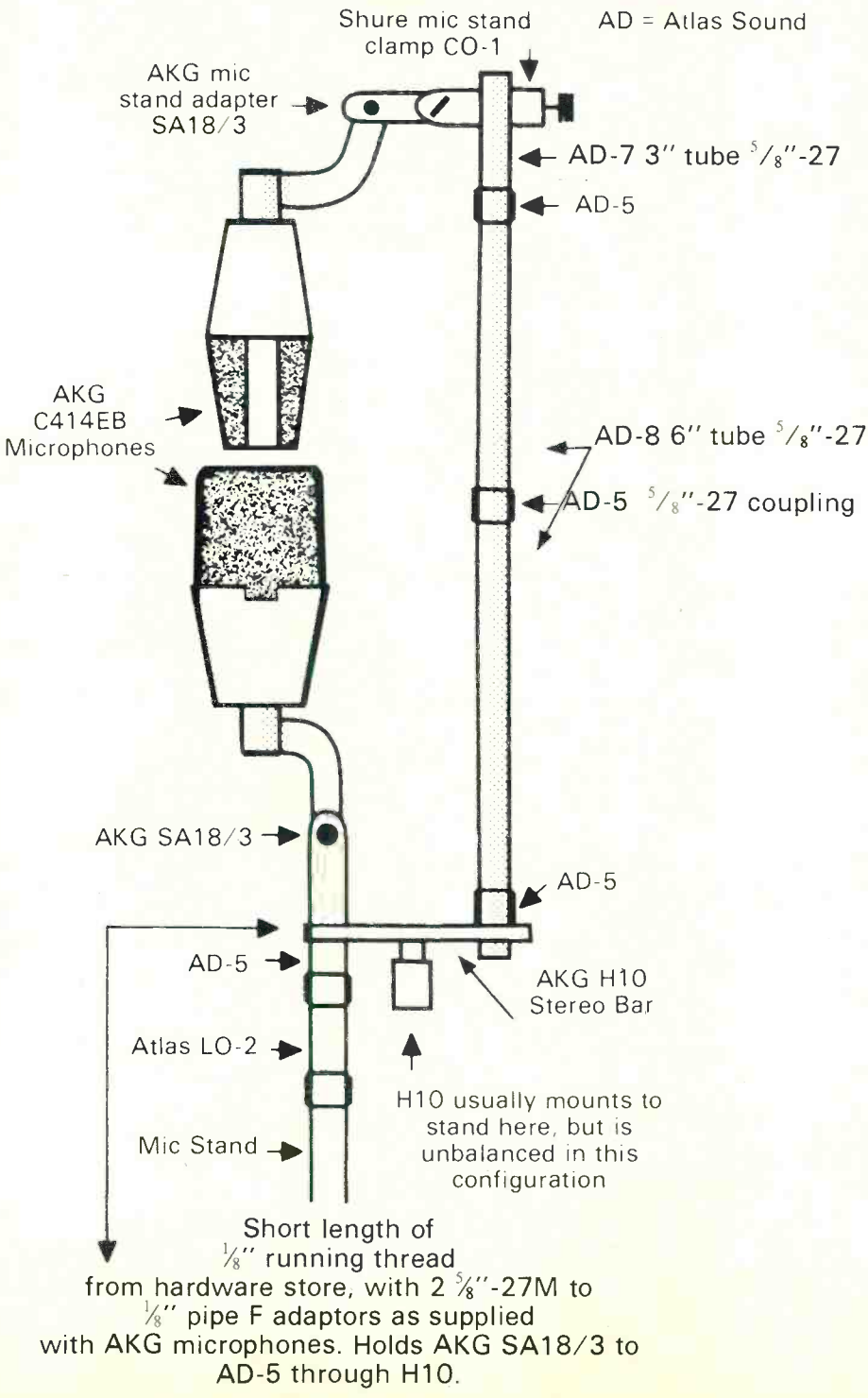
cable (Figure 1) is polarity consistent and feeds the Mid mike to inputs 1 and 2; the second Y cable feeds the Side mike to inputs 3 and 4, and has polarity reversal to input 4 only. Thus, inputs 1 and 3 give M+S and inputs 2 and 4 give M–S. The second Y cable polarity reversal to input 4 is, of course, unnecessary if the input module 4 has a so-called "phase reversal" or polarity switch.

The end result is beautiful stereo indeed. The four input modules are assigned Left, Right, Left and Right. The first two, together, control the Mid-level and the second two control the Side-level. As is usual with MS set-ups, first bring up the Mid-level inputs 1 and 2 for a good level into both left and right channels, then the Side-level inputs 3 and 4 are brought up for the proper stereo spread without letting the Side-level overbalance the Mid-level. It is essential to use a 'scope so that the proper Mid-level feed to left and right can be exactly centered, and the Side-level can be watched so that it does not produce an out-of-phase condition which occurs when too much Side-level is inserted. Figure 2 diagrams the physical arrangement of two AKG C-414EB mikes using standard AKG, Atlas, and Shure parts as shown in the photograph. The top mike is the Mid mike and is set for cardioid; the bottom mike is the side mike and is set for figure-of-eight.

Precautions

There are several precautions to pass on to the reader which will save time for others. First, carry the mikes with you on their usual stand adaptors, and carry the MS holder already assembled and locked tightly together. Then if you reach a new place and quickly determine that MS is usable, simply remove the mikes from the regular stand adaptors and put them in the stand adaptors that are part of the MS holder. An extra pair of the mike stand adaptors is easily available from AKG and you don't waste time assembling or dis-assembling the MS holder on the job.

Secondly, always have your 'scope. This is good location recording practice anyway but is essential using the MS mike technique, especially if you are live monitoring from speakers. However, with a headset your brain will tell you when the Side-level is too high and you are going out-of-phase. You will not perceive with speakers that the Side-level is too high until it is way too high, and by then your disk mastering engineering will already hate you. With the 'scope you will see the phaseshift just a little before you can hear it in the headset. A slight back-off of inputs 3 and 4 will make things correct and the 'scope will



help you make sure inputs 3 and 4 are still balanced correctly, left to right.

Thirdly, with MS at a concert where audience applause is desired on tape, and thus on the disk, the Side mike will pick up audience applause out-of-phase, so a separate pair of audience mikes is good practice; alternately bring down the level of the Side mike (inputs 3 and 4) a bit just as a selection ends so that the Mid mike is the predominant mike picking up applause. That the applause is essentially mono is okay, because in good practice the applause is faded out in a few seconds anyway.

Lastly, you will find the MS technique gives the most awful sound when recording in a church sanctuary that is not particularly large in terms of the room's width. The hard side walls give too much reflective clutter. Use of the spaced pair or the XY coincident pair is recommended for these conditions. Even Blumlein XY (figure-of-eight) or ORTF 110° XY cardioid will be better than having your Side mike pick up straight off the side walls.

By contrast, the MS technique will give a most beautiful stereo spread on any stage where side walls are not parallel or where the curtains at the side absorb the straight-off-the-wall garbage. On something as small as a male Barbershop quartet, you will have the most accurate voice positioning imaginable either in the headset or from your speakers. On something as large as a symphonic orchestra, or large band, or a 100 voice choir, the left-right perspective and front-to-back reach are both astounding. Best of all, try a single MS mike in front of a big band. You will find the reach to the back row of trumpets as amazing as the big, fat sound of the front row of saxes. The punch of all the trombones will also be there! It is as musically accurate as standing right in front of the band or sitting very close, and has the true timbre of the instruments instead of the false pinched sound of 15 individual mikes stuck in the bells of the instruments.

Addiionally, even though the MS mike takes up four inputs, you need far fewer additional mikes. Many soloists, both instrumental and vocal, will not need an additional solo mike. If an additional microphone is needed only because the soloist is quiet, then a properly panned solo mike, brought up just a little, will prove most satisfying. One MS mike in front of a big band eliminates the need for any mikes on percussion and will give a sound as people really hear them.

Conclusion? Try the MS technique wherever the room does not get in the way. Remember, it is not a cure-all, but properly used you will be very pleased with the results. The proper adjustment of the four inputs as discussed is no more difficult than the usual four MS controls (1, M+S; 2, M–S; 3, left; 4, right) and this simplified way puts nothing else in your mike level recording chain — no extra transformers and no T-pads. □□□

We've kept

THE CREST P-3500 SERIES PROFESSIONAL AMPS
250 watts per channel, 8 ohms*/400 watts per channel, 4 ohms*
TOP: P-3500/BOTTOM: P-3501 (without VU meter)

We're Crest Audio. We make the world's best professional power amplifiers.

Last year we introduced our P-3500 series low profile amplifiers. Delivering 250 watts per channel into an 8 ohm load and standing just 3½" high, the P-3500 was an immediate winner.

The P-3500 quickly proved itself on major concert tours. It's been put to the test in huge stadiums, small clubs and recording studios. And it's passed every test with rave reviews.

Because the P-3500 isn't just "another" amp. It's a demonstrably better amp. Aside from it's flawless sonic qualities, it has a unique combination of design and engineering features that leave it unrivaled in the world of professional amplifiers. Quite simply, it's the best pro amp in its class.

Success breeds success.

Introducing the newest addition to the Crest line:

The P-2500 Series professional amplifiers. They're virtually identical to the P-3500 Series with two notable exceptions: Lower power rating and a lower price tag. Otherwise, they've inherited the same low profile, flawless sound, smart features and rugged reliability of our P-3500 Series. The P-2500 Series is now the best professional amplifier in its class.

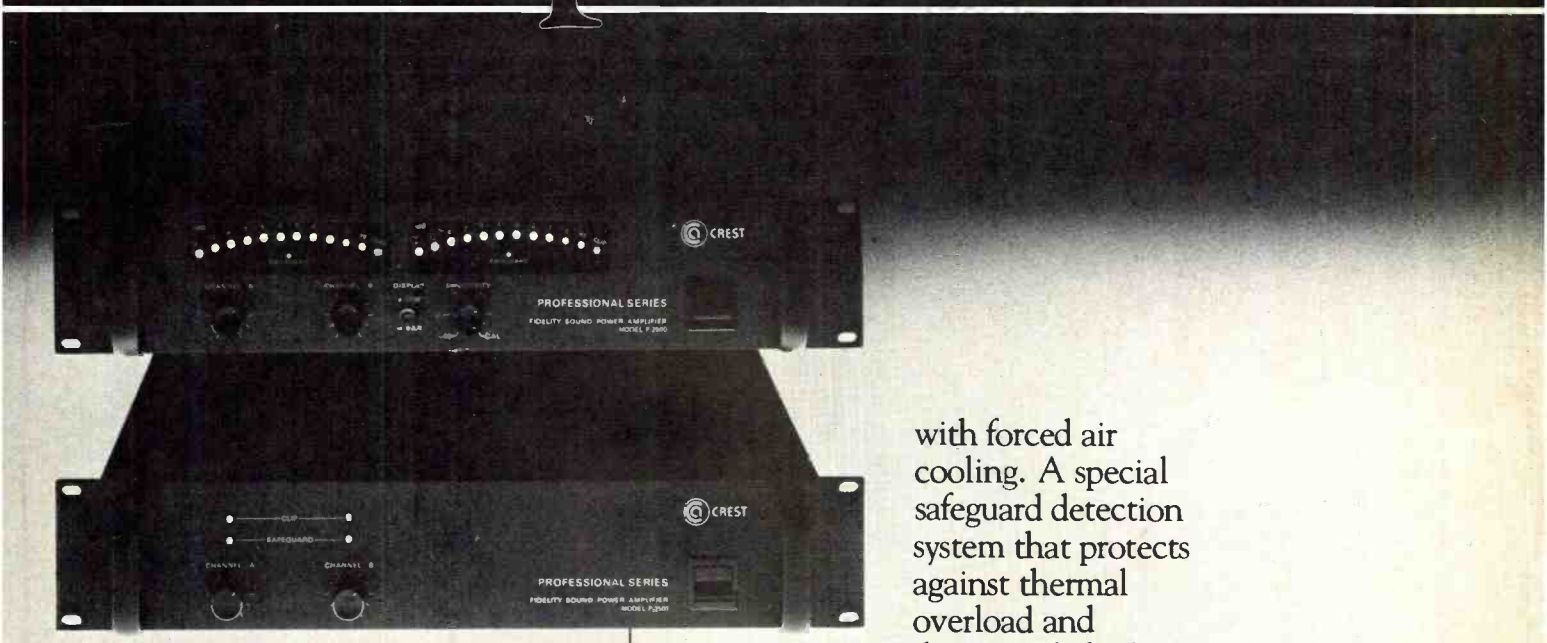
Our low profile.

All the Crest amps pack their power into a rack mountable package standing just 3½" tall. That's ½ the height of conventional amps. And that saves a lot of rack space. Compared to conventional amps of comparable power, Crest amps give you the same power output while using just ½ the vertical rack space.

Our sound.

You can't buy better sound. It's solid. Tight. Incredibly clean. Undeniably accurate.

a low profile.



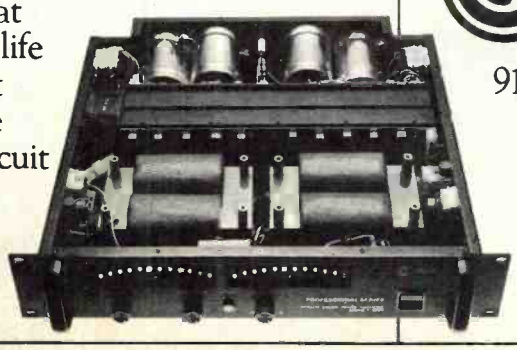
THE CREST P-2500 SERIES PROFESSIONAL AMPS
125 watts per channel, 8 ohms*/200 watts per channel, 4 ohms*
TOP: P-2500/BOTTOM: P-2501 (without VU meter)

It's what we put into our amps that accounts for what comes out. For example, we utilize Bi FET operational amplifiers coupled with 10 high speed output transistors per channel.

Our dual independent, semi-toroidal 1000 watt transformers keep the bottom end tight, deep and accurate while providing miles of reliable headroom. They also virtually eliminate crosstalk.

Features that make sense.

Crest amps incorporate features that make your life a whole lot easier. Like built-in circuit breakers. Massive channeled heat sinks with forced air cooling. A special safeguard detection system that protects against thermal overload and dangerously high DC voltage levels. Turn on delay. External balanced in-put circuitry. Easy to read LED VU meters. And a totally modular electronic design.



Toughest amps in the business.

Crest amps are practically bomb proof. Inside, everything's snug and tight, securely attached to the protective 16 gauge steel chassis. Although Crest amps are sophisticated, state-of-the-art electronic systems, fragile they are not. Check us out.

CREST

Crest Audio, Inc.
9171 Gazette Ave., Chatsworth,
CA 91311/(213) 998-3120

*FTC-rated continuous average sinewave over a bandwidth from 10Hz to 20kHz, both channels driven.

concert sound
video sound

View from house mix position, Bruce Burns at the console, Doobies on stage

A Technical Sound Report

By Patrick Maloney

the 22nd annual GRAMMY AWARDS concert & telecast

Imagine you are the recording engineer on a direct-to-disk recording session. Bob Dylan, Barbra Streisand, Neil Diamond, The Doobies, The Charlie Daniels Band, and Donna Summer — to name a few — will all be performing together with a rather large orchestra. You've been planning this session for weeks but there is no time for a complete run-through and there has only been one day of rehearsal due to budgetary considerations and artists' scheduling problems. It's a remote session and you've just finished working out all the bugs in the hook-up when the disk mastering engineer rushes in to tell you that every blank master lacquer has been stolen except for one and there's no chance of getting any more in time! You've gone through the trouble and expense of getting the best equipment, crew and musicians obtainable but everyone will go on double-time before the recording is completed unless you start immediately. You've got one lacquer — one chance to get it right, and one thought in mind — do the best you can because whatever you do is going to be stamped out onto thousands of unforgiving vinyl disks that have already been pre-sold. There's no possibility of re-takes, overdubbing or scrapping the session. The excitement and tension that charges the air pushes everyone to their professional limits as the cutter head is slowly lowered onto the lacquer and . . . !

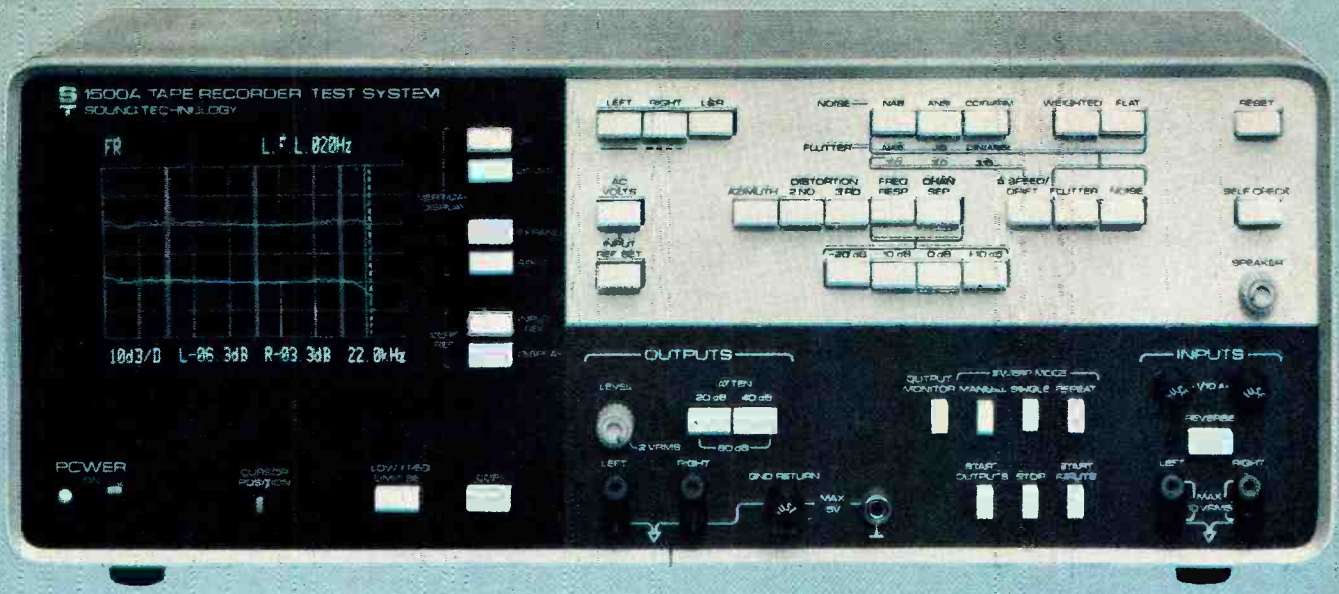
That's about as close as I can get to describing the atmosphere I experienced during the telecast of the 22nd Annual Grammy Awards. The overall complexity of the situation, the amount of preparation involved and the high degree of professionalism that was necessary to get just the audio portion of a program of this magnitude on the air is, I think, worthy of some note. So here are a few notes.

Ed Greene, veteran of many previous Grammy shows as well as numerous other live television specials, was in charge of the Audio Department again this year. Filmways/Heider Recording supplied their Mobile Unit 2, which was used as the audio control room from which Ed mixed the live feed. This feed was then transmitted live to the CBS Television Network and to the many stereo FM radio stations that were simulcasting the event. The PA system was provided by Filmways Audio Services in conjunction with Burns Audio, whose president, Bruce Burns, mixed the show for the 6,000-plus attendees inside the Shrine Auditorium, in Los Angeles.

As Bilbo Baggins once said, "It's always best to start at the beginning." And the beginning of the audio signal path in most cases starts at the microphone.

Microphones

Most visible, and perhaps most important, were the master of ceremonies mikes which were part of what Ed refers to as a 'standard podium kit.' The kit consists of two AKG 451 mike preamps with AKG CK-1 unidirectional capsules, 10 dB pads, metal windscreens and extension tubes. They were positioned in a somewhat modified XY configuration in that they formed a 90° angle with the capsules placed side by side instead of overlapping. The resulting pattern was a rather wide unidirectional pick-up. This way 3 or 4 people standing around the podium could all be picked up without having to resort to omnidirectional mikes. They actually sounded pretty good in stereo, but Ed chose to use them in mono so that there would be a back-up if one of the mikes failed (a wise decision as we



How to check your tape recorder in ten minutes

Graph-type display with digital readout

If you haven't actually measured the performance of your audio tape recorder lately, there's a better than 50-50 chance it's much poorer than you think. That's what considerable experience shows.

Checking ATR's is now simplicity itself. All you do is connect your recorder to the new Sound Tech computerized Tape Recorder Test System.

Just by pushing panel buttons you can measure:

- Frequency response
- Harmonic distortion
- Wow and flutter
- Noise
- Speed accuracy and drift
- Channel separation
- Head azimuth accuracy (position a head in 10 seconds)

Information-packed display

The display system in the New Model 1500A gives you all the information you want. Frequency response, distortion, noise, flutter, head azimuth, and channel separation are displayed as graphs with the scale values shown in numbers.

Then you have a positionable cursor (vertical dashed trace in photos). At whatever frequency, level, etc., you place it, the measured value will be shown on the screen in numbers.

Just by pushing buttons you can fully test your recorder almost in seconds.

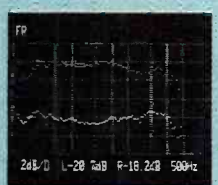
Call now

Users love the 1500A for its ease and speed.

You will, too. You can clean up your audio a whole lot easier than you ever imagined.

So call Sonny Funke or Dennis Noecker at Sound Tech now for our sales literature.

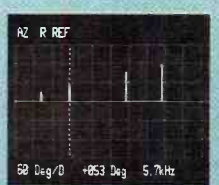
This new computerized test system is popular and you should get informed about it.



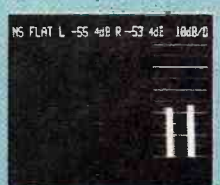
Two channel frequency response

Third harmonic distortion vs. level

Flutter: 0.049% shown



Head azimuth accuracy



Noise: two channels; −53.4 dB shown

Voltage (yes, it's a voltmeter, too)

SOUND TECHNOLOGY
1400 DELL AVENUE
CAMPBELL, CALIFORNIA 95008
(408) 378-6540
In Toronto: The Pringle Group

for additional information circle no. 26

concert sound
video sound

GRAMMY AWARDS

A Technical Sound Report

shall see shortly). Also, having two mikes next to each other in a crossing pattern minimized the phasing problem caused by a single voice reaching two separated mikes at different times. You still have a left and right area pick-up, however, and can raise the level of one mike independent of the other to compensate for a soft speaker sharing the podium with someone who projects louder.

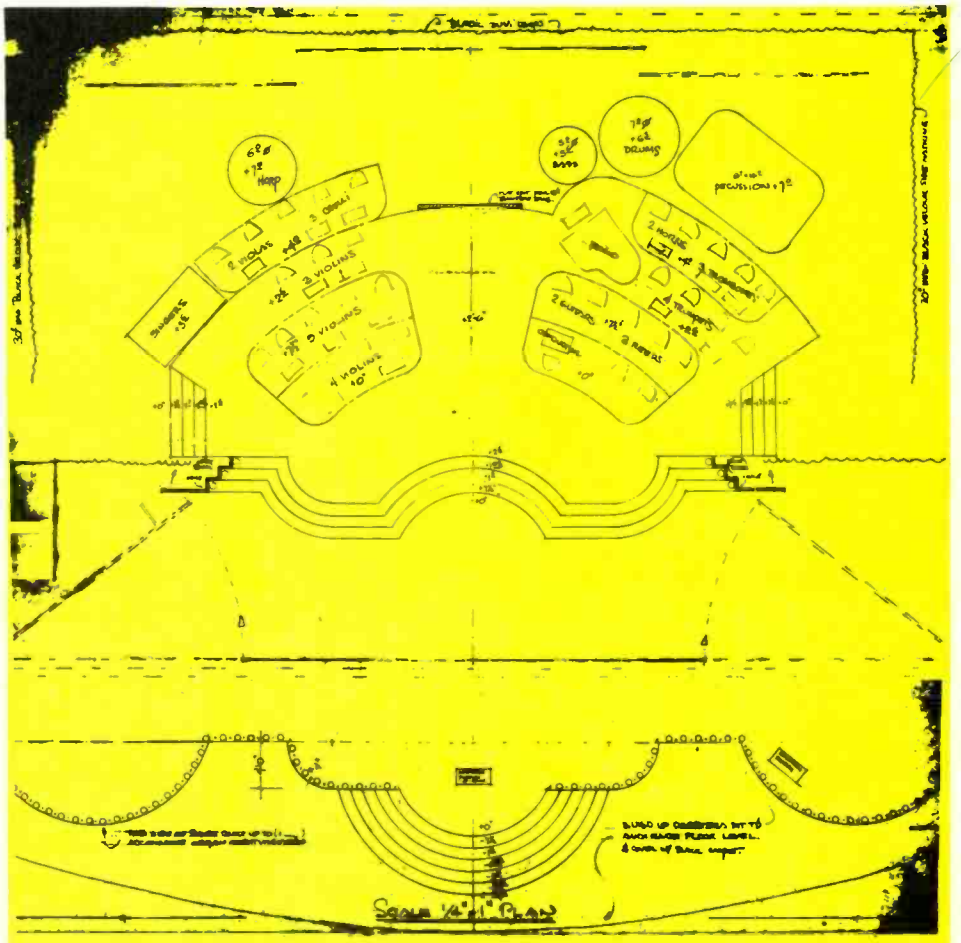
In an attempt to keep people back from the podium mikes, a little sign was placed on the podium to that effect since speakers sometimes try to bend the extension tubes or move them away from their centered position. However, there is no predicting on a live show exactly what will happen. On several occasions the MC, Kenny Rogers, leaned in too close to his mikes and caused them to distort. At first it sounded as though he was overpowering the windscreens but this was not the case as the windscreens proved to be very effective. What actually happened was somewhat more complicated and not easily rectifiable during the show. Even though they were 451's which have a fairly high output, it had been Ed's experience in the past that he had had buzz problems with those podium mikes due to all the lighting circuits running around the stage and the extreme RF in the area. So he put an RTS preamp box in the podiums to bring them up to line level. According to Ed, "We were fine during rehearsal but when we got on the air, the levels from the performers went up. I hate to put a tag on it but they can go up anywhere from 50% to 70% from what you're used to. So those preamp boxes were being slightly overloaded whenever Kenny leaned real close to the microphones. Unfortunately, those boxes were right near the podiums or in the podiums and they could not easily be adjusted while we were on the air."

The balance of the miking information can be determined by referring to the stage plan (Figure 1). One of the things that makes Ed one of the busiest free-lance audiomen in the business is the care and attention he gives to pre-production preparation. Based on information he gets at production planning sessions, Ed prepares extensive mike charts, diagrams and snake routing assignments which he then has duplicated and passed out to everyone on the audio team. All the information that the stage crew, the house mixer, or the monitor mixer needs is on those sheets so Ed can go about the business of getting the audio trucks set up without having to devote a lot of attention to the installation going on within the theater itself.

He has given a common name and number to each mike so that anybody that needs access to a microphone is always talking about the same number. For instance, Production 1 is a hand-held mike so that if someone says on the PL, "Such and such an artist is on Production 1" they all know exactly what it is and where it is. That example happens to be No. 5 in the No. 3 snake. Typically for a show like this, Ed will use up to 12 production mikes; some RFs and some hard wires. Production mikes are mikes that end up on center stage and were generally vocal mikes that get used with the orchestra as opposed to microphones that are used with the groups, such as Bob Dylan, Charlie Daniels and so forth. For instance, Sister Sledge had Production Mikes 1 through 4 which they used when they sang with the orchestra.

Filmways Audio custom builds their own direct boxes using Jensen Transformers. These were used within the orchestra and the individual groups whenever a direct was preferred. There were, of course, spare mikes and lines located offstage that could be rushed in if needed.

Sometimes no amount of pre-planning will solve your problems. What Ed knew was that the show would require 6 hand-held wireless microphones. Unfortunately, he soon found out that there weren't that many available of the type he was used to and preferred. Not only did the system have to be dependable, it had to accept high pressure levels which ruled out several systems that were available. What they eventually came up with was a unit designed by John Nady — the 'Nasty' cordless — which was really designed as an instrument RF device and which have been modified for use with hand-held microphones. The unit operates in the standard FM band and the inputs and outputs were matched to the balanced audio lines. Although they electronically seemed to work just fine once they were operating, Ed felt that "Physically they looked pretty grotesque! But they did work out very well. Sandra Schneider, who represented the company, did a really good job of getting them to us. The way they work is that they have a transmitter unit that interfaces with any microphone. So we used one pair of microphones for one situation and a different pair for another. Personally for hand-held microphones onstage, I like to use an omni mike because then you have no problem with proximity effect. You also don't have a problem with somebody moving the microphone around. So for Dionne Warwick, Barbra Streisand, and Neil Diamond we used Shure SM-61 omnis and they worked out fine." Although omnis can tend to be more of a problem feedback-wise, that didn't seem to be evident on this show and was due in part to the



27 Pair Snake #1 (Split with PA)
Main Orchestra Rhythm
1 - Bass Drum: Sennheiser 415
2 - Snare: Shure SM-57
3 - Hi Hat: Shure SM-57
4 - Hi Tom: Beyer M-88
5 - Mid Tom: Beyer M-88
6 - Lo Tom: Beyer M-88
7 - L. Overhead: Shure SM-81
8 - R. Overhead: Shure SM-81
9 - Electric Bass: Direct
10 - Acoustic Bass: Sony ECM-50
11 - Acoustic Piano: Shure SM-81
12-14 - Electric Keyboards 1-3: Direct
15-16 - Spare
17 - Electric Guitar: Sony C-37
18 - Acoustic Guitar: Sony ECM-50
19-20 - Spare
21-24 - Percussion 1-4: Shure SM-57

Snake #1 (continued)
25-27 - B/G Vocals 1-3: Shure SM-58

27 Pair Snake #2 (No PA Split)
1-5 - Woodwinds 1-5: Shure SM-57
6 - French Horns 1 & 2: PZM
7 - Spare
8 - French Horn 3: PZM
9 - Trombone 1: Neumann U87 with pad
10 - Trombones 2 & 3: Y-2* Neumann U87
11 - Trombone 4: Neumann U87
12 - Trumpet 1: Sony C-37
13 - Trumpets 2 & 3: Y-2* Sony C-37
14 - Trumpet 4: Sony C-37
15 - Violins 1 & 2: Y-2* Sony ECM-50
16 - Violins 3 & 4: Y-2* Sony ECM-50
17 - Violins 5 & 6: Y-2* Sony ECM-50
18 - Violins 7 & 8: Y-2* Sony ECM-50
19 - Violins 9 & 10: Y-2* Sony ECM-50

Snake #2 (continued)
20 - Violins 11 & 12: Y-2* Sony ECM-50
21 - Violins 13 & 14: Y-2* ECM-50
22 - Viola 1 & 2: Y-2* ECM-50
23 - Viola 3 & 4: Y-2* ECM-50
24 - Cello 1 & 2: Shure SM-57
25 - Cello 3 & 4: Shure SM-57
26 - Harp: AKG 451
27 - Basses: PZM

27 Pair Snake #3 (Split with PA)
1-4 - Podiums 1 & 2, Left and Right, AKG 451, w/10 dB pad, windscreen, RTS booster
5-9 - Production Inputs, 1-5
10-14 - RF 1-5
15-20 - Spare
21-26 - Audience Reaction 1-6: Sennheiser 415
27 - Announcer

** Indicates where two identical microphones, on similar instruments, were hardwire multed together. This combined output was plugged into a single snake input.*

FROM CONCEPT TO REALITY

Westbrook Audio is the leader in professional audio in the Southwest, incorporating innovations in acoustics, studio design, and the latest in technology. Whether it's a soundstage or a demo studio, the entire Westbrook staff will work with you on your dream — from concept to reality.

westbrook audio, inc.

11836 Judd Court • Suite 336 • Dallas, Texas 75243 • (214) 699-1203

for additional information circle no. 27

concert sound
video sound

GRAMMY AWARDS

A Technical Sound Report

high quality of the monitor system that was used.

If the SM-61s had been causing a problem, however, the house mixer, Bruce Burns, would have gone to Ed and they would have worked it out. Generally Bruce lets the recording crew use whatever type of microphones they choose — unless it absolutely won't work from a PA point of view. If the more visually oriented production folk have a problem with the appearance of a mike or its position onstage, they always go to Ed first anyway. So he generally has first say about what does or doesn't get used.

Snake System

Four major 27-pair microphone multi-cables or snakes were used. The first snake carried the signals from the main orchestra rhythm mikes. This snake was split twice, for the PA and foldback, to allow independent control of the same signals at those two locations. This provided the stage performance with a separate monitor mix of their rhythm section independent of the broadcast mix. Likewise the PA mixer needed individual control over the rhythm section as he was also dealing with their live sound in the house, therefore his mix varied somewhat from the broadcast mix.

The second snake contained the balance of the orchestra, i.e., the woodwinds, brass, and strings. These mikes were not split with the PA or foldback, but instead went to Ed in the truck where they appeared on a whole stack of Yamaha PM 180 sub-mixers. These signals got mixed together in sub-groups which were then routed back out to the house PA and foldback positions. These positions then had control of the various sections of the orchestra without having to take up a lot of inputs on their respective consoles. This actually worked out quite well as the internal balance within each section is easier to balance in the isolated environment of the truck than it is in the house where you hear everyone playing at once whether you want to or not. If Bruce needed a little more baritone sax in the house, Ed would try to accommodate him by raising the level of that mike within the sub-group as long as it didn't destroy the broadcast mix.

The third snake was the production snake. This snake contained the podium mikes, the Production Mikes 1 through 5, and the wireless mikes. It also split off to the PA and foldback positions.

That brings us to snake number four which contained all the feeds from the guest groups, such as Charlie Daniels, Bob Dylan, The Doobies, etc. This fourth snake is of course also split with PA and foldback and is directly connected to its own 26-input Auditronics board in the truck — separate from the main desk that Ed was manning. This console's operation was specifically supervised by Bones Howe, a veteran engineer and producer who is also the overall Grammy Audio Coordinator for NARAS. On the snake assignment sheet and on this console were five pre-assigned positions for vocals, eight positions for drums, a couple of positions for bass (one is usually direct and the other is a mike back-up), four positions for guitar, four positions for keyboards, two other positions for spares and the final open channel was used as a limiter return.

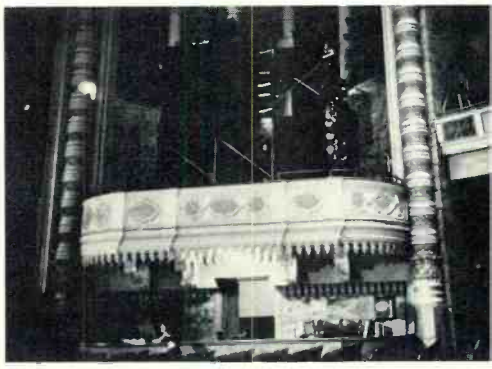
In actual practice what happened was the crew on stage had the assignment sheets and they worked with the roadies and with the band members during the rehearsal set up. Rather than Ed making any pre-assignments and saying, "I want this guy here," he let the crew do it. They had to deal with the realities of each individual band set up and were therefore given the freedom to decide exactly where things went. The set-up crew then came back to Ed, once the band was plugged in, and told him where each voice or instrument appeared on the snake. As you can see from Figure 2 there was not a lot of room to move freely between the orchestra and the large NARAS logo drop. Nor was there much time between acts to reset the stage!

R-e/p readers who were at the show will recall the mad scramble that took place when the crew reset the stage and mikes for the Andrae Crouch/Mighty Clouds of Joy segment. While the camera was on a shot of the lead singer for the Mighty Clouds of Joy (who was in the audience on a wireless mike), the crew was racing against time and the director to get set up before the camera panned onto the stage. Though the crew had run through this segment it had not been rehearsed with the act. The performer was actually singing live to a recorded track while the crew had to complete the hook-up before the tympani note segued the track into the live musicians. The loud crackles and buzzes that were heard a few times over the air were caused by musicians plugging their instruments into amplifiers on stage in preparation for the live portion of the song. In the rush to set up they had neglected to first turn down the volume controls on the amps, and so the noise was heard by all! But the end result was that everything got plugged into the correct input in time and the transition from track to live was flawless. There was certainly no time to pass the word along about which number the bass guitar was in — everyone had to know ahead of time. The duplicate snake assignment sheets not only provided this information but also allowed for problems and the inevitable unforeseen circumstances. If there was a problem, the first person to notice it would communicate that fact over the PL and everyone along the line would switch over to the next available position or back-up mike listed on the assignment sheets.

The actual splitter system itself is a very professional package which is getting wide acceptance among the top remote recording and sound reinforcement companies. While it is not actually available for purchase as a complete unit that I know of, it is available for rent from several companies. Filmways Audio Services, Burns Audio, McCune Sound, and Stanal Sound -- to name a few — have all built their own sytems, based on a gold-plated latching pin connector manufactured by AMP and wired up in a pin configuration and interconnection scheme developed by Jack Crymes. Though he now works for the Record Plant, Jack worked out the details of the system several years ago while employed by Wally Heider Recording. He then made the design available to anyone who desired it. Working with Dean Jensen, he developed a high-quality shielded transformer which is the heart of the system and which is now available from Dean Jensen Transformers. Largely due to Jack's unselfish attitude and desire for compatibility in the field, the industry now has a snake system that makes remote recordings, music festivals, and shows like the Grammys a lot easier and much more reliable. Designers with 'proprietary' information and 'secret' black boxes should take note! (Look for a complete description and list of parts for building a snake based on this system in a future article.)

House Sound

"The house PA was a collection of systems that we've been experimenting with in the past," said Bruce Burns, owner and operator of the system. "It's based on various JBL components housed in our own custom-built cabinets. The large concert reinforcement speakers on the side are three-way. The overhead hanging system was a bi-amped two-way as were the under-balcony speakers. The upper balcony system is a new four-way system with cabinets designed by my partner, Jim Showker, who also designed the crossovers for all the various systems" (Figure 3).



The hanging system over the center area was designed mainly to fill in the center of the house — the VIP section — with the output from the podium microphones. The music could be reproduced loud enough from the side systems to cover the house but Bruce couldn't turn up the podium mikes too loudly in the side sections without getting into feedback problems. The hanging system was hung over the first four rows or so, well in front of the podiums and pointing away from them so that the award recipients in this area could hear clearly. After all, if a winner doesn't hear his name, he's not going to go up and accept his award! This area also tends to contain the highest percentage of sound critics in the room — a fact of which Bruce was well aware.

Front fill speakers were used to provide the main source of sound for the first four rows and were controlled by a separate slider on the PA console. When someone is up at the podium, Bruce likes to have separate control over all the different areas of the house in order to get the maximum level to as many areas as possible without feedback. "For instance, when Rikki Lee Jones came up to receive her award for Best New Artist, she was really quiet. But I found I could bring up the under-balcony speakers as well as the overheads to get more level into the room. However, I

— continued on page 73 . . .

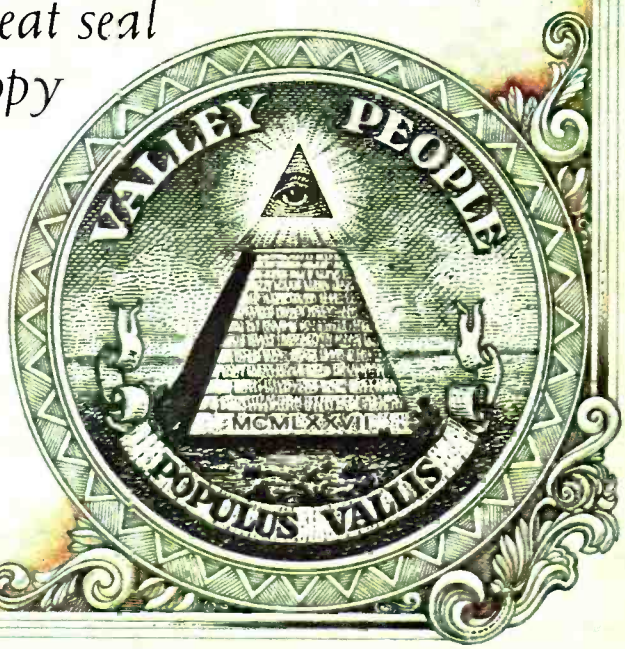
PROCLAMATION

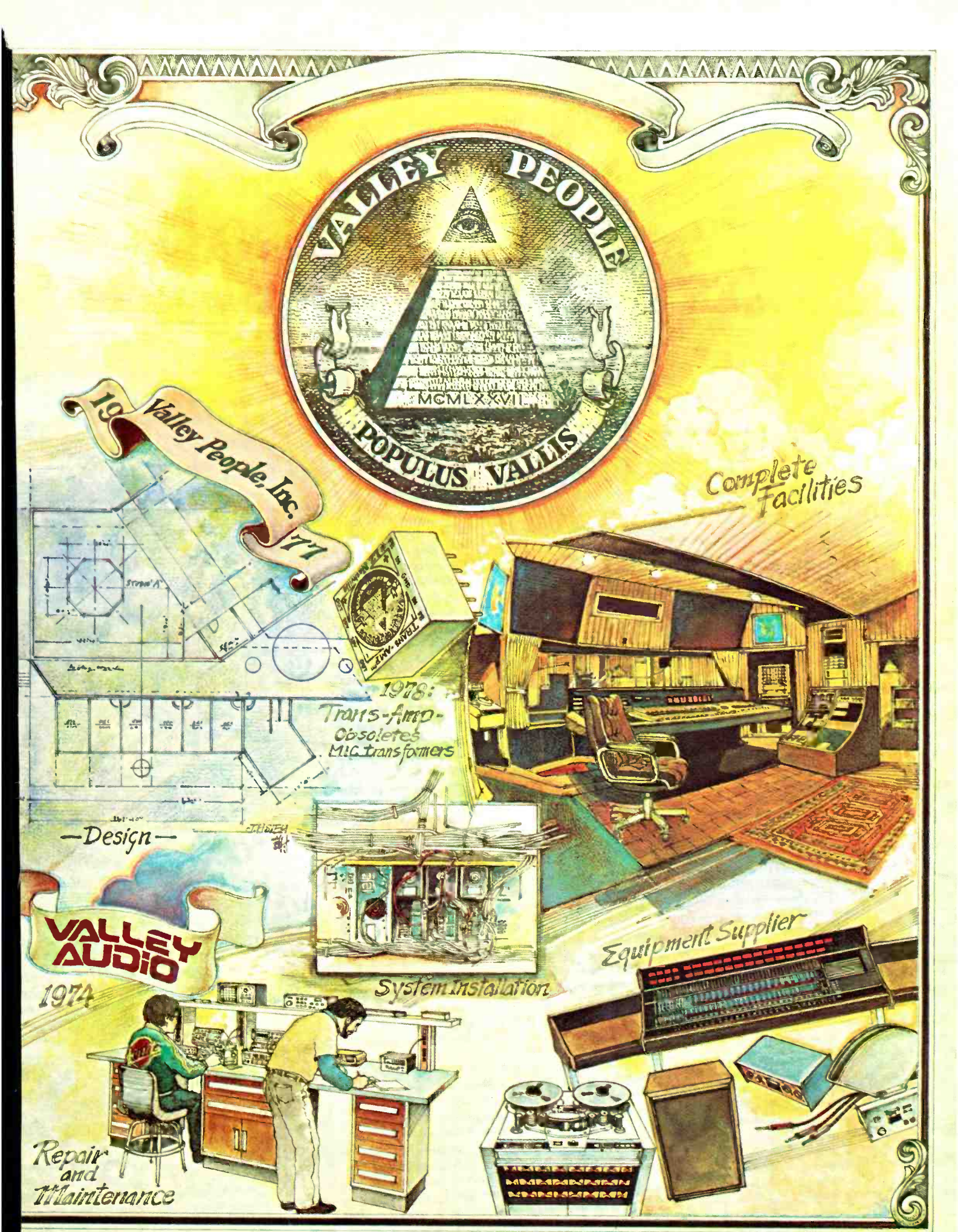
WE

the people of the Corporations known as Allison Research and Valley Audio, in order to form a more perfect union, establish more effective operations, insure client tranquility, promote the general product line, and secure the blessings of our great and growing industry, for ourselves and for posterity, do ordain and establish this alliance which shall hereafter be known to all of the universe as...

VALLEY PEOPLE INCORPORATED.

Our combined forces shall hitherto be bound together, as one, under the great seal of Valley People; specimen copy of said great seal appearing immediately at right:





ARTICLES OF ALLIANCE

WORDS FOR THE GREAT INDUSTRY:

Insofar as we of Allison Research Inc. and of Valley Audio Corp., have allied our resources and enjoined ourselves with the People of the Valley, a new force shall emerge from our midst. The alliance shall not be only of ourselves, but shall extend to those of the industry...those whom we depend upon for our existence. We, then, vow to offer good value, for consideration received, as we merge to exploit the best of our individual talents and technologies. Our fields of endeavor shall be vast, but unified, so that we may better serve with integrity.

FIELDS OF ENDEAVOR:

I. MANUFACTURING:
The People of the Valley shall manufacture products of ingenuity and value, for employment by our great industry in the pursuit of the highest possible level of creative attainment.

II. DESIGN/SYSTEMS:
We shall direct our people to the design and construction of great studio environments and systems of functional precision, drawing upon our collective and time honored capabilities as scientists, engineers, accousticians and innovators.

III. EQUIPMENT SUPPLY:
In order to fully serve the needs of our clients, the People of the Valley shall purvey equipment fabricated by others of our industry. We shall do so earnestly and without favoritism, being cognizant first and foremost of the needs and desires of the consumer. As an aid to arriving at satisfactory purchases, means of demonstrating the sonic qualities of the sundry goods offered shall be available at our place of business.

IV. INSTALLATION/SERVICE:
Upon your request, we shall expertly install the goods which we purvey into the desired location on your premises. We shall do so in a good and tidy manner, under the direction of our excellent staff of engineers. Under the same direction, we shall endeavor to render repair and maintenance service as required for perfect operation.

V. CONSULTATION:
We shall propagate, as consultants, our diversified knowledge of the substance of audio matters, to assist in making of systems most beneficial to the user. We shall do so honestly, as a service set apart from all other aspects of our existence, in order that these consultations not be improperly manipulated towards the purveyance of wares.

VALLEY PEOPLE, INC.
A merger of ALLISON RESEARCH and VALLEY AUDIO

P.O. Box 40306/2820 Erica Place
Nashville, Tennessee 37204
Phone: 615-383-4737
TELEX 558610 VAL PEOPLE NAS

concert sound / video sound

GRAMMY AWARDS

A Technical Sound Report

couldn't bring up the side speakers or the front fills without getting into ringing.™ The front fills were further divided into front center, which didn't change much level-wise, and front side, which was on a separate fader and didn't interact with the podium mikes to a great degree.

Four separate channels of digital delay were used to insure that the signals from all the various speaker systems arrived at about the same time for the majority of the audience. The initial Zero Point of Reference was the front fill speakers at the apron of the stage, so these were not delayed at all. The large side systems were delayed 15 ms. The hanging overhed system was delayed 22.5 ms. The balcony speakers (which were located on top of the scaffolding that held the side speakers) were delayed 20 ms. The under-balcony speakers were the furthest away from the front fills (about 30 feet out and positioned along the sides of the room) so they were delayed a total of 30 ms. A Lexicon Model 92 provided the delay to the overhead system while the other three channels were delayed via a Lexicon Model 102. "There was not a tremendous amount of delay," Bruce recalled. "There was just a little bit used judiciously, to tighten the room up. Without delay you could hear it; the bass would swim and the words wouldn't be as distinct. With the delays set properly — and I've got to thank George Velmer for his work on that — it really tightened up. In addition George and I went out and we listened here and there and A-B'd a couple of things and we ended up putting the front fill system out of phase with the rest of the system because it just sounded good acoustically. Sometimes it helps to do that. It's a nice trick."

At the main mix position in the house, Bruce had a Yamaha PM 1000-16, a PM 1000-32 and two PM 180's. The two Yamaha PM 180's were used for orchestra sub-mixing — one controlled the rhythm instruments and the other received Ed Greene's orchestra section sub-mixes from the truck. The PM 1000-16 was used to mix down all the various live guest bands. The output from these three mixers then fed the PM 1000-32 where they were combined with the various production vocal mikes, wireless mikes, podium mikes and tape sends from the truck.

The mix position at the front of the balcony was picked more from a visual standpoint than out of any regard for possible sound considerations. After all, when was the last time you saw the sound console when the video director called for a shot of the audience? You're not likely to either! Though Bruce was wearing a tuxedo as were the majority of the crews. As it turned out this position is one Bruce had been in before and it was quite acceptable. Cable runs to the stage were easy. There was an excellent view of the entire set and he was close enough to the side speaker stacks so that he could hear the onset of feedback before the majority of the house could.

Since this was essentially a live-to-the-world broadcast, Bruce and his crew took every precaution in the book to prevent any unsolvable problems. Becaues of the care taken with speaker placement and microphone selection, he was never in a serious feedback situation and could in fact run the music quite loud at times in the house without adversely affecting the sound that was going out over the air. Bruce was constantly aware of the home audience while he was mixing and didn't take any risk that might interfere with what Ed was doing out in the truck.

Of course, no matter how much you plan and rehearse there are often as not a few things that can and do go wrong with a live show. For instance, within the first 10 minutes of the show one of the AKG 451's on each podium went dead. The one on the stage left podium had given them some problems earlier that afternoon. But they thought they had it fixed. Unfortunately, it turned out to be one of those evil intermittents and went out during the show. The concensus of opinion regarding the bad mike at the center podium was that it suffered from a severe case of loose capsule or moisture shorting the diaphram, creating crackle. Fortunately Plan B came into action and the single remaining working mikes at each podium were used for the rest of the show . . . although their gain had to be ridden more carefully in order to pick up anyone who was slightly off axis. The name of the game with live shows — be they concerts or television shows — is to always have a 'Plan B,' i.e., Back-Up, Back-Up, and more Back-Up. It's not enough that you have a spare mike in a road case, it has to be connected and ready to go at all times. Now if they could only devise a back-up system of spare envelopes for presenters who suddenly find themselves 'live-to-the-world' with nothing to read. "May I have the envelope please . . . please!"

Monitors

On most live music shows nowadays, and on this show in particular, there is actually a good amount of attention paid to the audio portion of the show by the video director. Of course, he would prefer the audio equipment to be as invisible as possible but he is usually willing to bend a bit if the audio department feels something is important enough. One perpetual point of contention, however, are the stage monitor speakers. Directors don't want to see them but performers need to hear them.

Bruce recognized this conflict several years ago and developed a small but powerful speaker utilizing a JBL 2440 high-end driver coupled with an Electro-Voice 12-inch woofer. He has used them successfully on many major television shows including Don Kirschner's 'Rock Concert,' and in fact they were used for this year's Grammy show within the orchestra and as the front fill speakers.

The actual stage monitors this year, however, were provided by Filmways Audio Services and were the new 'Ultra monitors™' built by Meyer Sound Laboratories, Inc., of San Leandro, California. From all the reports I've heard so far and from what I can tell after listening to them briefly, they seem to be to most other stage monitors what Perrier is to water . . . or Anchor Steam is to beer or . . . ! Actually it's a complete highly sophisticated monitor *system* — not just a good sounding speaker in a compact slanted box. The system consists of two bi-amped floor monitors which exhibit a fairly uniform conical shaped dispersion pattern and a signal processor which interfaces them to whatever power amps you choose. The signal processor contains a 'Speaker Sense'™ circuit which detects the actual operating conditions of the amplifier/speaker combination and controls the processor accordingly. This processor performs a host of other activities — not the least of which is automatic two-tone level suppression that attenuates the lower tone of two simultaneous tones if the lower tone is below 150 hertz and the system is running at extremely high levels.

Norm Schwartz, vice president of Filmways Audio Services and monitor mixer for the Grammys, decided to use these monitors because of their compact size and their ability to project a good distance — they could therefore be placed well out of camera range and still be effective. As Norm put it, "The speakers had to be further away than we normally would have liked but I had almost no restriction on the level they would put out. The clarity in sound and the punch that develops from these speakers gives you the ability to back off 10 to 15 feet if necessary. This is one of the few systems that we've managed to do that with. Normally if the quality of your speakers is good enough, the mixer does not notice any detriment to his broadcast mix even if the speakers are run at a high level. My feeling was that those speakers were quite loud and I *did* bring their level down somewhat during the actual show. The fact that they did not interfere with the broadcast mix I would attribute to the fact that they sounded quite good. They are, as I say, unique in a sense. If we are not the first, I'm sure we are among the first to have the speakers. We are very, very happy with the system and we are just beginning to move with it now."

Only two 'Ultra monitors'™ were used on the stage itself. They handled all the vocal monitoring requirements for the groups. At one point during the rehearsals, Bob Dylan commented that the monitors were actually too loud! Music to any veteran monitor mixer's sore ears! You can see from Figure 4 just how far away the speakers were.

Two side fill monitors were located at the extreme sides of the stage and were intended to fill in if anyone got out of the pattern of the two 'Ultra monitors'.™ The side fills belong to Burns Audio and are composed of an E-V 15-inch woofer and an Altec horn with an Altec 808-B driver. Bruce has since switched over to a JBL 2440 for the high end, however.

Norm's main monitor mix console was a Yamaha PM 1000-32. Connected to this desk were two sub-mixers — a Yamaha PM 180 and a Neve 5422. The Neve is a complete package in itself in that it is an 8-in, 2-out console with full EQ and routing facilities and is housed in a rugged metal flight case. Filmways has several of these units and Norm is quite pleased with them as they can go out as separate consoles or they can be used as "fantastic, although very expensive sub-mixers."

Norm was feeding six separate monitor mixes from his position that were then sent out to various locations onstage. One channel went to the two MSLI speakers on the stage itself and the other channel fed four more 'Ultra monitors'™ that were on the floor at the foot of the stairs in the audience area. Then they had what were called group production monitor speakers which went on the band

Figure 4: ***Bob Dylan rehearsal, Ultra Monitor in foreground***

GRAMMY AWARDS

A Technical Sound Report

carts for the various guest groups. These were connected to two separate mix buses. The last two feeds were for various positions within the orchestra itself. The side fill monitors were connected to the group production channel and were switched on or off as needed.

In addition to the monitors, there were a few headsets used within the orchestra by those musicians who needed to listen to the final mix as it was coming from the truck. There were also some backstage speakers which received their program from Bruce's position at the PA console in the house.

Now you'd think that with over 100 live mikes, about 20 monitor speakers and a high feedback-paranoia factor, Norm would have several notch filters, feedback suppressors and a rabbit's foot at his disposal. Not so. He did have a dual parametric equalizer on two of the channels but did very little with it. "The Meyer speakers needed so little EQ that most of the equalization we did, we did through the console," Norm informed me. "And the upstage speakers were not running at a higher level so we had much of a problem with them."

The only other peripheral piece of gear in sight was a Lexicon Model 224 digital reverb unit that was used only for Donna Summer who wanted to hear a little reverb in the monitors. Filmways owns six of these units and Norm thinks they are fantastic. They use them in the studios constantly and out on the road and have had virtually no problems with them. Norm was assisted in the hook-up and operation of the monitors by Milt Chapman, who was more familiar with the MSLI system, and by Mark Johnson, the man onstage who relayed the various groups requirements to Norm. This team seemed to do a great job as there were no complaints and no feedback.

The audio truck used for the show was the Filmways/Heider Mobile Unit 2. Ed happens to like this truck for television work because the main console — a 32 x 24 API — has 8 VCA subgroups off to one side. As Ed puts it, "For a television show, even the more complex ones like this, it really comes down to actively operating no more than about 10 to 12 master faders with everything else sub-grouping around them — otherwise it becomes pretty unwieldy to operate."

Figure 5

The sub-mixing for the orchestra was handled by a stack of Yamaha PM 180s off to Ed's left, which were then fed to inputs on the API. Behind Ed, and off to his right was the Auditronics board that was used to sub-mix the guest music groups. The output of this board also fed into the API as did the signals from a Yamaha PM 700 that was locted in the adjoining truck. This desk was operated by Gordon Klimuck, who was responsible for all the tape cues and cartridge playbacks. Every record selection that was heard on the show was recorded onto standard broadcast carts that Gordon played from a rack of playback machines *(Figure 5)*. He would first preload all the carts for a particular category into the machine and then start each cart as that particular nomination was announced; segueing between the playback machine outputs on the PM 700. He took his cues, as did most of the audio department, from the production PL. "But Gordy is really sharp," said Ed. "If they don't call him, he's there anyway. Even if they call him wrong, he knows exactly where he needs to be."

The monitor speakers in the truck are a pair of Altec 604 Es housed in DeMedio cabinets with Mastering Lab Crossovers. Ed's preferred 'old standby' monitor, however, is a JBL 4310 or 4311. "If I'm stuck off somewhere and I have enough room for a monitor, I can be very happy with a 4310 or 4311. If I *really* get stuck and have to use something small, I like to use a Visonic or a small ADS or something like that." The truck's speakers are powered by McIntosh 2105 solid state amps.

An Eventide Harmonizer was used for effect on the orchestra — mainly to give more depth to the string section. Harmonizer effects were also used to help fill out the background voices as well, but Ed was a little more conservative than he would have liked because they only had enough time to set up a few of these situations. Ed likes the effect but only used it in some cases to try and match the recorded sound. Some DDLs were also floating around. For example, a DDL was used on the send-line to the echo chamber at a delay of around 175 ms. Although there were lots of limiters and compressors available, Ed chose not to use them much. He is very aware of what happens to the signal further down the transmission line and therefore likes to preserve as much dynamics and overall sound quality as he can. "You have to tailor what you do by the network that is involved. Since the show was on CBS I did what I had to do to try and make it

sound good on CBS. CBS, ABC, and NBC all do things a little bit differently in the way they handle audio. So I did what I felt I needed to do to accommodate CBS."

The reverb unit for the truck was an AKG B-10 — that worked! "When they are working well they can be pretty terrific, but they have to be working right." There are internal adjustments to them that need to be tweaked, according to Ed. He feels they are set up correctly at the factory but by the time they get shipped to a dealer and then shipped to a user and tossed around in a truck a few times, the springs get somewhat out of adjustment and after a while every unit sounds different. So Ed always specifies one "that works" just to save the delivery person an extra trip!

Two video monitors were in front of Ed in the truck, which allowed a visual contact with the stage at all times. One showed program, while the other showed the preview shot or what the director would probably put on the air next. In retrospect, the preview monitor really should have had a wide shot of the stage at all times so that Ed and the crew could always have a good overview of the entire situation.

Figure 6:

What with all the consoles, video monitors and personnel, it was fairly crowded in audio control — even though they did use the two remote trucks, back-to-back *(Figure 6)*. The next time they do the show, Ed is going to recommend putting the group mix console — the Auditronics in this case — in another truck, entirely. This would help out from a congestion standpoint, but perhaps more importantly, it would give the group mixer his own acoustic environment so that he could monitor his signals and deal with his own problems independently of the main mix. This would allow them the luxury of soloing the drum kit, for instance.

The final product of all these sub-mixers and mixers was a stereo signal and a composite mono. The stereo went out to all the simulcasting FM stations around the country and the mono was used for the television broadcast as well as for program feed throughout the auditorium. The mono signal was not simply a sum of the left and right stereo signals but was the result of the stereo signal being processed through a device called a CSG or Compatible Signal Generator. This is a device that shifts the phase of one channel in regard to the other so that there is no longer any center channel buildup. It makes a 'compatible mono' from the stereo mix so that the relative balances or energies that Ed listened to and mixed together in stereo for the simulcast were carried through to the mono signal which fed the network. Ed could listen to either the stereo mix or the composite mono as the CSG unit was located in the truck and could be easily patched into the monitors. The CSG exhibits a phase shift somewhere in the order of 90°, Ed believes. "It's pretty extreme. It was originally marketed as a device that would be a panacea to fix all the compatible problems with mono/stereo. If you listen closely to the stereo that's processed through it the signal seems a little bent out of shape. The imaging is not very accurate so it doesn't make a very satisfactory stereo — but it does make a wonderfully compatible mono."

The mono output from the CSG also went out to various small monitors and headphones within the orchestra. Since all the orchestra members often had five or six pieces of music in front of them that they chose from when the winner's name was called. So they needed to be able to hear the presenter's announcement. The podium mikes were not sent through the regular monitors so the orchestra needed a feed from the main mono program bus.

Simulcast In Stereo

Most of the shows Ed's mixed lately have been recorded in stereo even though the signal has usually been processed through a CSG for airing in mono. He's done this, not only for the experience but also in the hope that stereo television is not all that far off and he intends to be ready when it arrives. The closest thing we've got to stereo TV at the moment, however, is simulcasting over various FM radio stations. This year's Grammy Awards were broadcast live and in stereo throughout the United States over a network of independent stations that was set up specifically for the show by Gary Standard Productions, in association with TM Special Projects. Of course, only those folks on the East Coast got the production live. Everyone else actually saw and heard the un-edited version that had been recorded onto 1-inch video tape at CBS Studio 43 in Television City, Los Angeles.

There was no separate stereo audio playback machine synchronized to the video — both picture and stereo sound came off the same piece of video tape. The 1-inch machines actually contain three separate audio tracks, i.e., composite mono, left and right. The quality of the playback was determined to be excellent, and therefore eliminated the need for a separate synchronized 2-track machine and all its potential attendant problems.

. . . continued overleaf

GRAMMY AWARDS

A Technical Sound Report

PL System

By now you've probably figured out that there must be one hell of an intercom or PL system tying this whole thing together. Well, you're right. The communication system was designed by John Field, the overall technical supervisor on the show, and was assembled and maintained by Larry Freeman, of Filmways Audio. The name of the game for live music shows of this magnitude is instant communication and lots of it. This system utilized over 80 individual stations on at least seven separate channels and earned the right to make up new rules for the game. Many innovative and useful ideas make this system the most thorough and effective one I have seen to date.

John had to provide a system with the following separate channels:

1) An engineering channel which connected camera crews with other typically engineering positions such as the director, assistant director, production office personnel and PA;

2) A production channel which involves the cue card people, the stage managers, the announcer, conductor, PA, the director and assistant director;

3) A lighting PL which involves 8 spotlights, dimmer boards, and a lighting director who needs to hear the engineering channel in one ear and his lighting channel in the other;

4) An audio PL which consists of a closed-circuit engineering line between the audio truck, the A2s (assistant audio engineers), the PA mixer and the monitor mixer — they need to communicate between themselves without breaking in on the engineering or other director lines;

5) A tech 'iso' or isolated channel that allows communication to the maintenance crew without interrupting the director; and,

6) Finally, a system whereby John could communicate just with the PL crew who were responsible for the operation of the other five systems (Figure 7).

This pretty much took care of the needs within the auditorium. However, John still needed to communicate with CBS Studio 43. So he had the telephone company put in a transmission PL. this was a two-point automatic ringdown system which meant that if a receiver were picked up at either point, the phone at the other end would ring without having to be dialed first. One point was at CBS Master Control, in Television City. The other point consisted of three different positions at the Shrine: one at the telephone company transmission truck, another in the Filmways/Heider audio truck, and the last position was in the Mobile Video System truck where the actual video directing took place. If anybody at the CBS terminal were to pick up the phone, it would ring at all three locations at the Shrine and conversely, if anybody at the Shrine were to pick up any one of those phones, it would ring at CBS. It was a trouble line basically, and got instant attention if it rang.

Last but hardly least, there is a Telco PL between the CBS assitant director and the AD in the Mobile Video truck who needs to stay in touch with regard to commercial breaks and the like. In the future, however, John plans to eliminate this system and instead integrate the AD at CBS directly into the production channel so that the Mobile Video AD won't have to wear two headsets, as was the case this year. So that's the system that John needed. In his words, "I put a great amount of emphasis on PL because if you can't communicate you're dead."

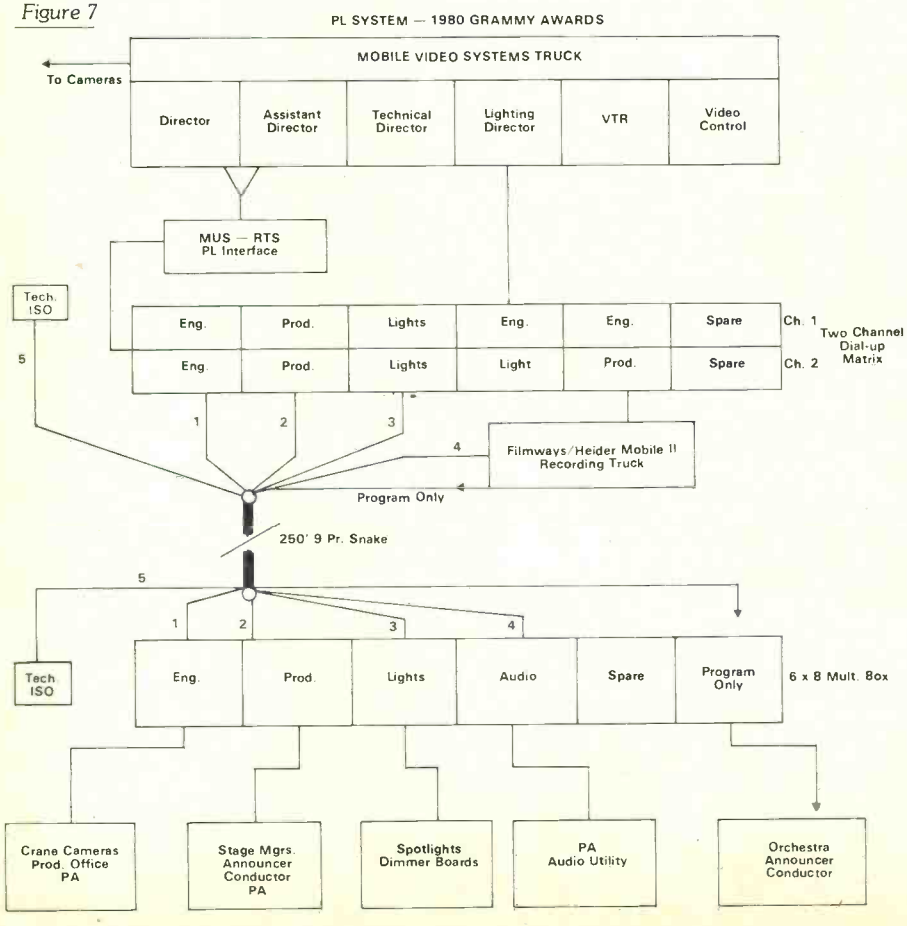
Keeping everyone alive and well was the job of Larry Freeman and the intercom system which was manufactured by RTS. This system was chosen because it provides the flexibility of receiving and transmitting on two separate channels at each station, using standard shielded mike cable with three-pin XLR connectors. A station can consist of a belt pack with a single or double headset, or a biscuit which is a free-standing metal box with a built-in loudspeaker and remote mike. In addition to these remote stations, the director and the technical director had a master station that was the heart of the entire network and which was close to the ultimate in control and flexibility. This master station had six separate buttons for talk and six for listen — which meant that the director could listen to as many channels as he wanted and talk to only those stations that he needed to. There are separate volume controls for each channel as well, and a button marked 'SA' for Sound Announce. This is a direct line out to the PA system in the house so that he could communicate to everyone who wasn't on a PL station during set up and rehearsals. An interface box in the video truck provided the link between the RTS system and Mobile Video's own intercom so that the director and AD could communicate through both systems.

Since every station had the capacity to send and receive two distinct channels, there needed to be some system for determining which stations got which channels. To this end Larry had Filmways devise a matrixing box which enabled him to dial up any two of a total of six channels into any single PL line. Therefore any main line could have whatever two channels it needed — although all stations on that line would get the same feeds. All stations could have engineering, for example, on Channel 1 and their own specialized department on the other, or any other combination that they needed. A similar matrixing box is also available from RTS.

Larry modified this system a little further to satisfy the crane people who had to have the production channel but who also needed to talk privately among themselves. So he built a special system that allowed conversation between just the crane driver and the cameraman on one channel while allowing both of them to stay connected with production on the other. In the case where everyone on a particular line, engineering for example, did not need to have access to a second channel as well, Larry would simply dial up the engineering line onto both channels. Then, even if someone were to accidentally hit the channel switch at their station, they would still remain connected to the same PL line.

As complex and as interesting as this system was, what intrigued me the most was the wireless headset that Larry and Filmways devised for use by the stage managers. It's a complete duplex system composed of an HME transmitter and a Fannon receiver connected to the standard Beyer headset. Each headset transmits on a separate frequency to its own reciever in what is called the RF-PL interface rack. The output of these receivers is mixed with the production PL line and sent back out

Figure 7



Six Ways To Make Your Sound Sound Better

111B Dual Spring Reverb
A professional reverb with an excellent price/performance ratio

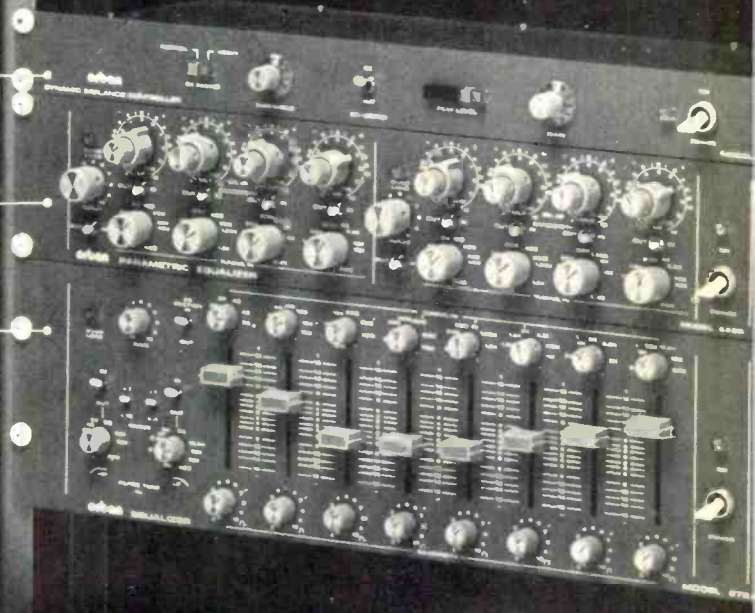
245E Stereo Synthesizer
Creates a seductive, mono-compatible pseudo-stereo effect from mono sources

418A Stereo Compressor/Limiter
For smooth, undetectable level and high frequency control in recording

526A Dynamic Sibilance Controller
Clean, inaudible de-essing of vocals with consistent action regardless of levels

622B Dual Channel Parametric EQ
Constant-Q design makes it an exceptionally versatile EQ

672A Equalizer
A Parametric EQ with graphic controls, including variable high and low-pass filters usable as an electronic crossover



AES BOOTH 62

All products are sold through authorized Orban professional audio dealers worldwide.
Call or write for the name of the dealer nearest you.

orban

Orban Associates Inc., 645 Bryant Street, San Francisco, CA 94107 (415) 957-1067
for additional information circle no. 57

to the Fannon receivers in the wireless headsets via a 1-watt TPL transmitter. The result is the same as if they had a hardwire connecting them to each other a well as to the production PL line. The RF-PL rack interfaces with either the RTS of the ClearCom Systems. Antenna systems are placed throughout the building so that the stage managers can go wherever they want without losing communication. There were also three 'Listen Only' headsets in use that contained the Fannon receiver section only. Whoever carried these receivers could hear the conversations between production and the stage managers but couldn't talk back. Normally Larry monitored all these various PL channels at his poition off stage right, but if he needed to leave this area, he would take along one of these Listen Only headsets so he could respond to a problem no matter where he happened to be.

Now with a system this complex one would assume there would be a few failures and problems here and there. As it turned out the only thing that went South was an earpiece on one of the stage manager's wireless headsets. Of course, Larry had a spare handy and that was the end of the PL problems.

Another common problem with most intercom systems is that if one cable goes bad, all the stations down the line from it go out as well, since they are all looped together. Yet another innovative concept pretty much eliminated this possibility. Into every area that Larry felt could possibly have a need for PL, he ran a snake with a rather unique mult-box at the end of it. Each box had six inputs with eight outputs for every input. So when, for instance, the engineering PL line was plugged into Input No. 1, eight engineering headset drops could be taken off the same box. Then if a cable was bad, it only affected one station — not the entire line. The number of individual cables used is the same; the installation is considerably neater; it's much easier to troubleshoot and maintain; and you can add a headset at the last minute to any line at any location within the auditorium without running a cable clear across the stage or possibly interrupting a loop momentarily just to tie into a channel. According to Larry this mult-system came in handy when "All of a sudden on stage left they needed an audio drop. There was no rhyme or reason for it — it wasn't in John's plans, it wasn't in my plans but the guy came up to me and said 'You know, I've got two production mikes sitting by me over here and I have to have a cue from the truck — can you put in a biscuit?' And no sooner had he said that then I said, 'You bet.' My mult-box was sitting right there and any line could be run from it. I learned a long time ago that it's much better to run a six-pair cable everywhere than it is to have to run an individual 100-foot cable at the last minute." As complex as the overall PL system was, it was extremely well thought out and put together and contributed enormously to the smooth operation of the show.

Personnel

As important as careful planning and high quality professional equipment was to this show, it could never have worked at all had it not been for the crew. Only two eight-hour days were allocated to get the show in and running — an almost impossible task unless your crew is the very best. Everywhere I looked I was impressed with the efficiency and high level of professionalism that I encountered. Even when there were serious problems — for instance, a bad grounding situation never got totally cleared up until noon, the day of the broadcast — nobody showed signs of panicking. I got the feeling that everyone knew that everyone else was the best in the business and that if they couldn't do it, nobody could.

John Field, who was responsible for the entire crew, stated that, "Audio to me is a world all of its own. I don't pretend to know what these experts know and so I cover myself with the best people there are. When I hire them and I ask them to do a show, they look forward to doing it and they do it well. And I don't ask them a lot of questions. If the system has a serious problem then I'll get involved, otherwise I give them total freedom. I don't expect to be questioned when I'm hired to do a job because I feel that I'm hired for a specific reason and I feel the same way towards my crew. People are the most important commodity there is in this world and particularly in this business. This crew is the finest there is in television. I take them with me everywhere." Ed Greene is the only man John doesn't hire because generally the Executive Producer of the Grammys hires him himself — usually right after every year's Grammy Show. According to John, "He is the best."

One thing that makes Ed the best is his ability to surround himself with the best crew he can — all of whom are seasoned professional stagehands who usually get called to work most of the elaborate television specials in the area. People like Mike Gannon, Jeff Fecteau, Bart Chiate, Don Worsham, Paul Sandweiss, and Chris Seidenglanz were some of the real stars of this show, Ed maintained. Both he and Bruce Burns work with them on various other programs like "Rock Concert" where they are used to having to accommodate four or five different groups on one show. Bruce and Ed agree that a big reason why these guys get called for all the important shows has as much to do with their attitude as with their expertise. "Fifty per cent of what they do is their job and the other fifty per cent is their getting along with everybody else," affirmed Bruce. "You can get a guy who is incredibly good at his job but who has trouble relating to the people he works with and he won't get called again — I'll guarantee you." Whether you survive in this business or get swallowed up in it depends a lot on your attitude and your determination to only go with the best — the best equipment and the best personnel.

There is an incredible challenge in doing live specials like this — the same kind of challenge a live mixer feels when the house lights go down at the start of the concert — with one slight twist. If something goes wrong at a live concert only those in the auditorium are aware of it. If you make a mistake on a live television show not only does the entire world know about it, but it's been recorded for posterity's sake and will be played again, and again, and again. Ed, Bruce, Larry, Norm and the rest of the crew can easily relate to the direct-to-disk engineer who only has one lacquer left. They know that the situation demands that their expertise, their equipment, and above all, their attitudes have got to be the best.

"It's the challenge of the live shows that I enjoy," Ed states. "But if you sat down and really worried about it, you could drive yourself crazy. Whatever the situation, whatever the problem, I can't get upset about it. I can't worry about it. I stay as relaxed as I can and I take whatever comes. And really, the secret is to always have a Plan B." □□□

Peavey equalizers have been designed using the latest computer assisted design techinques and precision components to offer the musician, sound man, and home audiophile flawless performance without extravagant cost or compromises in quality.

The Stereo Graphic features two independent ten-band sections with 15 dB cut or boost at ten center frequencies. Filters are provided for each channel with continuously variable 12 dB high and low cut or boost.

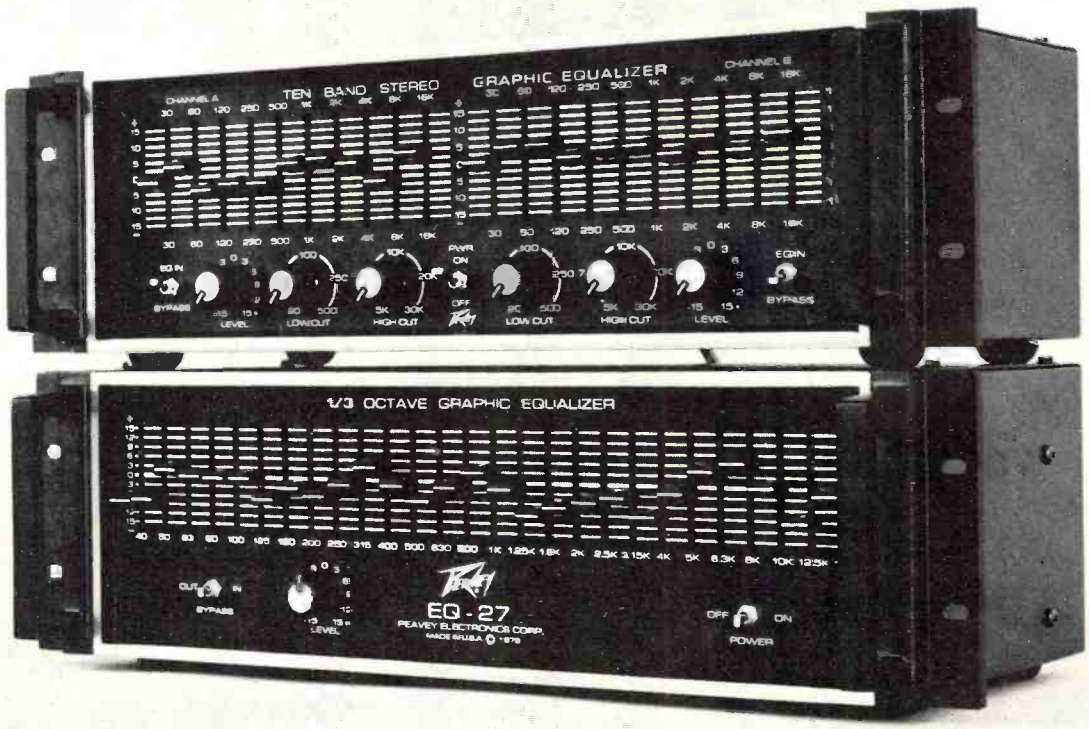
The EQ-27 features 27 bands at one-third octave centers throughout the audio range and is fully compatible with the most professional real time analyzers.

Each system's input circuitry can be matched to a wide range of signal levels thanks to special gain/attenuator level controls. Balanced and unbalanced outputs are equipped on each unit with protection for any accidental overvoltage or short circuit situation that may occur.

Because of a high level transformer balanced output circuitry, the Stereo Graphic and EQ-27 have the capability of providing greater than +16 dBm into 600 ohms making them excellent as high quality line amplifiers.

The Peavey Stereo Graphic and EQ-27 are technically two of the finest equalizers available today. Exceptional performance and compatibility with a wide range of signal and impedance levels make these units an unmatched professional value.

PEAVEY STEREO GRAPHIC & EQ-27 price/performance no other graphics can equal.



Complete specifications and descriptions of the Stereo Graphic and EQ-27 are available upon request by writing our Literature and Promotional Department, Peavey Electronics; 711 A Street; Meridian, Miss. 39301.

for additional information circle no. 59

SOUND MAN'S GUIDE TO VENUES

— Number 6 in the Series —

OMAHA CIVIC AUDITORIUM
1804 Capitol
Omaha, Nebraska 68102
(402) 341-1473

Directions from Closest Highway

From Interstate 480 take either 14th or 19th Street off-ramp. 19th Street exit leads directly to Auditorium.

Facility

11,300 Seat coliseum, including 5,000 seats on main floor. Portable scaffold stage. Building open 16 to 6, Monday through Saturday. No specific show ending time enforced. Stage height either 3 or 6 feet. Stage width and depth variable. Ceiling is 65' above audience floor at stage position, which is generally at north end of arena.

Acoustics

Some slapback off rear wall. Tends to be a bit bass heavy due in part to solid wall 10' behind stage. Acoustical ceiling throughout building. Hardback chairs. Fairly typical "coliseum" sound — big and boomy. No RT_{60} reverb measurements available.

Loading

Loading door is reached from parking lot at north end of building. Two loading doors measure 16' W x 11' H and 16' W x 9' H, respectively. From loading doors, equipment moves up slight ramp about 50' to stage. Plenty of reserved parking for semi's and trucks.

Set-Up

Sound console can go anywhere — no special area is reserved. A maximum of about 200' of cable needed to reach stage, depending on mix position chosen. Platforms are available measuring 8' W x 4' D x 6" H. Speaker clusters can be hung from almost anywhere within the arena.

Sound System

- house speakers -

About 80 JBL 2150 loudspeakers are powered by Altec 200 and 100 watt amps and are distributed overhead in the ceiling. Time delay is used if stage is located at end of arena. This system is generally used for sporting and rodeo events and was not designed for high level music reproduction. Twenty-four Shure SM-54 microphones are available with Atlas stands.

- house console -

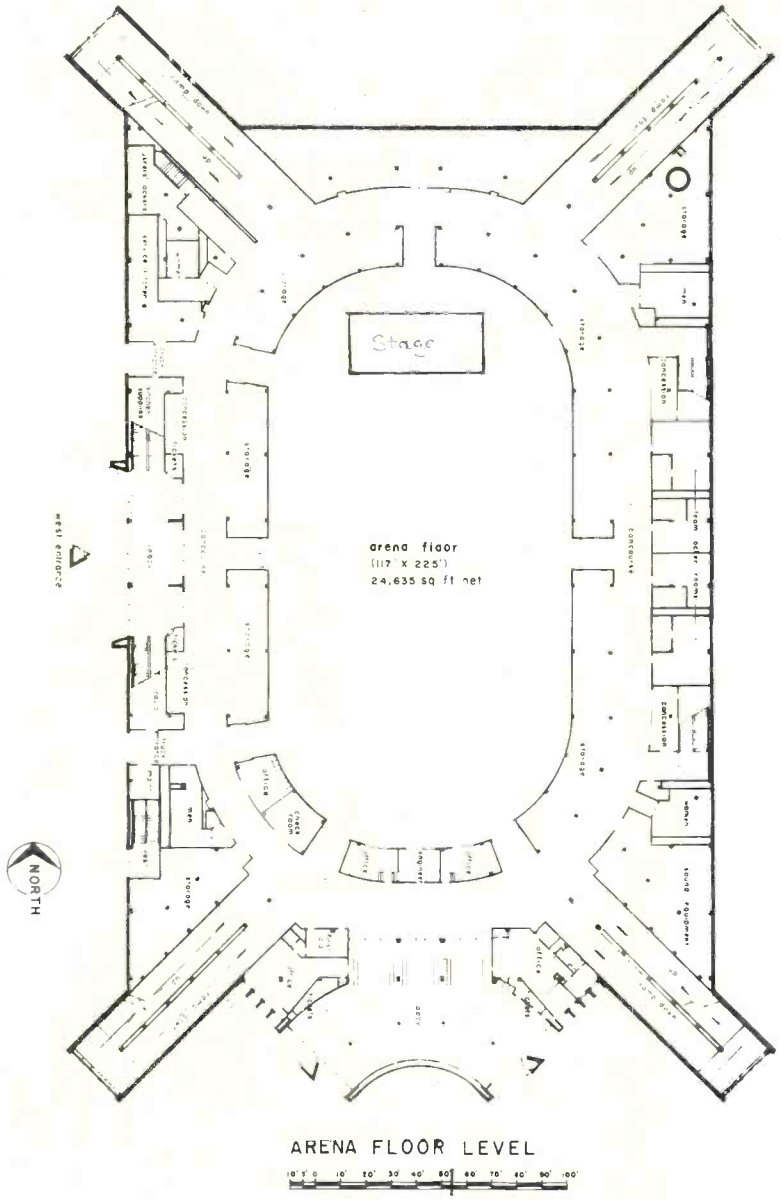
Yamaha PM 700 (12x2) with three band EQ, will accept a balanced line level signal on an XLR 3-pin male connector.

- monitor system -

Small portable system composed of JBL 2440 speakers and a Yamaha PM 700 console (12x2) with three band EQ.

Electrical

There are two separate AC distribution systems available with a combined total of 2,400 amps. System A is three-phase, 600 amps per leg, and is generally used for lighting. System B is three-phase, 200 amps per leg, and is used for sound. Breaker boxes are located upstage and require pigtail connections. Ample 120 volt stage circuits are available — contact the hall with requirements.



Personnel

Union house, non-departmentalized. Separate crew not required for loading. Advisable to order forklift and operator to facilitate loading onto stage.

Building Manager: Terry Forsberg, (402) 346-1323.

Stage Manager: Mike Janda, (402) 346-1323, ext. 32.

Sound Engineer: Colbert McClellan, (402) 341-1473.

Piano Tuner: Paul Curro, (402) 731-0846.

Traveling Soundman Reaction:

"Real boomy sound. Typical 'coliseum' peak around 100 - 200 Hz. Two trucks can unload at a time and equipment comes in at stage right rear. Seating area seems very wide for this size auditorium. Real good crew. Recently two of our semi's full of the sound gear for a Ted Nugent concert were delayed by a snowstorm until 4 p.m. and the crew got the equipment in and up in time for an 8 p.m. show," ***Michael George,*** *TFA-Electrosound.*

"This place used to be pretty bad! However, five or six years ago they suspended an acoustical ceiling in the hall which improved the sound tremendously. Now it's a workable, reasonable room. It's smaller than a coliseum actually; it's more like a large gymnasium, but it sounds better because of the ceiling," ***Stan Miller,*** *Stanal Sound.*

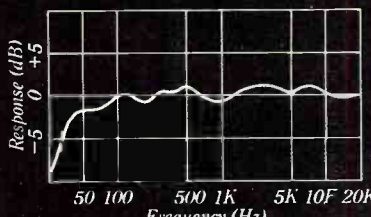
WHY JBL FLATTENS THE COMPETITION.

INTRODUCING THE 4313.

Flat frequency response. It means accuracy. Naturalness. Reality.

JBL gives it to you without the bigger box that you'd expect along with it, since the 4313 only measures about 23" by 14" x 10"!

This new, compact professional monitor produces deep, distortion-free bass. And does it with a newly developed 10" driver. Its massive magnet structure and voice coil are equivalent to most 12" or 15" speakers. Yet it delivers heavy-duty power handling and



On-axis frequency response, 4313 monitor.

a smoother transition to the midrange than most larger-cone speakers.

The 4313's edge-wound voice coil midrange accurately reproduces strong, natural vocals and powerful transients.

Up top, a dome radiator provides high acoustic output with extreme clarity and wide dispersion. A large 1" voice coil gives it the ruggedness needed in professional use.

Working together, these precision-matched speakers offer superb stereo imaging, powerful sound levels and wide dynamic range.

Audition the 4313 soon.

We think you'll agree that its combination of flat response, power and moderate size flattens the competition.

James B. Lansing Sound, Inc., 8500 Balboa Boulevard, Northridge, California 91329.

JBL

FIRST WITH THE PROS.

acoustics • design • construction

Fantasy Records Studio D

Since its inception several decades ago as an esoteric jazz label, but perhaps even better known back then as the label which released Lenny Bruce's ("America's dirty-mouthed bad boy") material, Fantasy Records has consistently achieved a truly remarkable growth. In reality, their name and logos only became very readily recognizable as Credance Clearwater's label.

It was during the Credance popularity that Fantasy moved from San Francisco to what has become the Fantasy compound in Berkeley, California. Their first recording facilities were built at that time.

Contributing to their further need for physical expansion was the monumentally successful entrance into the film production business as the producers of "One Flew Over The Cuckoo's Nest."

Having experienced the typical hardship of piecemeal expansion, decisions were made providing for a comprehensive master plan for the type of facilities which would equip Fantasy for progress well into the 1980s, and perhaps into the '90s, as well. The plan called for integrating the proposed new studio facilities, both audio and film, into the construction of a new six story headquarters building linked to the existing structures.

Audio studio acoustical designer Tom Hidley was selected to provide the designs for the recording studio complex; construction execution and supervision, electronic interface and installation contracts were awarded to Sierra Audio. This activity to be coordinated by, then, chief engineer, Jim Stern.

Acoustician Jeff Cooper was commissioned to treat the separate film facilities.

The Recording Studios

Since Fantasy knew that their new recording facility would be used for everything from full orchestra film scoring on down, they projected a need to house as many as 80 performers in the main studio area, and 30 in the control room. Notwithstanding the exponential cost increment, by philosophy it was intended that both the studio and control

. . . continued overleaf -

THE STUDER STANDARD
Good is not enough, only excellence is adequate.

The Studer A80/RC Mk II. For studio mastering. Or cutting master lacquers. Or broadcast syndication or master film soundtracks. Whenever you need a ¼-inch master recorder you can base your reputation on, you need a machine built to the unique Studer standard of excellence. The Studer A 80/RC Mk II.

Compare the editing facilities of the A80/RC Mk II with any other master recorder on the market. And the unique Studer real-time (positive and negative) digital tape position indicator and zero-locating feature. Compare the noise level of its electronics. Check out the wide variety of available head configurations, including a pilot tone version with or without resolver for film sync applications. Vari-speed control (±7 musical semitones) is standard, as is a monitor panel with built-in speaker/amplifier which lets you cue the tape right at the machine without tying up your monitor system.

As for servicing ease, the A80/RC Mk II is simply incomparable. All the logic boards have LED status indicators so a failure can be spotted instantly. You can even take apart the entire recorder with the two Allen wrenches supplied.

Of course, there aren't any secrets to the incredible rigidity of the die-cast, precision-milled A80 frame and the extraordinary machining tolerances of its stainless steel headblock. Only Willi Studer's characteristic unwillingness to compromise.

Others could make their heads and motors as well, no doubt; they just don't. Servo-controlled reel torque and capstan drive (independent of line frequency or voltage) aren't exactly new concepts. Nor is PROM-logic transport control. But try them all out and see whether you can settle for anything less than the Studer A80/RC Mk II.

Second best is very good today. But not good enough.

Studer Revox America, Inc.
1425 Elm Hill Pike, Nashville, TN 37210
(615) 254-5651
Offices: Los Angeles (213) 780-4234
New York (212) 255-4462
In Canada: Studer Revox Canada, Ltd.

STUDER REVOX

Fantasy Records Studio D

room would be considerably larger in both height and area than the normal enclosures built to accommodate these numbers.

The control room design which was ultimately approved, although similar to the twelve control rooms designed for Sony in Japan, is the largest ever done by the Hidley/Sierra team. The studio area exhibits a number of very new acoustical control features which will be described.

Isolation Systems

Acknowledging that the '80s and '90s would certainly become *the* digital recording decades, the need for total de-coupling of all the structures became a prime and absolute requirement of the design. (See: Kent Duncan, *"Studio Design for the Next Decade,"* R-e/p, Volume 10, Number 2, April 1979, p 68.) As reported by the designers, "Fantasy was a more than ordinarily difficult problem to solve [in isolating from ground transmitted low frequency energy] because of their location in a warehouse district adjacent to active railroad spurs, with additional truck traffic in the area."

To achieve the kind of isolation specified, three walls, two floors, and two ceilings were built to contain the studio. The outer wall is 8" thick, and made of poured concrete. This wall is an outside wall and is well secured far below ground level in a substantial footing. Between the first wall and the second is a 5" air space which is filled with styrofoam pellets. The second wall is 4" thick concrete and extends below the ground into an isolated footing. Then there is another 5" empty air space followed by a 4" thick wood wall. Each wall system is independent and isolated from the other. The third wall is built atop the primary floating floor's system; but is, in fact, directly isolated from the floor by a layer of rubber between the floor and the wall's base plates. Then inside of the isolated three wall system is the geometric wall system visible to the studio.

The two concrete floor systems are floated from each other and the concrete walls by various layers of styrofoam, microlite insulation, and Kaiser's polyurithain sound board. The 12" thick bottom slab was poured on a standard vapor barrier and was done in three separate pours. All three run the length of the entire studio area, but they are isolated from each other. These slabs were also built around and isolated from the support piers of the office building that has been built above the studio.

The top concrete slab is 10" thick and is composed of seven separately floated slabs; one for each individual acoustic area. These areas are isolated from each other by ½" machinery rubber. The individual acoustical areas are the producer's suite, the control room, the string room, and four separate acoustic areas in the studio. These are the drum booth, piano area, the greater rhythm area, and the hardwood floor area. The entire studio floor is at the same level. On top of the 10" slab the individual acoustic treatments; padding, and carpet, hardwood and marble flooring was installed.

The control room has an additional floor floated on the top concrete slab, as does the drum area. This is a Sierra standard. In order for these two floors to be level with the rest of the studio, the concrete slabs were countersunk. This was done for several reasons. Primarily, the additional floor was needed to isolate the extreme power level developed in the control room from the studio. Secondly, it made it possible to install easy-access recessed wire troughs from the console to other areas in the studio.

The hardwood flooring in the studio required special attention. Wood floors, by their nature, have an undesirable natural tendency to creak when walked on. The hardwood floor was mounted on a glue base and then nailed to 1" chipboard. The chipboard, a much higher mass substance than plywood, is attached to the concrete with a stud gun after it's floated on the glue base. Great care was taken to get every air pocket out from between the layered surfaces.

Each of the separate floors provide an independent base for the isolated wall systems of the string room, control room, producer's lounge, and the studio.

It should be noted that at 18 feet high the walls, according to code, could no longer be constructed of 2 x 4s; 2 x 6s became mandatory above 16 feet. The necessary use of beefed-up materials carrying heavier loads contributed to making this size studio about 30% more expensive per square foot, by comparison to the average studio which Sierra estimates at about $90.00 per square foot. (New York is slightly higher, Los Angeles a bit lower.)

The roof of the facility is composed of a three ceiling system. The outside ceiling is also the bottom of the office building's third floor. Below that is an air void packed with insulation, followed by another concrete shell. The second shell is isolated from the office building's main support columns by machine rubber. The ceiling trapping blankets are attached to this shell. The interior ceilings for the string room, producer's suite, control room, and studio are supported from the bottom and not hung from the top, and are isolated from their respective floating floor and wall systems with machine rubber. Basically, the acoustic principles of "box-within-a-box" construction were strictly observed to achieve digital level isolation.

The Visual Environment

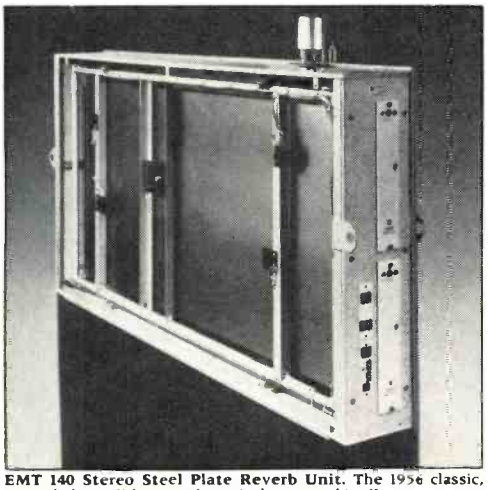
Unbroken sight lines have long been a problem in large modern studios with varying acoustic areas. Eliminating or minimizing these became an important consideration for the designers in configuring the relationship between the control room and the various acoustic environments. To accomplish this, one of the primary wall finish materials used in the studio was an abundance of mirrors. These were placed precisely at exact sight angles. Remarkably, from the typical console positons in the control room, it is clearly possible to see into every remote corner of the string room and studio, reflected in the mirror surfaces.

The visual feeling is one of overall spaciousness and high visibility. Though expensive to implement, and time consuming to design, each room area achieved acoustical isolation while maintaining visual contact. How desirable this is is illustrated by the number of times during every session that visual gestures become the appropriate communication. The artists can't tell the engineer to turn it up while they are singing.

Acoustics

Before addressing the specifics of the room, a brief description of current trapping design

But Antonio Stradivari would have understood.



EMT 140 Stereo Steel Plate Reverb Unit. The 1956 classic, upgraded to solid state. The unit that started it all.

Right now, the *oldest* reverb unit in our line– the EMT 140– is priced higher than anyone else's *newest*. And our later models are even costlier.

Yet, this doesn't seem to discourage anyone. According to *Billboard*'s recent equipment study, EMT reverbs are used by one-third of all the surveyed studios. That's almost *twice* the number using the next brand. And more than the second and third brands *combined*.

How come?

Mr. Stradivari could explain: There's nothing so precious as exactly the right sound. And once an artist discovers the sound he likes, he's reluctant to give it up.

No matter what the price. No matter how many years– or new models– come and go.

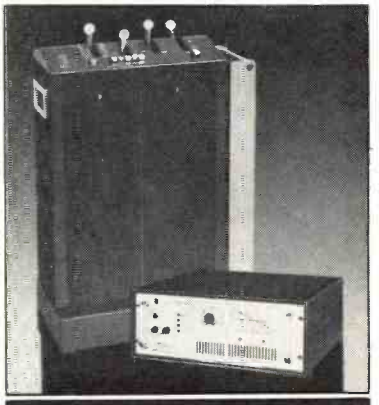
So, for all the people devoted to its singular sound, we have to go on making the EMT 140. Despite its costliness. And even though we can now offer its successor, the EMT 240 Gold Foil. As well as the EMT 250 and 244– the amazing digital units that redefine state of the art in reverberation.

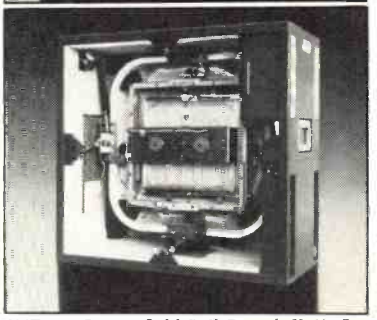
Our situation is very much like Mr. Stradivari's. He stopped making violins in 1737, but the demand for his sound continues undiminished. And, in the same way, each of our four different models has its partisans– and demand goes on, year after year.

We do have one advantage, however:

Today a Stradivarius is priceless. An EMT is merely expensive.

EMT 250 and 244– Digital Reverberation Units. Fully Electronic Reverberation. EMT uses today's technology and again sets the fashion. Send for our extensive list of owners.





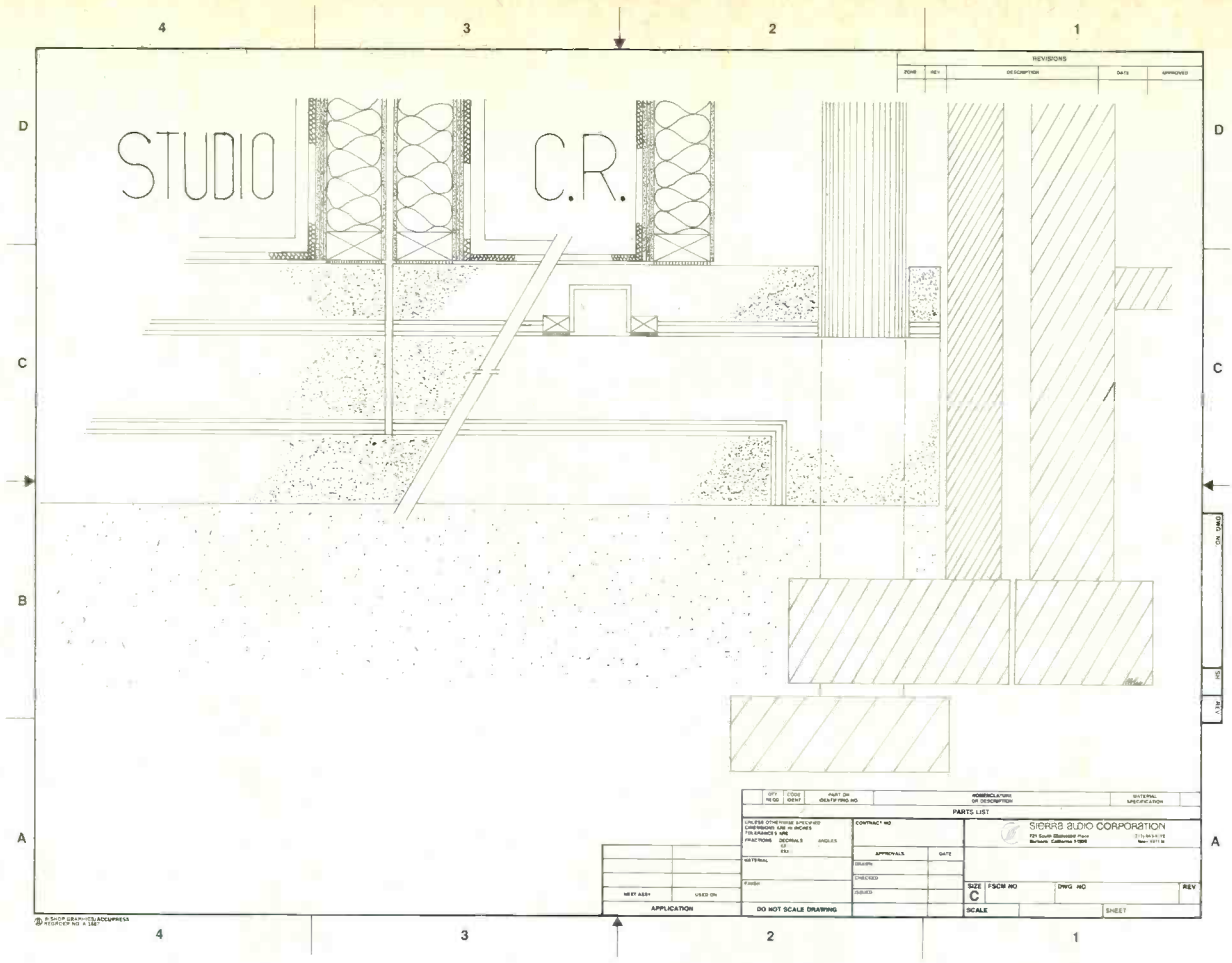
EMT 240 Stereo Gold Foil Reverb Unit. One fifth the EMT 140 Steel Plate reverb's size, virtually impervious to outside interference– ideal for mobile use.

For additional information, contact:

GOTHAM

741 Washington Street, New York, NY 10014 • (212)741-7411
West Coast Office: (213)874-4444
EMT-FRANZ worldwide: Box 1520,
7630 Lahr, W. Germany

GA-4



Non-Dimensioned Detail of Isolated Slab and Wall Systems

and theory should be explored. The physical dimensions of trap cavities are determined by the frequency which they are designed to absorb. The height, width, and depth of each cavity, and the length of the blankets which are suspended inside of them, are related to the quarter wavelength in free air of the frequency which the trap system has been designed to absorb. For instance, ¼ wavelength of 40 Hz is approximately 8 feet. The volume and blanket length are therefore designed to operate around a specific center frequency which is determined by the trap's particular application and placement in the studio. The spacing between each blanket is specific, but not regular or periodic to insure that a particular frequency or its harmonics will not elude the trap and come back into the room.

. . . trap construction

In order to improve the effectiveness of the trap, each suspended baffle must be completely free swinging from the trap's ceiling, and not staticly connected to any part of the trap nor touching other baffles. The baffles are typically made of a sandwich of sound board and fiberglas. They are then suspended by fish line or bailing wire so that the baffles absorb the energy that strikes them by going into sympathetic motion, which attenuates the energy entering the trap.

By making each trap an independent volume, the interior dimensions can be made closer to the ideal specific frequency and dimensions. The effect of this is to increase the Q of the trap. Q, in this bandpass situation, is defined as the ratio of center frequency to bandwidth. Q = Fc/Bandwidth.

The Q of the trap is further determined by the size of the trap opening. The narrower the opening the higher the Q, up to the point that absorption at that center frequency as the opening begins to excessively block the entrance. Like an equalizer, the higher the Q, the narrower the bandwidth. Essentially this changes the dB/octave bell around a specified center frequency which each trap is designed for. Throughout the Fantasy facility there are tuned traps at various points along the top and bottom of the walls and the ceiling. Each opening enters into its own large volume trap.

Since each and every room has particular resonance frequencies, the traps are designed to attenuate those frequencies. These frequencies are determined by mathematical analysis of the room volume prior to construction. The degree of attenuation is largely determined by the volume of the cavity and number of blankets used. The resonance frequency of the room is determined by the height, width, and depth of the space. In designing the traps it is possible to manipulate the trap surface opening area and its volume to achieve mid- and upper-band reflection while maintaining bass absorption.

Needless to say, every room should have some decay, but for best results, it has been found, that the decay should be frequency dependent. For example, defining a room as having two second decay is not sufficient since it might be two seconds at 3,100 Hz, ¾-second at 100 Hz, and 2/10-second at 40 Hz. This has become an important consideration in defining the parameters of any room. Sierra feels that in the mid-bands the decay should be between .25 and .4 seconds decay, .5 at 5 kHz, under .4 at 10 kHz, and .25 seconds in the presence frequencies.

In a room as large as the Fantasy studio, the airborn transmission loss is also a significant factor with 26 dB of attentuation every 3 meters across the floor (10 feet). So, from the

. . . continued overleaf -

THE VOCAL-STRESSER
A HYBRID WHOSE ROOTS STAND ALONE!

ADR at AES Booth #123

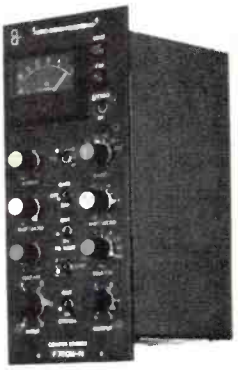
Another original from **audio & design recording.**

The **Vocal-Stresser** combines a parametric-type equalizer with a multi-ratio compressor, peak limiter and expander/gate. An extremely versatile signal processor in one rack mount unit.

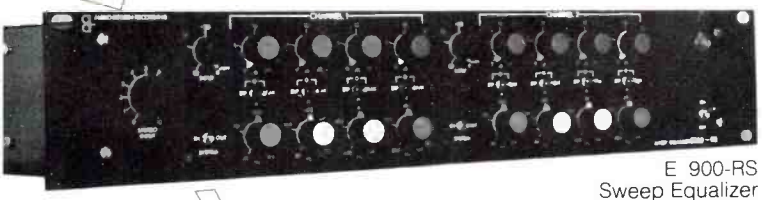
To use the Vocal-Stresser:

- Switch the Equalizer **before** the Compressor for maximum signal conditioning while maintaining critical overload protection.
- Switch the Equalizer **after** the Compressor for enhanced compression and limiting effect.
- Switch the Equalizer **into** the Compressor side chain for frequency conscious compression (e.g. de-essing, reduction of modulation effects when compressing a mixed program).
- Switch the Equalizer **out** of the system for simultaneous use of equalizer on **separate** program material via additional input/output channel.
- Switch **in** the Expander/Gate to attenuate source and channel noise, cross mic pick-up and reverb, and to cancel increased compression noise during program pauses — as well as for punchy effect.
- Use the Vocal-Stresser on vocals. . .or **any** signal source.

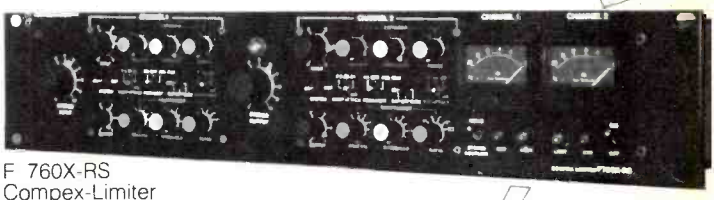
E 900-N
Sweep Equalizer



F 760X-N
Compex-Limiter



E 900-RS
Sweep Equalizer



F 760X-RS
Compex-Limiter

F 769X Vocal-Stresser

audio & design recording

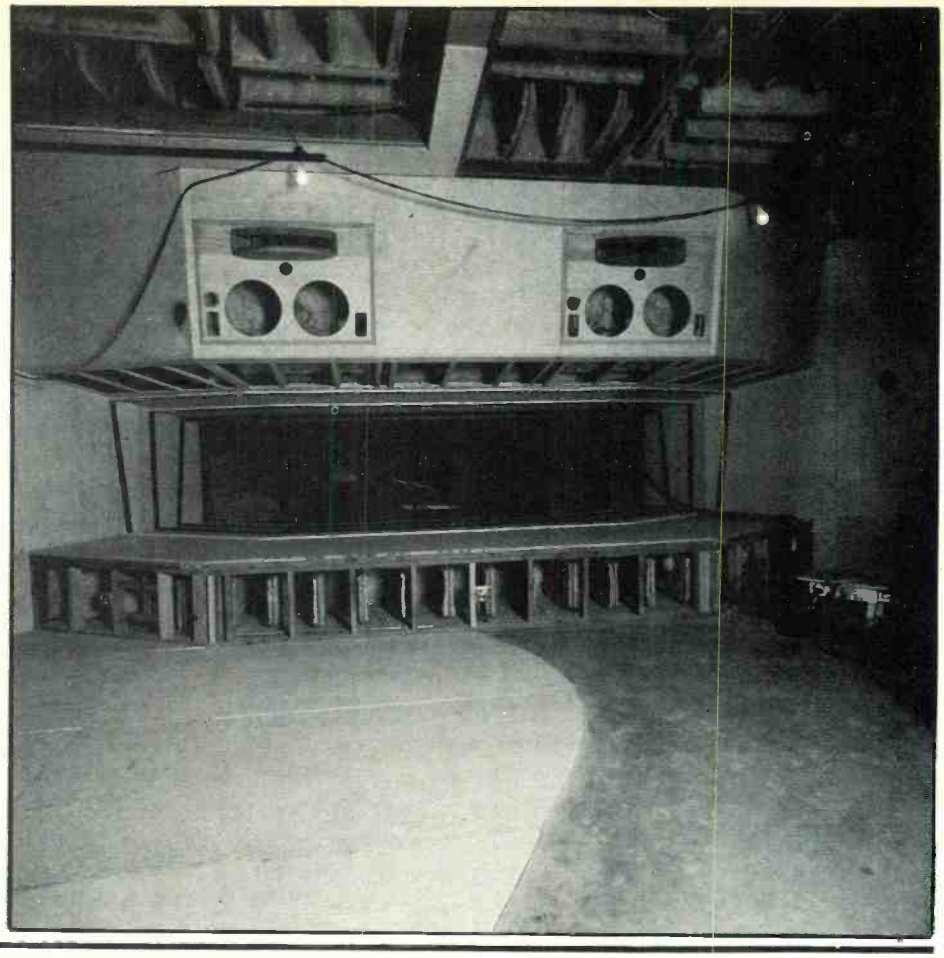
Contact Nigel Branwell, P.O. Box 786, Bremerton, WA 98310
(206) 275-5009 TELEX 15-2426

Providing the international audio industry with clean, quiet, dependable Signal Processing for more than 15 years.

Excellent specs. Exemplary sound. Definitive practicality.

for additional information circle no. 63

Audio & Design (Recording) Ltd., 84 Oxford Rd., Reading, Berks. RG1 7LJ. England, TEL: (0734) 53411 TELEX 848722 a/b ADR UK

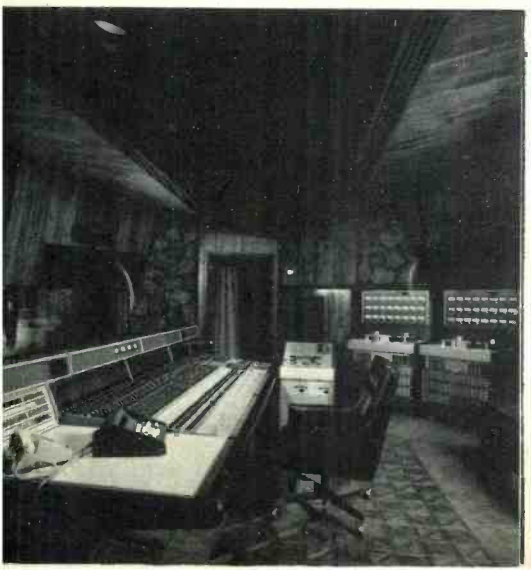


construction detail: split slab, ceiling traps, monitor framing, looking toward control room window

drums to the piano ten feet away, the drums are down by 56 dB or so. Twenty-four dB to the drum traps, 26 dB airborn transmission loss, and 6 dB or so because of the piano lid. The signal that goes past the lid is soaked up by the piano trap, and the mechanical isolation is complete because of the floating floors.

Typically, in the Fantasy ceiling, there is 44 dB of attenuation at 40 Hz. At 100 Hz the absorption goes to about 12 dB. The basic idea in designing a room this size is to dramatically raise the point at which the room goes into compression. It is at this point, and beyond, that separation becomes impossible. The idea is to dramatically roll off the low end reverberation of the room. In an older type of studio design the room may be fine as long as the session is recording softer material. But as soon as loud rock and roll is placed in the studio the low end saturates the room and acoustic compression sets in. Put another way, placing a moving baffle in front of a Marshall stack stops none of its low energy from moving right across the room. So the trap is specifically designed to break the back of the low end. Once this is achieved, much of the apparent need for Gobos is eliminated.

finished control room showing Neve Necam console and twin Studer 24-track recorders



The Control Room

Control rooms present a particularly difficult problem since none of their dimensions are generally greater than one wavelength of bass. If early reflection low end is not quickly absorbed the wave can bounce back and sum or cancel a similar wave on its way from the speaker. The resulting listening condition will have a low frequency bump or hole in the audio spectrum at various points in the listening area.

The Fantasy room has extensive trapping for low end to eliminate this problem. In conjunction with this, high and mid-band frequencies are also attenuated to eliminate excessive reflection in these areas. A curtain absorbs the mid-bands, the high end is caught by the carpet, and the low end walks through the curtain and is absorbed by the trap.

The control room wood is pre-finished ½" walnut hardwood. It is random length and width, and took the Sierra foreman a month to install because it had to be hand fitted, glued, and toe nailed piece-by-piece. The effect is dramatic.

The control room ceiling is also ½" walnut hardwood. The ceiling trap goes wall-to-wall, and there is a ribbon trap around the ceiling parameter. All the other surfaces and trapping are similar to other Tom Hidley designs. There are bass traps under the control room windows, and behind lava rock walls on both sides of the room are full bass and mid-range traps that vent at the bottom. There is additional bass trapping at the rear of the room.

The top of the window is lower than past Hidley designs. This allows the monitors to have an almost straight angle of dispersion, which extends the depth of the accurate listening area.

The control room glass is aimed downward so that any sound that it reflects is bounced off the back of the console and into the traps under the window. The control room window has three panes, each a different thickness and mounted separately on isolated wall systems. None are parallel to each other so that the same sound striking the top of the glass will arrive at the bottom at a different time.

In the studio the control room glass is tipped upwards so that any reflections will head toward the ceiling traps and out of the room. In a smaller room this would not be possible since the angle which the glass would have to be to reach the ceiling would be so severe that it would not realistically work.

There is also a unique ribbon trap that runs along the upper frame of the control room window. This trap vents into a cavity in the wall above the window.

The Room

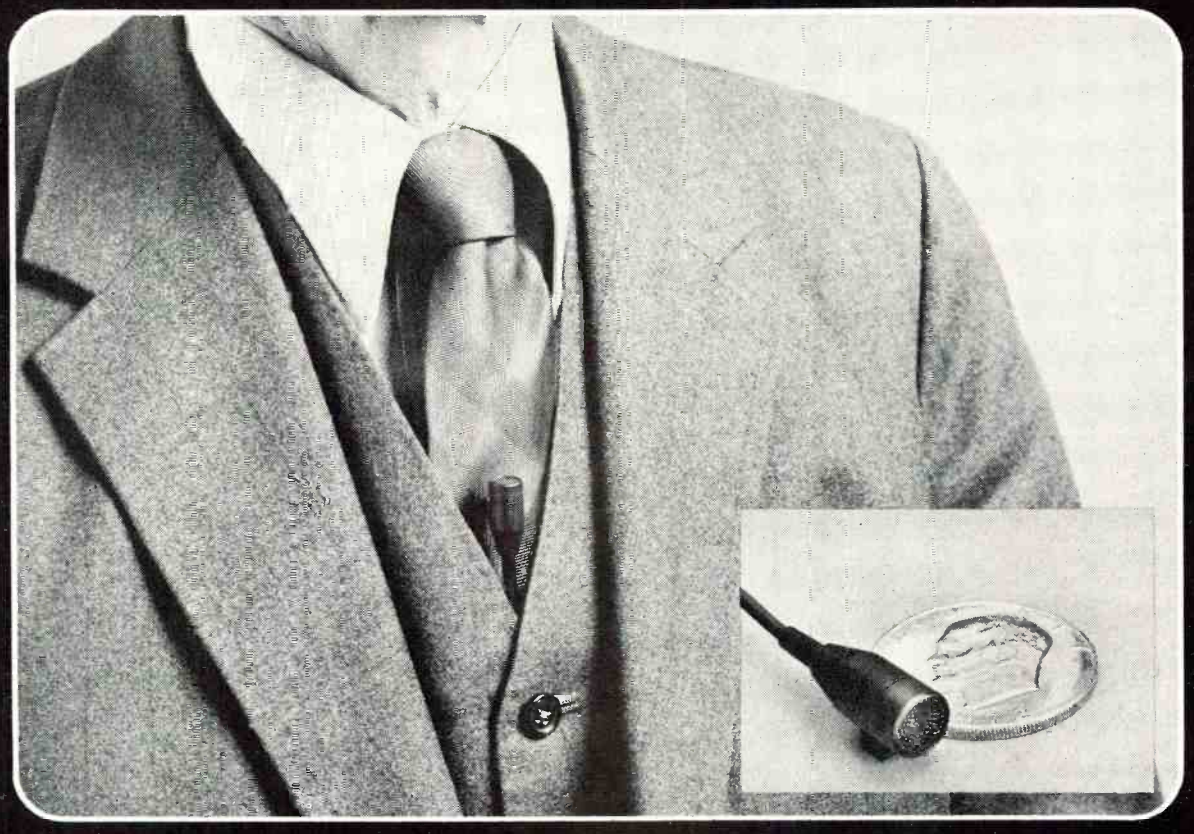
The rhythm area makes up about half of the available studio space. This area is traditional Tom Hidley design with ceiling traps, soffits, rugs, and drapes acoustically balanced with rocks and wood surfaces.

The drum "booth" is on the same level as the rest of the studio. It has a ceiling height of seven feet and will hold two full sets. (It, too, is the largest built to date by Sierra.)

. . . continued overleaf -

AKG® acoustics

C-567 - the "almost" invisible Condenser Lavalier Microphone



AKG unveils the *smart* lavalier.

It's right on, a most out of sight . . . and a super performer!

In television, news and interview shows, it is hardly noticed when worn. In motion-picture work it is min scu e enough to be hidden in the smallest of props. At the pulpit or lectern, replacing visible and intimidating microphones, it will convert "preaching" to dramatic, personal monologues. In recording studios, it will provide uniquely intimate "tight" sound for a wide range of instruments as a clip-on microphone.

Durable construction—completely new, all-metal, non-glare satin-black chrome finish. Accessories include t e bars for *one* or *two* C-567 mics, a single-mic tie tac, a wire-mesh windscreen, and a belt clip for the output module. And it's field repairable.

Incomparable performance—its omnidirectional electret condenser transducer has a wide frequency range of 20-20,000 Hz.

Be among the knowledgeable. Send for details today!

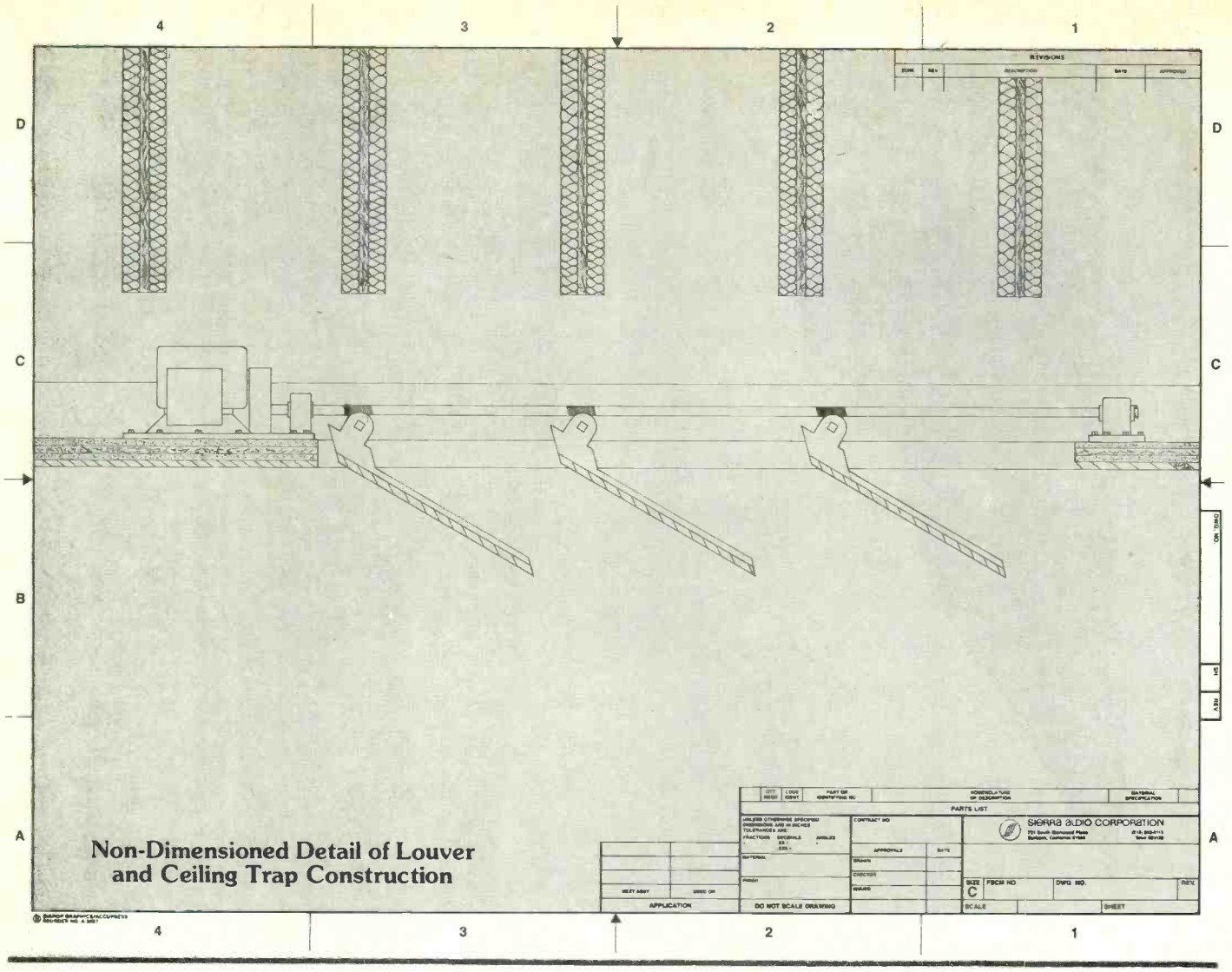
PHILIPS AUDIO VIDEO SYSTEMS CORP.
A NORTH AMERICAN PHILIPS COMPANY
91 McKee Drive, Mahwah, N.J. 07430 • (201) 529-3800

AKG

...the mark of professional quality

in microphones, headphones, phonocartridges, reverb units.

® AKG Akustische und Kino-Gerate GmbH, Austria



Non-Dimensioned Detail of Louver and Ceiling Trap Construction

The drum area has a ceiling trap with a primary frequency of 90 Hz. Previous Hidley designs have 45 Hz traps in this area. Though 45 Hz seemed to be a good average for the primary frequency of most kick drums, it was discovered that the instruments' first harmonic could be four to five dB hotter than the primary. Hence, the trap frequency has been shifted upwards.

Along the bottom of the booth's back wall is a ribbon trap that opens to a large cavity which gives the booth about 16 dB of attenuation at 40 Hz. The angle of the booth's back wall is approximately 105 degrees, causing any reflections to converge outside of the drum space. The drum booth will absorb about 24 dB broadband, from cymbals to kick drum, and was designed to be open to the room. Jim Stern, having played drums for many years, understood the claustrophobic feel of the traditional drum booth. Gobos can be rolled in front of the opening, but good isolation is achieved without them.

The rest of the rhythm area seats 20 and contains a large volume ceiling trap, and separate bass, piano, and corner traps.

Beginning with the hardwood floor and going toward the opposite wall, there exists a totally variable acoustic environment. The junction of the wood floor and the carpet occurs on top of the rubber seal which separates the two large floating areas. The carpet touches the wood floor, but the wood does not touch the adjacent concrete slab.

The entire ceiling above the wood floor is made of ¾" ash, which is also used in many other areas of the studio complex. The ceiling trap cavity above the wood floor is separate from the system above the carpeted area. This maintains the acoustic integrity and isolation between the two traps and the two areas. This ceiling contains 24 louvers which, when closed, fit flush with the ceiling. This wood ceiling is probably five times more effective in increasing mid-band decay time than the wall surfaces due to the close proximity of the ceiling to the floor, and their almost parallel surfaces. The reflection characteristics, however, can be dramatically changed by opening or closing the vents. Because the vents are controlled as six groups of four, it is possible to create six different acoustic areas, each with its own ceiling-to-floor acoustic relationship. The group controls are operated from the console where position indicator meters are also mounted, thus allowing specific settings to be noted and repeated at any time. As the louvers open they not only allow sound up into the trap, but they also make ceiling reflection more random and diffused.

The louver assemblies were designed for another purpose, hence, they are considerably overbuilt for this application. Because they were designed for a high mass application, the gearing for them is very slow so it takes a minute to open or close them.

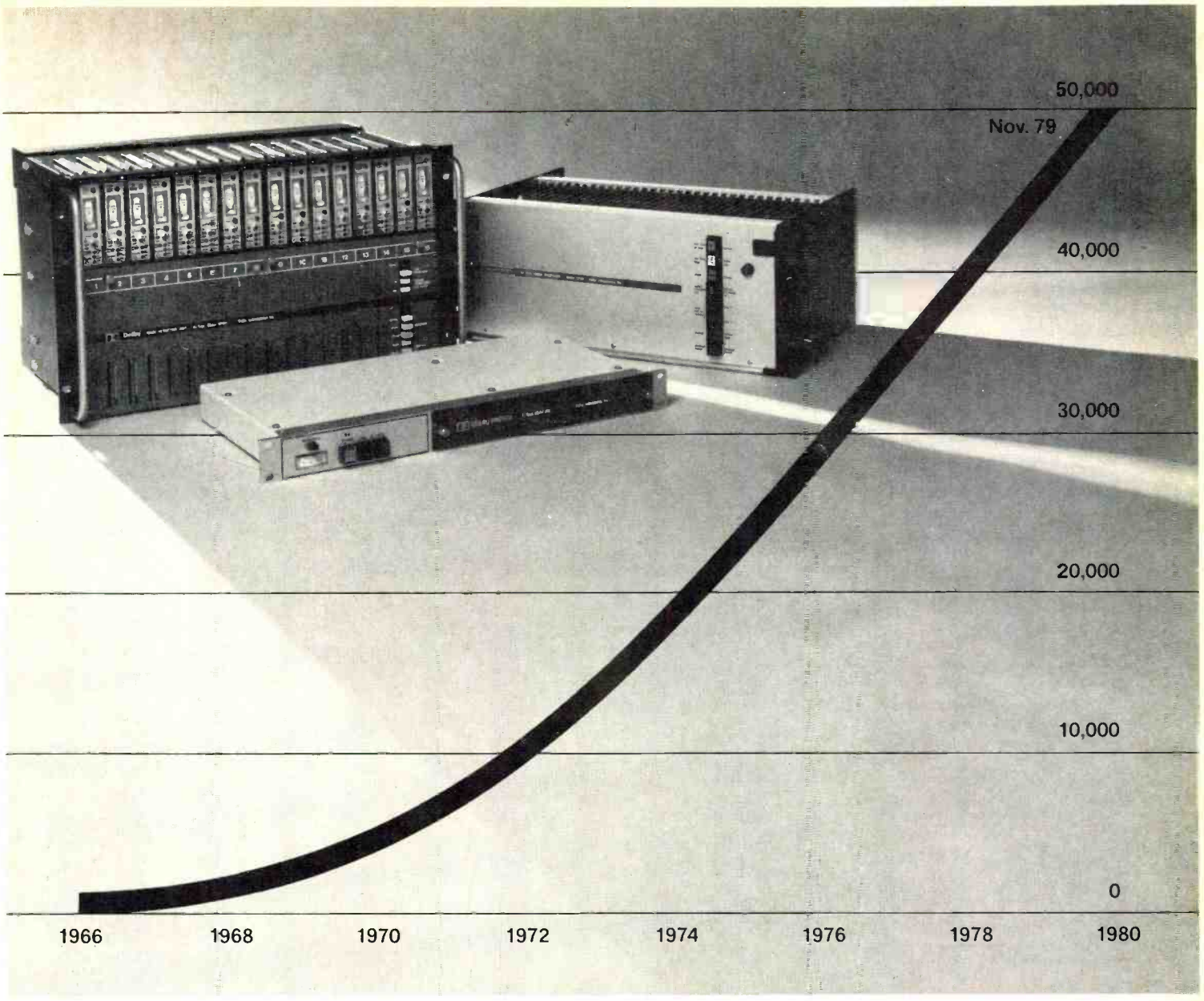
There are also three carpet rolls which have been seamed like throw rugs. If desired these can be put down so the entire studio can be covered with matched carpet. There are also two such carpets that cover the hardwood floor in the drum booth to provide a change in mid-band decay time.

Five sliding glass mirrors are on the long wall of this area, and three on the short wall. Each is on a separate track, and because they are non-interlocking, they can be placed anywhere desired.

Behind these highly reflective surfaces are

. . . continued overleaf -

louvered ceiling, open over live area



50,000 Tracks Of Dolby Noise Reduction

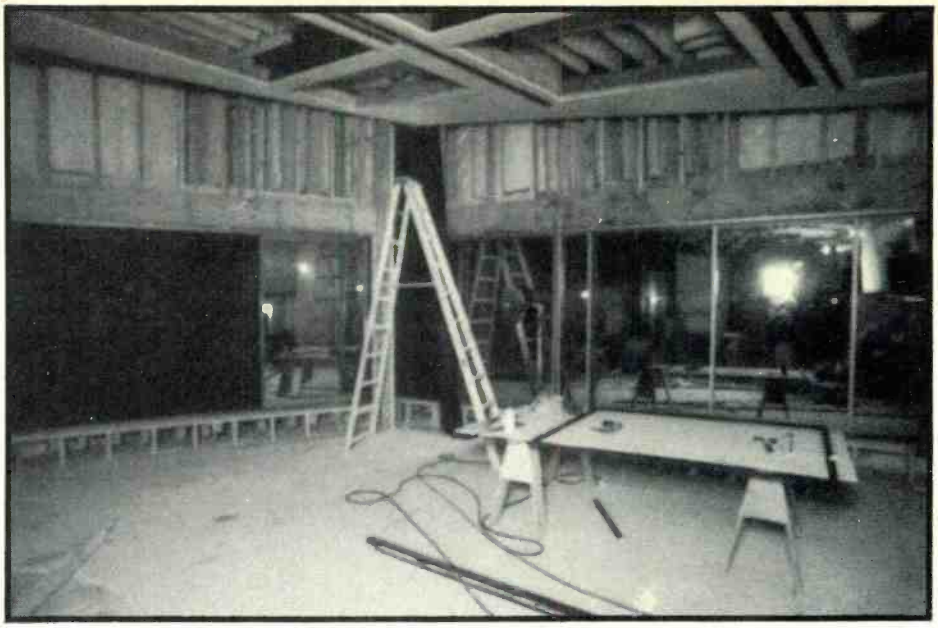
In November 1979, the number of audio tracks throughout the world equipped with Dolby A-type noise reduction passed the 50,000 mark. No other single form of signal processing has ever been so widely accepted by professional sound engineers.

The reason is simple. Every practical method for storing and transmitting sound adds noise to the original signal. The Dolby system diminishes the noise by 10 dB without audible side effects on any kind of program material. This performance is maintained with any type and amount of noise encountered in normal professional applications. Add proven dependability and world-wide compatibility, and that is why each year more and more professionals continue to choose Dolby noise reduction.

The original Dolby noise reduction unit was the two-channel A301, nearly all of which are still in use. Today there is a range of models for every application, from the MH series for multi-track recording to the CP series for cinema sound reproduction. Together they account for the more than 50,000 equipped tracks now fulfilling the Dolby system's original promise: effective noise reduction combined with complete signal integrity.

DOLBY LABORATORIES. 731 Sansome Street. San Francisco CA 94111. Telephone (415) 392-0300. Telex 34409 • 346 Clapham Road. London SW9. Telephone 01-720 1111. Telex 919109 S79 2086

Dolby®



construction view: showing sliding mirror wall installed in front of acoustic trapping system

large volume traps. By varying the placement of the various glass panels this area's acoustic environment can be dramatically altered. However, even when the mirrors are positioned completely in front of the traps, low frequency absorption continues. An 18" ribbon trap runs along both of the walls, between the floor and the bottom of the mirrors. Thus any low end rolling across the floor continues to be absorbed into the rear cavity. The effect is to maintain bass trapping while varying the amount of broadband absoption. The natural absorption of each of these variable soffits is 8 dB of attenuation at 40 Hz, and 3 dB at 100 Hz.

The result is a studio area that is totally variable. The ceiling, walls, and floors are all variable. Hence, it is possible to achieve any sonic environment — from a dead area to a live one.

This variable area has been designated the horn area, but its possibilities seem limitless.

It is, however, particularly well suited for horn recording because of the variation in dynamics, and frequency range produced by different types of horns.

finished string room, looking through sliding doors torward drum booth in main studio

The String Room

At the other end of the studio, next to the control room, is the reverberant string room. This room is a seven-sided trapezoid and is a new design by Tom Hidley. The string room can hold twenty players. As mentioned earlier, the angles of the mirror surfaces are optimized for vision. There are two independent corner traps and a floor ribbon trap to dissipate any low frequency problems.

The interlocking sliding glass doors that separate the string room from the rest of the studio can be pushed back into a wall soffit. When they are closed and properly seated, they give about 25 dB of isolation. The string room also has drapes along the mirrored walls if it is necessary to vary the highs and the upper-mids in the room. Opposite the mirrored walls are hardwood walls, which is also what the ceiling is made of. Above the ceiling is another full trap that is open to the string room through a narrow 9" ribbon that runs around the ceiling perimeter. This eliminates any low and mid-low build-up at the corners of the room.

The Producer's Suite

A producer's area just off the control room was considered very necessary because of the amount of business that a producer conducts during those periods of tuning up, getting sounds, and repetitive punch-ins. Very often the engineer will be asked to turn the monitors down so that a phone call can be made. A separate but adjoining area specifically set up for the producer was the answer. This room has full monitor and remote controls of machine and console functions. Here the producer can work and still see and hear what is going on in the control room, studio, or string room. The area can also be used for other applications such as a place for a synthesizer player to work out a sound or part, out of the way of the rest of the session.

Since the space is near the studio it was also set up to be used as an isolation booth. Each wall surface is different. There is a hardwood wall, one of glass, a rug, a tree bark wall, and a trapped ceiling.

The air locks on both sides of the control room also have ceiling soffits, and have been wired with mike inputs and direct boxes in case someone wants to do some sort of overdub in the air locks.

The Electronics

There are 170 microphone inputs from the three rooms (including the disk mastering room) to the control room. These are patchable to 74 inputs on the Neve 8108 board (56-in, 48 out, Necam automated). There are an additional 18 inputs as part of an overbridge which has three 6 x 1 mixers, for a total of 74 inputs.

The room is equipped with a quad Sierra/Hidley SM III monitoring system, with TAD drivers. White crossovers and Crown DC-300s are used throughout with the front speakers tri-amped, and the back ones bi-amped. The string room has JBL 4311s built in.

All microphone plates have Jensen transformer directs with ground and phase switches built in. These DIs are patchable at the plate to whatever input is desired. Also, mounted on these plates are the cue mixer connectors which feed 60 custom made sub-mixer boxes, each with a self-contained 8-into-2 mixer and power amp.

The recorders are Studer A-800 24-track with SMPTE locks. The 2-tracks are Studer A-80-RCs with the butterfly head stacks for quick changing to mono operation.

The studio is also equipped with a custom conductor's podium that comes complete with video monitors, talkback, and slate clock that is synchronized to one on the producer's console in the control room. The music editor can operate the clock and the conductor can read the clock for cues. Between the control speaker and above the window are several video monitors which can only be seen when on. The air conditioning was designed and built for highest performance, and was implemented as specified. There are three separate designated systems that provide high volume, low velocity air to the string room, control room, and the studio. The units are virtually silent.

The lighting system is equally extensive, providing colors and accent lighting to fit any mood, and all dimmers are remoted to the console.

The fantasy of perfection is no longer a fantasy at Fantasy. □□□

Eight good reasons to be a Beyer Buyer.

one The first reason is Beyer. We have fifty years experience making the world's finest microphones and headphones. And an unmatched reputation for quality, reliability and innovation. The choice of professionals everywhere.

two M 160. One of the world's best-loved and most versatile microphones. Warm, soft sound favored by vocalists and musicians alike. Dual ribbon design for high strength and fast transient response.

three Beyer headphones. A full range of high quality professional models for critical monitoring and reliable communication. DT 109 combines stereo headphones and boom-mounted microphone, ideal for on-air use and disco deejays. DT 444S wireless headphone receives sound from an infra-red LED transmitter up to

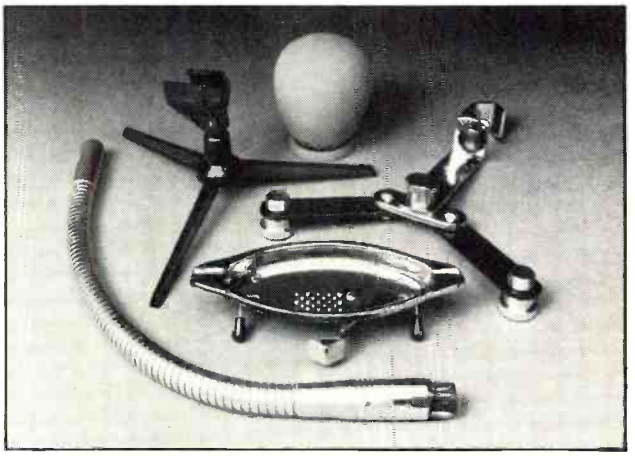
300 feet away. Full 20-20,000Hz frequency response. Six hour stereo operation on rechargeable NiCad batteries.

four The new M 400. A great performer's mic. Supercardioid pick-up pattern to minimize feedback. Rugged design for long life. Tapered frequency response with rising high end and rolled off lows, plus midrange presence boost. Built-in humbucking coil and pop filter. Dynamic design is unaffected by heat and humidity.

We're looking for a few more great dealers to handle the Beyer line. Contact Norm Wieland at Burns Audiotronics.

five Beyer microphone stands and booms. A full range of mic mounts for floor and desk use, with fixed and folding bases. Available with collapsible tubes for easy packing. Also heavy-duty stands for speaker cabinets.

six Beyer microphone accessories. Wind screens, impedance matching transformers, in-line switches, power supplies, wireless transmitters, stereo arms, goosenecks, clamps, thread adapters, anti-shock suspensions, and even a mic stand ashtray! The whole works. If you can use it with a mic, we make it.



seven M 713. One of our unsurpassed studio condenser mics. Modular system; accepts different transducer capsules and power supplies. Gold-vapored mylar diaphragm for high transient response. Mu-metal shield. Temperature and humidity stable.

eight See your dealer or write for information on our product line. You'll have many more reasons to be a Beyer buyer.

Beyer Dynamic

BURNS AUDIOTRONICS, INC.
5-05 Burns Avenue, Hicksville, NY 11801 • (516) 935-8000
In Canada, H. Roy Gray, Ltd.

for additional information circle no. 66

PERFORMANCE LIMITS IN CONTEMPORARY CONSOLE DESIGN

by John Roberts

If we take a look at how consoles have evolved over the years, we will observe two trends, not only has the console grown in input/output capacity in response to popular tape machines, but control flexibility has increased even faster.

A single input strip today has more electronic circuitry than an entire console of 15 years ago and the trend is not slowing. Microprocessors have started popping up in consoles, combined with automation to give console memory and simple computational powers. I will not attempt to predict where all this will lead, but if a console ever acquires taste we're all in trouble!

This unchecked demand for more capacity and complexity, has forced the circuit designer to become more reliant on miniature integrated circuits to meet reasonable package size and power requirements. To better understand the realizable signal quality capability of a modern console we must look at the basic IC op-amp.

Operational Amplifiers

In the last ten years the operational amplifier has progressed from a laboratory curiosity to a low cost building block, capable of outstanding performance and incredible circuit densities. Generous application of negative feedback effects, ruler flat frequency response, and barely measurable distortions.

How They Work

To better understand integrated circuit op-amp performance in different configurations, let's first look at their open-loop gain characteristics. Think of the op-amp as a black box with a floating differential input and single-ended output.

Since a typical high performance IC op-amp can have open-loop gains exceeding 100 dB (100,000:1), the output will swing rail-to-rail for differential inputs as small as .0003 volts peak-to-peak. It's immediately obvious that they were not designed to be used this way as the same op-amps have typical input offset voltages ten times that!

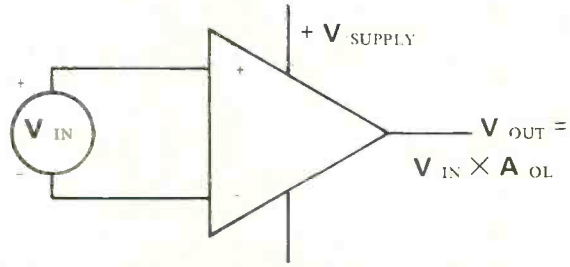


Figure 1: **Floating Differential Input/Single Ended Output**

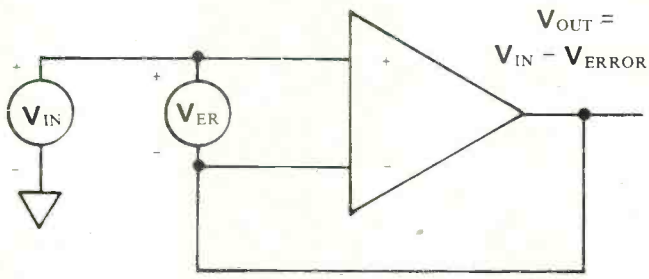


Figure 2: **Op-Amp Using Negative Feedback**

— the author —

***JOHN ROBERTS** is president and owner of Phoenix Systems, a graduate of Northeastern University, and was associated with the MIT Instrumentation Labs and with the Cambridge Research and Development Group. He has written several articles related to Phoenix Systems' kits, and has designed Home Delay Units for Bozak, and the Loft 440 Delay Line and Series 400/800 consoles.*

Enter Negative Feedback

Connecting the op-amps output directly back to its minus input dramatically changes this circuit's character. (You may recognize the standard unity gain follower.) One-hundred-per-cent negative feedback causes the output to very closely follow the input. If we now drive the output rail-to-rail we notice something rather curious. The same .0003 volts peak-to-peak shows up at the input as a differential error voltage. In this unity gain mode the error voltage subtracts directly from the input voltage causing a very small gain error (.001%). While it may seem unreasonable to worry about by an error voltage 100 dB below the output, let's see what happens in other gain configurations.

Figure 3 shows an op-amp configured as a non-inverting gain stage. As before, we can assume the negative feedback will force the minus input to follow the plus input. Knowing that these inputs offer high impedances to the feedback network, we can use Ohms Law to calculate the current flowing through R_G:

$$(V_{IN} - V_{ER})/R_G = I_{RG}$$

Since this current must be supplied by the output through R_F we can again use Ohms Law to calculate the voltage drop across R_F and thus the output voltage:

Since

$$I_{RG} = I_{RF}$$

$$V_{RF} = R_F (I_{RG})$$

$$V_O = V_{IN} - V_{ER} + V_{RF}$$

$$V_O = (V_I - V_{ER})(1 + R_F/R_G) \qquad \text{[EQ.1]}$$

From inspection of this equation we can make two useful observations; 1) the gain of a non-inverting amp can be predicted by: $G = 1 + (R_F/R_G)$ [EQ.1A], 2) the error voltage is referenced to the input and amplified along with the signal.

Now let's look at another popular configuration (inverting amp/summer).

In this case the input signal is connected to the minus input through R_G. Once again the negative feedback will force the minus input to follow the plus input which is connected to ground. The minus input becomes a virtual ground, and we can again use Ohms Law to predict the output voltage. Since the

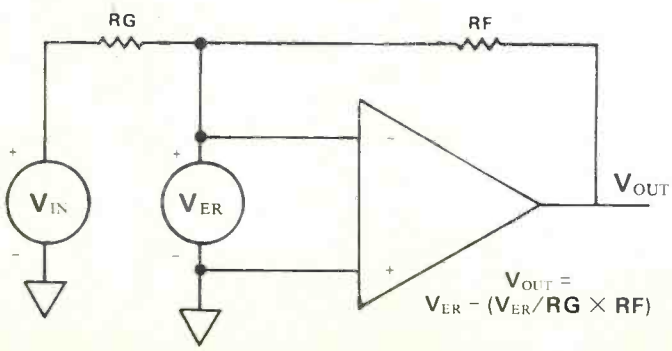
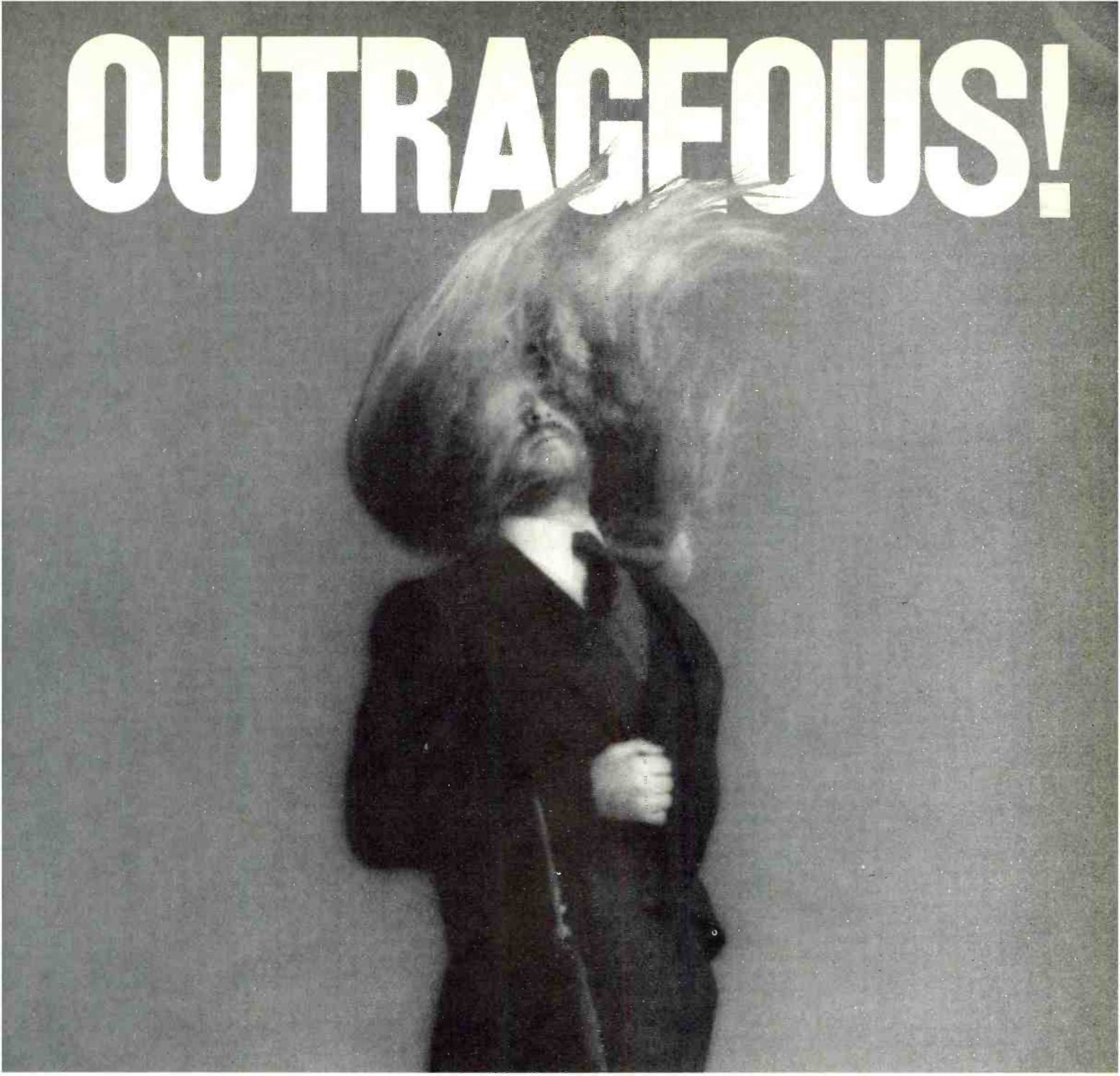
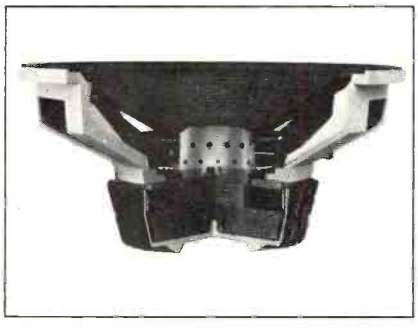


Figure 3: **Non-Inverting Gain Stage**

OUTRAGEOUS!



Gauss speakers. Outrageous performance in a very conservative package. Demanding specs. Rigid quality assurance. Louder and cleaner sound. Speakers that stand up to 400 watts of continuous pink noise power. That's Gauss. A company dedicated to the proposition that

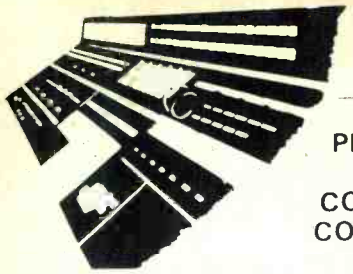


music is a profession, not a hobby. A company free from the distraction of hifi design considerations. Hear us at your local Gauss music retailer. A select group of the best. They just might turn your head around!
Gauss.
Professional. Only professional.

gauss by Cetec.

CETEC GAUSS. 9130 Glenoaks Blvd. Sun Valley, CA 91352 (213) 875-1900 TELEX: 194189
CETEC INTERNATIONAL LTD. 16 Uxbridge Road Ealing, London W5, England 01-579-9145 TELEX: 935847
Divisions of Cetec Corporation

for additional information circle no. 67



— John Roberts —

PERFORMANCE LIMITS IN CONTEMPORARY CONSOLE DESIGN

minus input will be held to within the error voltage of ground we can define the current in R_G as:

$$I_{RG} = (V_{IN} - V_{ER})/R_G$$

and again:

$$I_{RG} = I_{RF}$$

therefore:

$$V_O = V_{ER} - (V_{IN} - V_{ER})\,(R_F/R_G) \qquad \text{[EQ.2]}$$

From this we can derive the general inverting gain equation:

$$V_O = -V_{IN}\,(R_F/R_G) \qquad \text{[EQ.2A]}$$

However, the error voltage in this case is amplified by 1 + (R_F/R_G). You will recognize this as the gain equation for the non-inverting configuration [EQ.1A]. This observation allows us to simplify analysis of input error effects by always considering them in series with the plus input. A very useful characteristic of the virtual ground is it's ability to sum together multiple inputs at different gains with no interaction.

V out now becomes:

$$V_O = [V_{IN1}/_{RG1} + V_{IN2}/_{RG2} + V_{IN3}/_{RG3}]\,[-R_F] \qquad \text{[EQ.3]}$$

To properly analyze the error voltage contribution we assume resistors R_{G1} through R_{G3} are connected to ground. The gain seen by the error voltage is:

$$G_{EQ} = V_{ER}\,(1 + R_F)/(1/R_{G1} + 1/R_{G2} + 1/R_{G3}) \qquad \text{[EQ.4]}$$

The disturbing thing to notice here is that the error voltage is amplified by one plus the sum of all the gains. This error gain can rapidly become significant in the case of a recording console where 40 to 50 signals can be summed together at one time.

The Real World

Until now we have been considering the performance of ideal op-amps. Let's take a look at a real integrated circuit op-amp. At very high frequencies (1 - 10 MHz) inter-stage delays and phase shift add to where the output is lagging the input by 180°. Normally one would not take phase response up with the radio frequencies as being a very significant performance factor, but look at what happens when that phase-shifted output is applied to the minus input. That wonderful negative feedback suddenly becomes positive feedback, exciting tweeter smoking oscillations. To insure stability, the product of open loop gain and feedback factor must be kept less than unity for frequencies where the time phase shift approach 180°. Contrary to what you might guess the worst case for stability is the unity gain follower (Figure 2). In all the other gain configurations the feedback is attenuated by the ratio $R_G/(R_F + R_G)$ [EQ.5]. This feedback factor improves stability, since we do not often encounter feedback factors of −100 dB (a closed loop gain of 100,000:1) we must roll-off the op-amps open loop gain. The most commonly used technique is to integrate a capacitor right onto the chip across an intermediate gain stage.

Since this compensation cap reduces the slew rate as well as the usable open loop gain, some amplifiers do not compensate for unity gain stability allowing the user to optimize the compensation for a given feedback factor and desired margin of stability. A TL074 is unity gain stable while still providing 13 μv/sec. A NE5534 is only stable at gains above 10 dB, adding the 22PF external compensation capacitor required for unity gain stability drops the slew rate drops from 12 v/μsec. to 7 v/μsec.

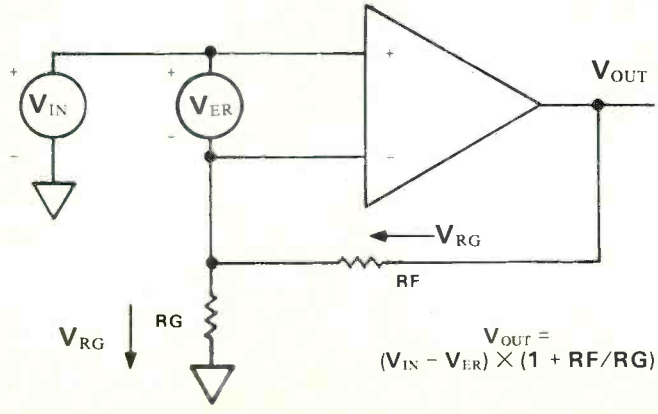


Figure 4: **Inverting Gain Stage**

More Error Voltage

So far we have only looked at the error voltage in terms of open loop gain. To properly assess its significance we must look more closely. The error voltage is a catch-all term composed of all the ways op-amps vary from the ideal. This error voltage contains a noise term, a distortion term, a DC offset term, and a loop-gain error term.

Input Noise

Since the op-amps input noise term interacts with the source and feedback network impedances, it is usually specififed as a voltage term and a current term. The total input noise being the sum of the noise voltage plus the noise current times the

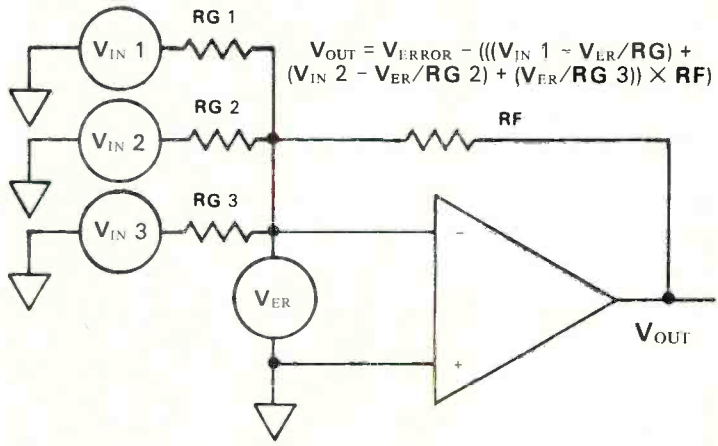


Figure 5: **Inverting Amp Summer**

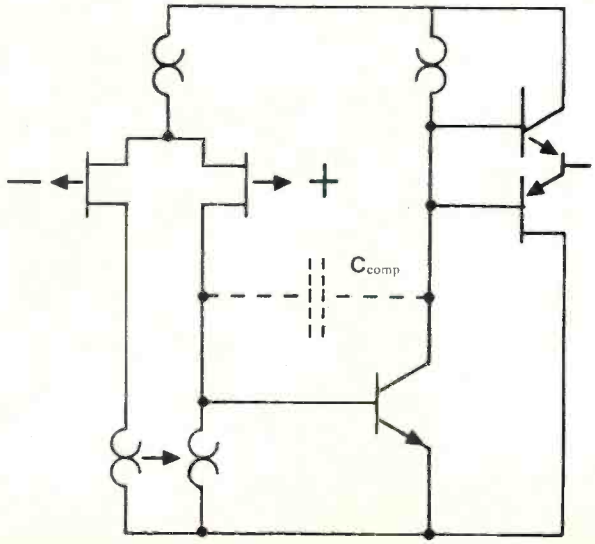
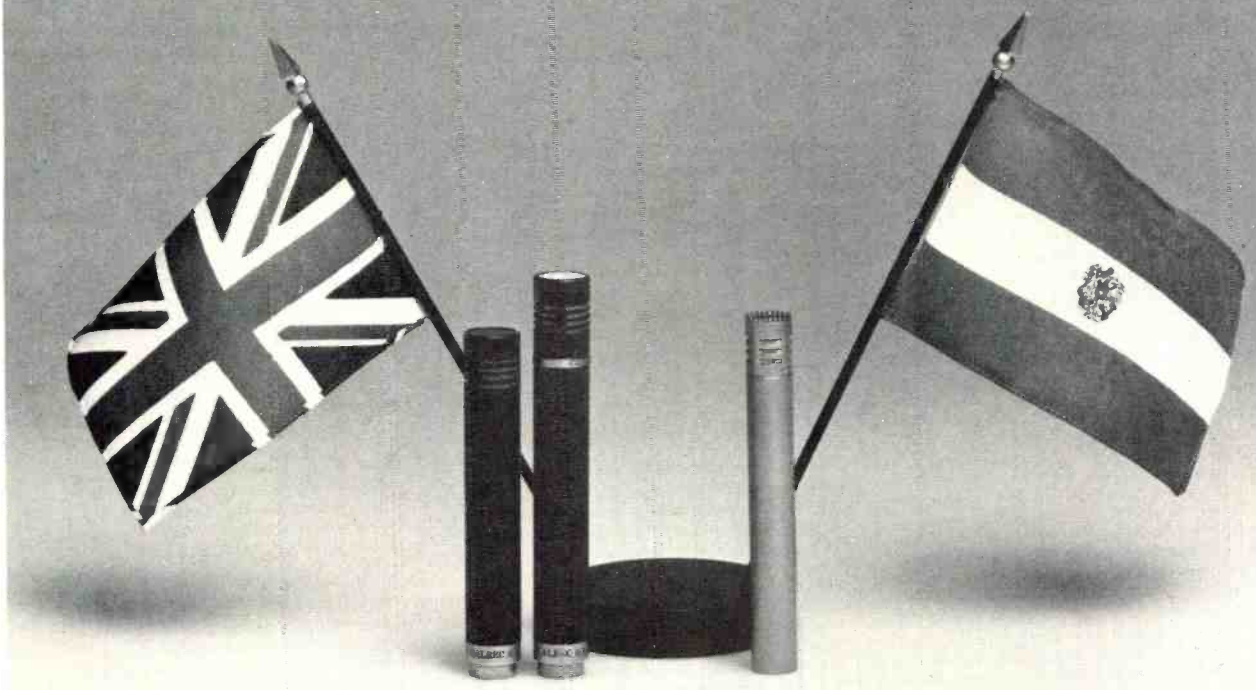


Figure 6: **Typical Op-Amp Internal Schematic**

PUZZLE

WHICH CONDENSER MICROPHONE WILL YOU PREFER ONCE YOU HAVE TRIED THEM BOTH?



THE CONDENSER MICROPHONES FROM ENGLAND HAVE

* A solid reputation
* A satin Black finish
* Unsurpassed performance characteristics
* A not quite so wide assortment of capsules

---

* A two year replacement warranty
* Large pipe like threads immune to cross threading
* Operation without need of 10dB attenuation pads
* Thick housing wall and P.C. board for rugged reliability
* A larger diameter diaphragm condenser element
* Lock tight sealing systems
* Superior cardioid patterns (compare front to back ratios)
* Unibody mics also, for those who don't need to change capsules
* SAVE YOURSELF SOME MONEY

THE CONDENSER MICROPHONE FROM AUSTRIA HAS

* A good solid reputation
* A beautiful jewel like finish
* Excellent performance characteristics
* A wide variety of capsules

SO NOW YOU'RE SAYING, "YEAH, BUT YOUR OPINION IS PREJUDICED." RIGHT. AND YOUR OPINION WILL BE TOO ONCE YOU HAVE TRIED BOTH MICROPHONES.

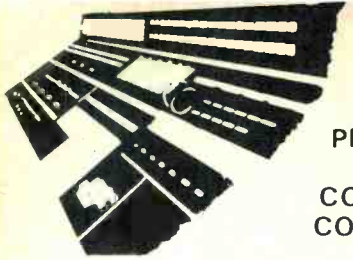
We invite you to clip the free mic stand adaptor coupon, and take it to your nearest Calrec dealer. Ask him to show you the difference, hand him the coupon, and he will give you one free MC6 Clip stand adaptor.

Available at participating dealers April 1, thru June 30, 1980
FREE CLIP STAND ADAPTOR COUPON

Edcor Calrec

16782 Hale Ave. · Irvine, Ca. 92714 · (714) 556-2740

for additional information circle no. 68



John Roberts

PERFORMANCE LIMITS IN CONTEMPORARY CONSOLE DESIGN

source/feedback network impedance, plus the thermal noise (Johnson) of the source/feedback network. This total input noise voltage is referred to the input and amplified along with the signal. As shown by the earlier example (Figure 5), the noise is amplified by the gain seen by the plus input. This gain is often referred to as the noise gain [EQ.1A.4].

DC Offset

Like the noise term, DC offset also interacts with the source/feedback network impedances and is specified in terms of a voltage term and a current term. The offset also contains a bias current term which must be applied to the difference between the impedances present at the plus and minus inputs. This term is referenced to the input and amplified by the noise gain.

AC Error Voltage

The amplitude of the AC error voltage can be calculated directly from the open loop gain plot (Figure 7). Above the compensation pole, the AC error voltage leads the output by 90° and rises 6 dB per octave. Like the other error terms this is also referenced to the input and amplified by the noise gain.

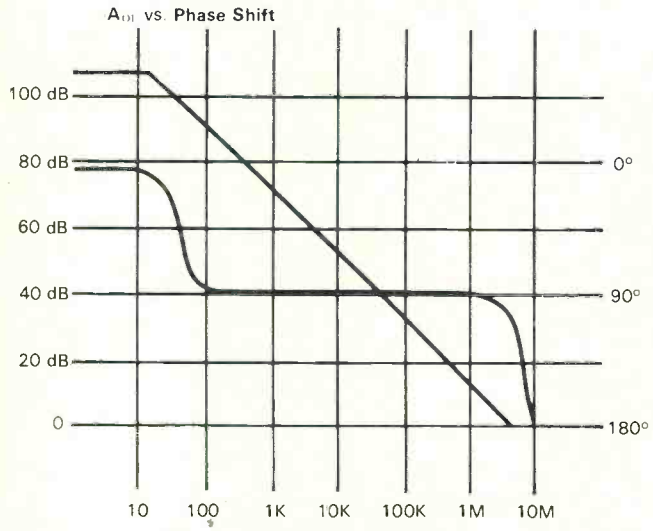


Figure 7: A_{OL} vs. Phase Shift

Distortion

The dominant source of distortion in op-amps is the increasing non-linearity of the input differential stages transconductance with amplitude. Since the amplitude seen by this input stage is the inverse of the open loop gain there is a significantly rising distortion versus frequency term. Again, this error is referenced to the input and amplified by the noise gain.

Typical Values

To get a better feeling for the significance of these errors, let's look at some typical values. These numbers are generalized; the exact values will depend on source/feedback network impedances and device selection.

Bi-FET (J-FET Input TL074)	
Offset Voltage	3 mV
Offset Current	5 ρA
Bias Current	30 ρA
Noise Voltage	18 $\eta V/\sqrt{Hz}$
Noise Current	0.01 $\rho A/\sqrt{Hz}$
Typical Noise	2.5-3 μV (−110 dBv)
A_{OL} @ 100 Hz	105 dB
A_{OL} @ 10 kHz	55 dB

High Performance Bi-Polar (NE5534)	
Offset Voltage	0.5 mV
Offset Current	20 ηA
Bias Current	500 ηA
Noise Voltage	4.5 $\eta V/\sqrt{Hz}$
Noise Current	0.5 $\rho A/\sqrt{Hz}$
Typical Noise	0.5-1 μV (−120 dBv)
A_{OL} @ 100 Hz	100 dB
A_{OL} @ 10 kHz	70 dB

Distortion

It is very difficult, if not impossible, to come up with some typical specs for distortion. It is further confused by typical measurement techniques. As you will recall from our discussion of the gain error term, it is the output voltage times the inverse of the open loop gain. Since the compensation cap forms an integrator above the pole frequency the error voltage is the inverse, or time derivative, of the output divided by the input stage transconductance. (For those of you whose calculus is as rusty as mine, the time derivative is simply the slope or dV/dt of a waveform. We can assume the input stage to be linear for small signals (frequency << slew limiting).

The problem occurs when we attempt to measure distortion with a sine wave. The slope or derivative of a sine wave is a cosine wave. Since a cosine wave also happens to be a sine wave phase shifted 90°, these two sine waves combine to form a new sine wave slightly reduced in amplitude and phase shifted from the original. Your megadollar distortion analyzer doesn't even see that error voltage. Right now some of you are saying, "If it cancels out, so what!" Well, let's take another example: this time instead of a slippery old sine wave let's look at a triangle wave. This time the slope error voltage is a square wave. Now there's no way you're going to add a square wave to a triangle wave and get anything but a distorted triangle wave! I am encouraged by the amount of interest in other than single tone sinewave testing (sine + sine and sine + square), as demonstration of a dissatisfaction with the status quo. The major difference in the new tests is the presence of more high frequency content forcing the input stage into its non-linear regions.

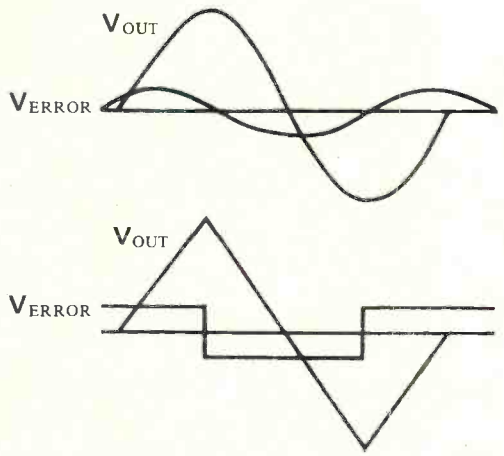


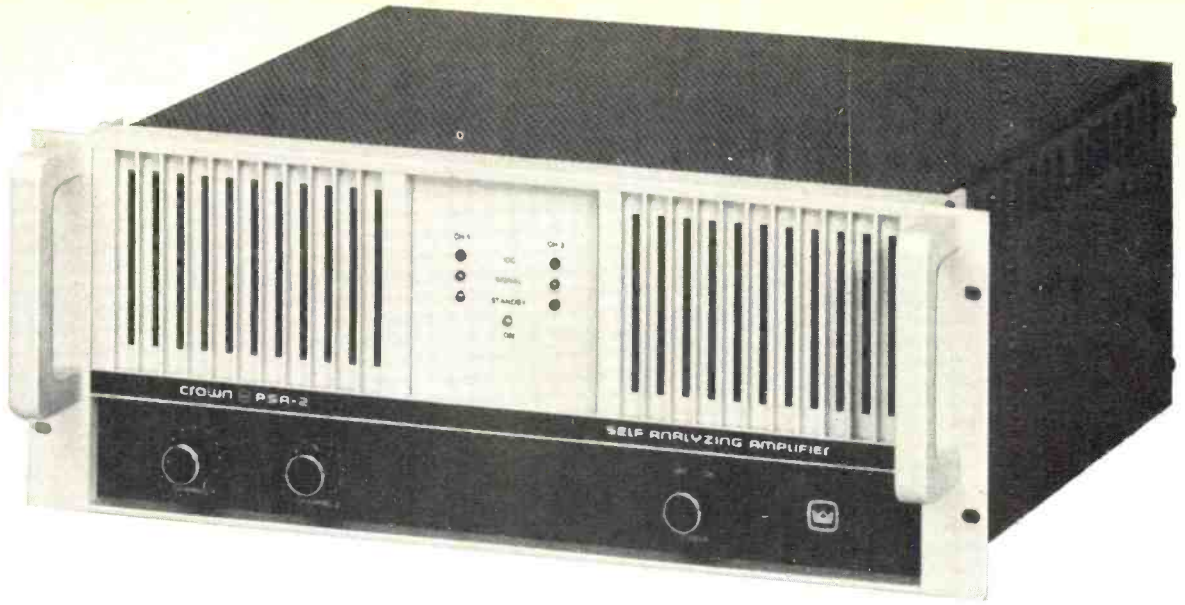
Figure 8: V_{OUT} as it relates to V_{ERROR}

The distortion that does turn up in the traditional measurement is the distortion on the error voltage reduced by its relative amplitude. A popular equation to describe this distortion is:

$$D_{CL} = D_{OL}\ (A_{CL}/A_{OL}) \qquad \text{[EQ.6]}$$

To demonstrate the ability of negative feedback to reduce distortion, imagine either one of the two example op-amps operating at a closed loop gain of 20 dB. Even 100% open loop distortion would not approach 1% at the output until above 20 kHz. Since typical open loop harmonic distortion is clearly orders of magnitude lower, this measurement usually returns statistically small numbers below 20 kHz.

However, all of these errors are referenced to the input and will be increased by the noise gain. Amplify any of these terms



This amp isn't getting a lot of attention...it doesn't need it.

The Crown PSA-2 is the most reliable high-power professional power amplifier you can buy at any price. One reviewer described it as "indestructible," since the PSA-2 accepts seemingly impossible loads, and unlike many other amp designs, will continue to produce useable output power.

PROOF OF PERFORMANCE

Crown engineers devised a simple test to show how the PSA-2 operates. Two flat metal bars are wired into the output circuit of one channel of the amp, with a music signal input. The other input is connected to a 1½ volt battery, requiring the PSA-2 to deal also with a DC signal. A heavy round steel bar is laid across the speaker leads. The amp *continues* to produce useable power, and the metal bar becomes a transducer, producing small sounds from the output signal!

ON-BOARD COMPUTING

The PSA-2 uses its built-in computer logic and unique sensing systems to determine the limits of the safe operating area of the output transistors. The PSA-2 does not just thermal out or shut down as other designs tend to do under strange loads. It computes the level of output power at which it can continue to operate, and then orders itself to do that.

Under normal load conditions, this on-board computing makes it possible for the PSA-2 to use its output transistors more efficiently than any other protection system. There are no arbitrary cut-off points, but a continuous computing of the conditions of the output devices, and an adjustment of output to the maximum comfortable level for the amp.

NEW CONVENIENCE

Versions of the PSA-2 are now available with a choice of front and rear panel configurations. Users can select a model with on/off LED indicators for overload, signal and standby; or they can select the version equipped with the Crown "Dynamic Range Indicator," an LED array that displays peak/hold and instantaneous output for both channels. For the rear panel, a balanced input module (including variable gain and switchable hi/low Butterworth filters) is available, or unbalanced input only.

FIELD TESTED

The Crown PSA-2 amp has already proven its ability to require very little attention after it's been set up in the field. The PSA-2 has provided trouble-free power for several major touring setups, and it is now installed in a number of top-flight recording studios and auditoriums.*

TOP QUALITY SOUND

A bonus for users of the PSA-2 is its excellent sound quality. The amp proves that sonic quality, ruggedness and reliability *can* be combined in one amp.

If you haven't already considered the PSA-2 for the systems you are currently designing, write to Crown today. We'll send you a fully descriptive brochure and reprints of several reviews. They're worth your full attention.

*Names on request.

crown

See the PSA-2 in action at Booth 76, AES Convention, Los Angeles, May 6-9, 1980.

1718 W. Mishawaka Road, Elkhart, Indiana 46514

Innovation. High technology. American. That's Crown.

for additional information circle no. 69

— John Roberts

PERFORMANCE LIMITS IN CONTEMPORARY CONSOLE DESIGN

by the 60 dB typical of a mike pre-amp and they will get significant. A large console's summing amp with 50 inputs is operating at a noise gain of 34 dB. In conclusion these op-amps are very good but not perfect. When used at low noise gains (20 dB) they should provide excellent performance.

Slew Rate

You cannot easily predict amplifier slew rate requirements from manufacturers spec sheets and the accepted sine wave frequency response of a human ear. Both op-amps chosen for this discussion are capable of slew rates on the order of 12 - 13 V/μsec., or almost ten times the slew rate so predicted. This slew rate is not as excessive as first appears. Manufacturers often spec maximum slew rates with the input stage saturated or over-driven. Above input saturation the output is no longer able to follow the input and the negative feedback is not working its magic. Even more importantly, the input stage has a rapidly increasing non-linearity as you approach this saturation point. For reasonable control of distortion it is desirable to afford as much margin as is practical. Eating away at this margin from the other direction is the fact that in live music situations you will encounter slew rates corresponding to sine wave frequencies well in excess of the 17 - 20 kHz considered audible. Without debating the audibility of these higher frequencies they are capable of overloading slower input stages and causing intermodulations. When in doubt choose the higher slew rate amplifier as it usually predcits a larger region of linear operation.

Now To The Console

These advances in technology have for the most part made console design a little easier. The op-amps' near ideal performance in low gain applications, simplifies most of the routine processing and routing. Needless to say, the rest of the industry has not been standing idle. Advances in media (metal tape) and recording technology (analog — Stephens/digital — 3M, Sony/noise reduction — Dolby, dbx, etc.) promise dynamic ranges on the order of 90 dB. For the console to remain transparent to such program we must better that 90 dB by some margin. Further incentive to maintain these dynamics is provided by recent developments in consumer playback equipment. While the question of how much dynamic range is usable or even desirable deserves consideration, it is better decided by the producer on an artistic basis whenever possible.

As you will recall from our earlier dicussion of feedback networks, op-amps' noise and distortion can be referenced to their inputs for analysis. The high signal gains required by microphone pre-amps rule out single op-amp approaches. The other problem area in console design is the master summing busses. Although each signal may be mixed in with a gain of unity, the input referred noise and distortion adds to each one being effectively multiplied by the number of inputs. Since it is not uncommon for a console to mix as many as 50 inputs, the single op-amp approach is again inadequate.

Microphone Preamplifiers

Until recently the state-of-the-art in microphone pre-amps consisted of a transformer gain stage followed by a traditional op-amp or discrete gain stage. The transformers almost noiseless gain and impedance matching ability was able to scale the microphone's 100 - 200 ohm source impedance and -60 dBv signal up to levels that could be handled by subsequent stages. Properly executed a transformer pre-amp design is capable of a 3 dB noise figure.

Being within 3 dB of a 200 ohm resistors' Johnson (thermal) noise is respectable but the Trans-Amp™ improves upon even that. The Trans-Amp combines a discrete transistor gain stage coupled to a unity gain stable op-amp. Negative feedback is brought from the output of the op-amp to the emitter of the transistor gain stage.

The closed loop gain of the circuit in Figure 10 is $1 + (R_F/R_G)$. The open loop gain becomes:

$$G_{OL} = A_{OL} + R_{OL}\,(1/R_G + 1/R_F)$$

If we vary R_G to change our closed loop gain, the open loop gain changes also since R_G is common to both equations. This topology is capable of very large ±160 dB open loop gains since the feedback factor equal R_{OL}/R_F the amplifier is stable at all gain settings. The input noise is dominated by the transistor stage which is optimized for the low source impedance. The Trans-Amp will deliver distortion performance approaching the unity gain configured op-amp and noise performance within 1 dB of the source impedance.

The Summing Amp

It is not as easy to define what was the state-of-the-art in summing amp design. So as not to offend anybody I'll describe several popular approaches.

The first approach involves designing a dedicated op-amp. A discrete op-amp can be designed with lower input noise and better high frequency phase characteristics than an integrated circuit. Optimizing the compensation capacitor for the improved phase margin and known feedback factor can result in substantial increases in usable open loop gain. Therefore, lower error voltage and distortion.

To simplify analysis of the noise and distortion performance of a summing op-amp let's consider all the input resistors terminated to ground and the noise/distortion in series with the plus input.

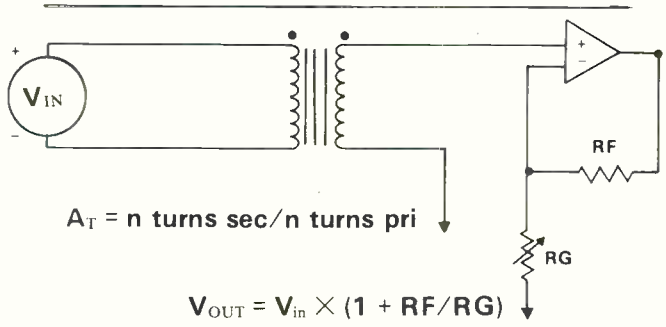


Figure 9: **Op-Amp With Tranformer Input**

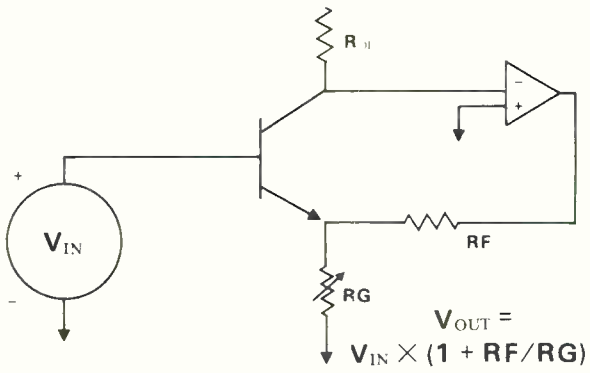


Figure 10: **Trans-Amp Example**

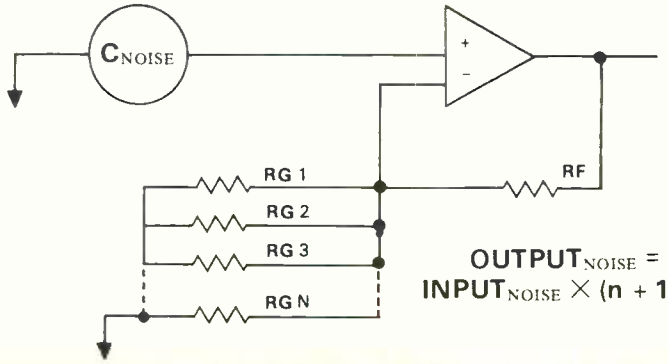


Figure 11: **Dedicated Op-Amp Summing Design**

. . . continued overlea

Now, for the first time, you can play any cards.

And win.

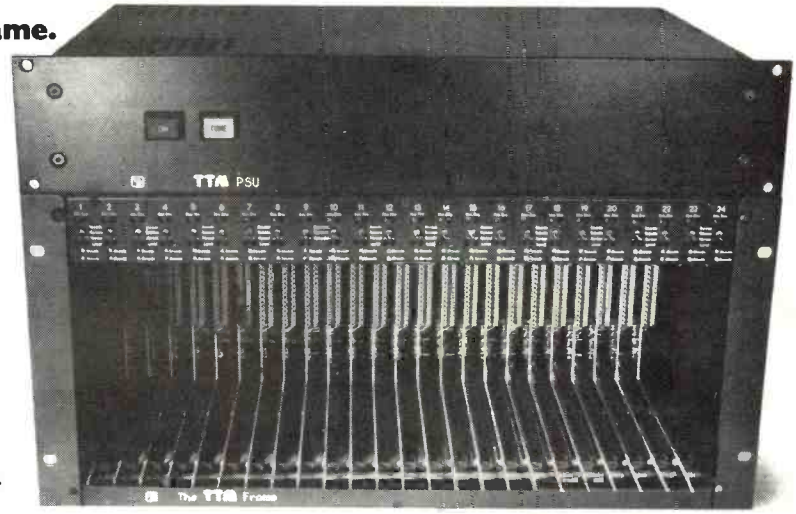
Introducing the TTM 24-track Frame.

The world's only multi-track frame that can accept all the noise reduction cards on the market today.

And using only 12¼ inches (310 mm) of rack space–including the silent-fan equipped power supply.

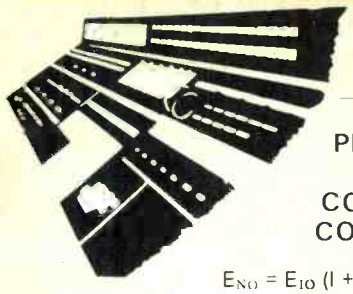
- Transformer-less balanced input/output electronics.
- Simple to install and interface.
- Gold contact fail-safe relay switching.
- By-pass mode eliminates all electronics.
- LED alignment replaces meters.
- Delivery from stock in Europe and the U.S.

The TTM 24-track Frame. It doesn't just help you to reduce noise. It reduces your problems.



For additional information, contact:

GOTHAM
AUDIO CORPORATION
741 Washington Street, New York, NY 10014 • (212)741-7411
West Coast Office: (213)874-4444



— John Roberts —

PERFORMANCE LIMITS IN CONTEMPORARY CONSOLE DESIGN

$$E_{NO} = E_{IO} (I + R_F/(1/R1 + 1/R2 + 1/RN))$$

$$E_{NO} = E_{IO} (N + 1)$$

$$D_{CL} = D_{OL} (A_{CL}/A_{OL})$$

If we take the example of a 48 input mix buss, the noise and distortion is being amplified by 49 times (34 dB).

A second popular approach is to break up the buss into 2 or 4 sub-busses, and then re-combining those outputs. This approach takes advantage of the non-coherent addition of each sub-busses' noise and distortion.

Output noise =

$$E_{on} = \sqrt{[4\ (13en)^2 + 5\ (en)^2]}$$

$$E_{on} = \sqrt{[676(en)^2 + 25(en)^2]}$$

$$E_{on} = \sqrt{701(en)^2}$$

$$E_{on} = 26.5(en)$$

The law of diminishing returns takes over rapidly as the four sub-buss approach only buys you a (5.3 dB) improvement over the single op-amp approach. Approaches one and two can be combined for an added noise improvement. The distortion improvement would probably wash since you have to increase the compensation caps to make up for the lower sub-buss feedback factors.

Once again the Trans-Amp topology has merit. Grounding the input and connecting the buss directly to the emitter of the input

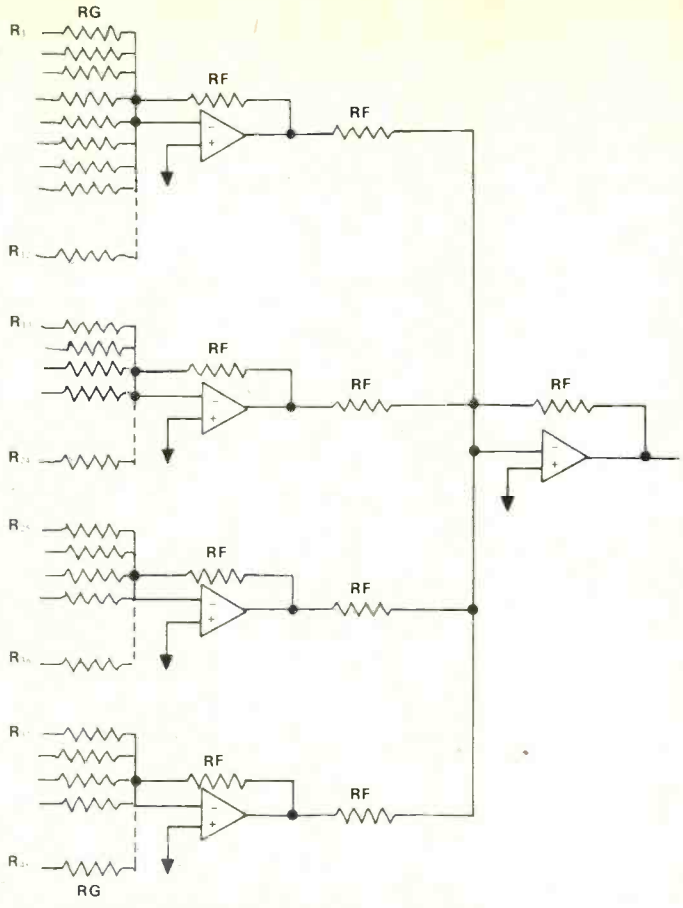


Figure 12: **Multiple Buss Summing Design**

gain stage reaps the same open loop to closed loop gain tracking with the possible qualification that the Trans-Amp will not excell when a small number of inputs are being summed. The Trans-Amp will outperform the previous examples for large buss structures.

The best solution to the summing buss problem sounds almost too simple to be true.

If we replace the summing resistors with current sources, the N term completely drops out of the noise/distortion equations. (Assuming the practical current sources have relatively high output impedances.)

Output noise =

$$E_{ON}\ (1 + RF/\infty) = (1 + 0)$$

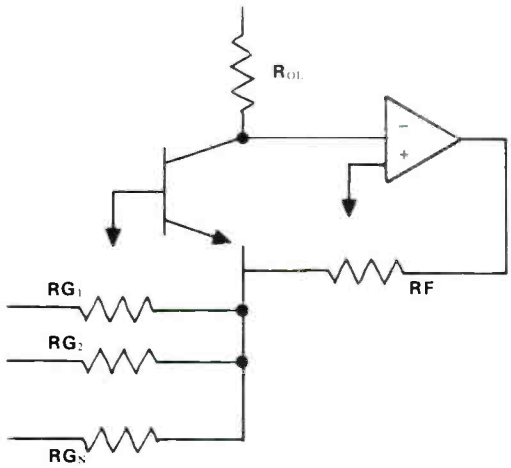
$$E_{ON} = E_{IN}\ (1)$$

The complete absence of an N term in the noise gain equation does feed the imagination. Hundreds of signals can be summed together with no measurable degradation in quality.

As if the advantages of a noiseless summing amp aren't enough, there are other practical benefits. In the traditional resistive summing amp, minute differences in ground potential (like hum and buzz) are amplified by the full noise gain of the summing amp. You quickly find out how clean your signal ground is when you throw 34 dB of gain on it! Another benefit occurs when the current sources are switched electronically. Non-linearitys in device on-resistance have no effect on the signal current being passed.

Since we are already dealing with currents the buss can be connected directly to the input of a current ratioing VCA (such as an Allison EGC-101) for improved buss headroom and control flexibility.

Not unlike archeology it is interesting to examine what lies below this freshly removed layer of noise/distortion. The next level or noise floor merits discussion as it describes the limit of what a console can deliver. Let's consider the summing amp to be noiseless. Suppose we choose to sum together 48 channels



Figuer 13: **Trans-Amp Summing Design**

of program. We can assume their noise to be incoherent and add as the sum of the squares. Therefore:

Output noise =

$$E_{ON} = \sqrt{48(en)^2}$$

$$E_{ON} = 6.9(en)$$

$$E_{ON}\ (dB) = 20\log_{10}/E_{ON}/ + 16.8$$

To see what that means in actual noise terms, suppose those 48 channels were all dbx or digital at fader positions such that the channel noise in each channel is −90 dBv. Adding 48 of these together in a perfect summing amp gives us an output noise floor of −73 dBv. We are still getting better than 90 dB dynamic range, but not by a whole lot.

— continued on page 108 . . .

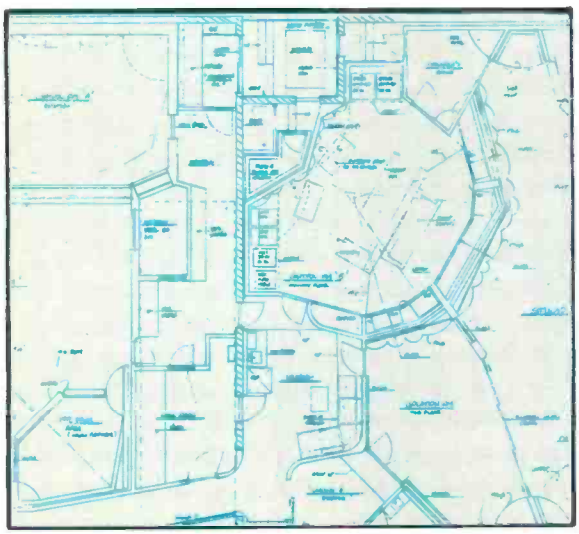
Electric Lady Studio

Westlake show room & facilities in Los Angeles exemplifies Westlake's continued dedication to the state of the art.

Westlake's HR-1 Phase Coherent 4 way monitoring system, as well as "Controlled Travel Path"T.M. acoustic design assures accurate recordings.

Radio & Records uses its Westlake Production room for multi-media and syndicated radio production.

Designing For Innovation, Quality a



Our detailed design leaves little doubt what the results will be. Westlake has "pioneered" guaranteed acoustical designs.

In taking the state-of-the-art to new limits, Westlake has developed many proprietary products. The D-1 Active Direct Box with 106 dB of dynamic range is a product of that research and development.

As we move into the 80's, television sound will take on new dimensions. Westlake recently completed renovation of the KCET (P.B.S.) facilities in Los Angeles.

The professional home studio is no stranger to Westlake. People such as Danny Serephine, George Duke, Michael Lloyd, and Georgio Moroder all chose Westlake to create their professional listening and recording environments at home.

Your Needs...
d Service

Consider our reputation! With more than 100 major installations, Westlake has many satisfied clients. So whether you are looking to purchase recording equipment or a complete turn-key studio, Westlake's professionals are ready to earn your confidence.

from acoustic design
to down beat...

Westlake Audio

6311 Wilshire Boulevard
Los Angeles, California 90048
(213) 655-0303
TELEX 698645

8447 Beverly Boulevard
Los Angeles, California 90048
(213) 654-2155

New York City
(212) 926-3454

John Roberts

PERFORMANCE LIMITS IN CONTEMPORARY CONSOLE DESIGN

Now the chances of your ever encountering that many channels, that quiet, are not very likely. But let's carry this example one step further. Suppose all 48 channels are muted or noise-gated off. (A possible situation with today's automated consoles.) The buss output noise is now dominated by the residual noise of the current sources. Since the practical implimentation of a usable voltage-to-current convertor (current source) contributes noise on the order of −105 dBv. Forty-eight of these add to become −88 dBv at the buss output. The VCAs (Allison EGC101) unity gain noise contribution of −88 dBv further degrades the output noise another 3 dB to −85 dBv. If we then make the buss output driver capable of a +27 dBv output (Note: This requires discrete components as most op-amps will not drive 600 ohms to 50 volts peak-to-peak.) the buss output noise floor is +27 dBv − (−85 dB) or −112 dB below clipping! Because of this ideal summation, every time you double the number of inputs the output noise only rises 3 dB. One-hundred channels could be summed together with a dynamic range of 109 dB. Two-hundred inputs with 106 dB, etc.! I feel comfortable calling this buss structure noiseless, or at least transparent to 90 dB dynamic range programs.

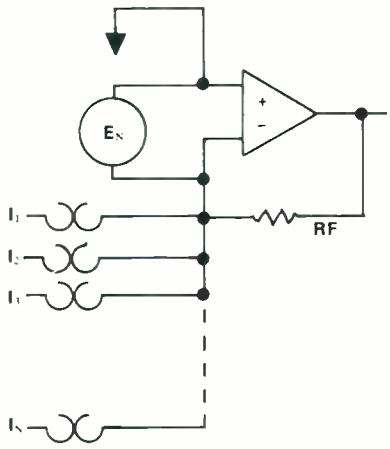


Figure 14: **Current Source Summing Design**

If we define the best dynamic range any one channel of program can deliver as: Analog with metal tape (Stephens), 80 - 90 dB. Digital (Sony), 90 - 93 dB.

Any one channel mixed in at unity gain will dominate, and this doesn't even consider the fact that you first have to get 80 - 90 dB out of your room. Easier said than done.

As good as this new hardware is, all it takes is one sloppy track to sabotage this effort. The engineer/producer will ultimately determine the dynamic range of the finished product.

Without getting too far away from this discussion of hardware, I would like to offer a few suggestions:

- 1. Use only as many tracks as you need. Just because you're paying for all 45 don't feel compelled to use them, or if you must, you can leave them turned off during mixdown.
- 2. If you can afford the extra tracks, double up your lead vocals or other noise critical tracks. (Putting the same signal on 2 tracks improves signal-to-noise 3 dB. On 4 tracks, 6 dB.)
- 3. If you are confident that you won't want to change the equalization later, apply all mid-range boost when laying down the track. Cut during mixdown. (Note: When in doubt don't do it. Even the best symmetrical equalizer can not always be corrected.)
- 4. If you have automation, noise gates, or even lots of hands, keep all secondary tracks down when not contributing to the mix.
- 5. Use compression sparingly and only on the track(s) that need it.
- 6. Effects mix levels should be set at the return and not the send. This way the effect is always operating at its best signal-to-noise ratio.
- 7. If you're making a disco version of the "1812 Overture," disregard 1 through 6.

While these suggestions will help you maintain dynamic range, they are not inviolate and should only be followed when they don't interfere with artistic considerations.

Meters

The general availability of high resolution bar-graph displays have improved the readability of the typical console's meters. It's a lot easier to scan across a line than focus on 32 jumping needles. Well, that's obvious. However, there still seems to be a certain amount of schizophrenia in the industry between PPM (peak program) and VU (average responding). In brilliant attempts to please most of the people most of the time, console meter packages vary from switched, to side-by-side, to switched side-by-side. Well, guys, there is a better way. Drawing upon the definition of what peak and VU actually represent you can make some very useful assumptions. Not only will peak rarely fall below VU, but you can rely on it to provide a useable margin (3 dB in a sine wave). Displaying the VU as a connected bar and the

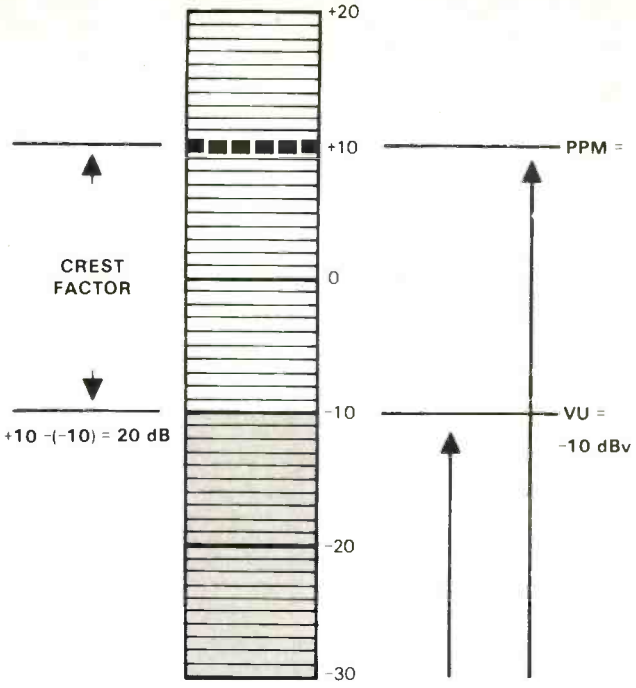


Figure 15: **Illustration of a meter which simulaneously reads peak and average.**

peak value as a dot floating above the bar, you can successfully display both characteristics on one meter.

The simultaneous display of peak and VU against a dB scale allows you a direct readout of crest factor (ratio of peak to VU), useful when compressing a track or even when deciding what tracks could use compression.

Caveat

By the way, almost everything discussed in this article that is of any value is either patented, patent applied for, or proprietary. Loft Modular Devices (Roberts), U.S. Patent No. 4,166,245. Allison Research, Inc. (Buff), U.S. Patents Nos. 3,237,028, 3,293,450, and 3,714,462. Unauthorized use prohibited by law. □ □ □

Glossary

Ohms Law: Ohms Law defines the relationship between voltage, current, and resistance. If you know any two you can calculate the third.

I = Current in amperes
V = Voltage in volts
R = Resistance in ohms
I = E/R, or E = R/I, or R = E/I

A OL = Open Loop Gain. How much the output changes for given input change.

A CL = Closed Loop Gain. Voltage that would appear at ouput as predicted by feedback if inserted directly at plus input.

"Johnson" Noise Voltage: Noise caused by thermal agitation of electrons in resistors. The amount of noise voltage is directly related to the resistance. Therefore, a 100 K resistor has much more noise than a 100 ohm resistor. The significance of this voltage depends on the circuit. A 100 ohm resistor can be noisy when at the input of a mike pre-amp, while a 100 K resistor may be insigificant in a unity gain op-amp.

Transconductance: Is the relationship of an output current to an input voltage. In the case of an op-amp input stage it refers to the current delivered to the next stage for a given differential input voltage.

References

Operational Amplifiers, Design and Application, Graeme/Tobey/Huelsman (McGraw/Hill).

Integrated Circuit Operational Amplifiers, Meyer, (IEEE Press).

An Overview Sid and Tim, Jung/Stephens/Todd, (Audio Magazine, June 1979).

. . . author Webb (far right) with Robert Redford on the set of ALL THE PRESIDENTS MEN

USING THE MULTI-TRACK FORMAT FOR PRODUCTION FILM RECORDING

by **Jim Webb** with assistance from Don Ketteler

For the production sound mixer, the world is his studio and his equipment is often literally on his back. It can be a thankless 'front line' job that plays a constant second fiddle to the camera and visual medium of the film. It can mean working with a director that takes the general attitude that what you do is of passing interest because all of it can be fixed in post-production. This view is shared by many in the film industry. How does one reconcile these facts with a production mixer's feeling that if he does the location sound correctly, he can contribute just as much to the mood of the film as the camerman. Reconciliation comes with understanding and appreciating what's involved in single, and particularly, multitrack production film sound.

There are many reasons to use the multitrack format, but most filter down to its ability to gather and isolate the information that would ordinarily have to be sacrificed or compromised if only a single track were being recorded. On face value it seems the multitrack format would be ideal. Unfortunately, as the complexity of the system increases the number of complications that can potentially occur also multiply. Before examining multitrack advantages and disadvantages, let's take a look at the procedures, techniques, and equipment involved.

Regardless of the tape format being used, i.e., single or multitrack, and before the first foot of film is shot, pre-production planning sessions should be arranged with the director to discuss the basic approach. The sound may not be as significant a pre-production concern as the setting or filming conditions, but it cannot be ignored. The sound mixer should be involved in scouting trips where any question concerning the sound field exists, so that problems can be solved before they happen. Locations with problematical sound conditions should be exchanged for spots that are as well suited for the picture, but which have better sound environments.

Keep in mind that in film production an entire day may be spent on two or three minutes of finished print. To maintain even that depressed a pace, all contingencies must be allowed for. This includes not only the scouting trip during pre-production, but also developing relationships with electricians and grips, and foreseeing typical sound pitfalls during the course of the production, such as traffic, air conditioning, or generator noises.

It behooves the sound mixer to keep in touch with the director during planning as well as sticking close to him in production. Ideas tend to change so fast in film that the scouting concept will suddenly bear no relationship to what's actually being shot. On "Three Women," Robert Altman worked from only an outline. Each morning he would sit down and type up the script for that day's shooting.

. . . continued overleaf -

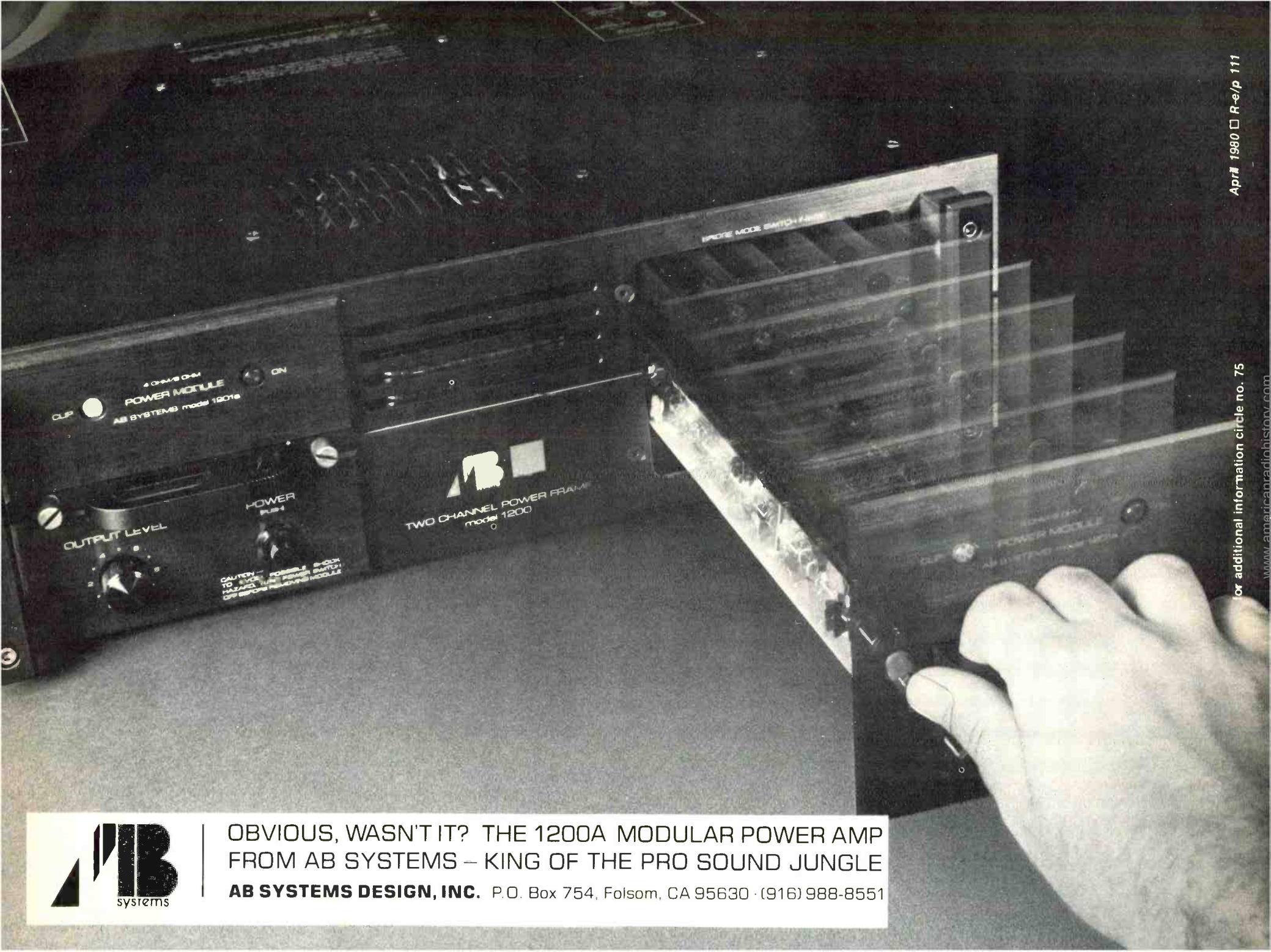
the authors

USC film school and a particular and self-motivated interest in production film sound led **Jim Webb** *to news and documentary work in the 1960s. His interest and these roots in live and realistic production forecast his multitrack work and led him next into a series of specials on musicians for PBS. Peggy Lee and Mason Williams' shows were followed by a Credence Clearwater special that so impressed A&M Records that they committed to film the upcoming Joe Cocker tour using Jim as supervising sound mixer. That grew into a documentary feature and was followed by his last music special, "Elvis On Tour."*

With a growing interest in feature films, Jim began what was to be a series of films with Robert Altman and the multitrack production film sound format. From these productions, he went on to do "All The President's Men," whose producers felt Jim particularly well suited to capture and convey the newsroom chaos.

"Nashville" won for Jim a British Academy Award, and "All The President's Men" an American Oscar.

Don Ketteler *has an electronics degree from Columbus Technical Institute. He has worked as an artists/management special projects liaison as well as a sound engineer for many acts including Kiss, Meatloaf, and Ashford & Simpson. He has authored many articles on various aspects of recording sound.*



AB systems

OBVIOUS, WASN'T IT? THE 1200A MODULAR POWER AMP FROM AB SYSTEMS – KING OF THE PRO SOUND JUNGLE

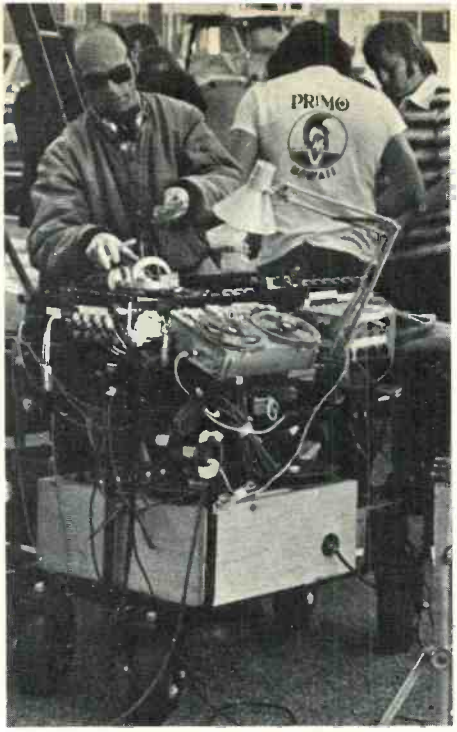
AB SYSTEMS DESIGN, INC. P.O. Box 754, Folsom, CA 95630 · (916) 988-8551

USING THE MULTI-TRACK FORMAT FOR PRODUCTION FILM RECORDING

Needless to say the production mixer has got to be tuned in, or he'll never know what's happening next. Some directors are helpful along these lines and do consult with the mixer both before production and during it. But because it is a visual medium the director may tend to forget about the sound. If this is the case, you have to record what you know he's going to need later. This means getting as many of the effects as possible along with the dialogue. Hopefully, this will save time in post-production and add an element of realism to the movie. Remember, it is better to be safe with too much information than sorry with too little. Within the multitrack format one can certainly accumulate a great deal of information, whether it be effects or dialogue. As you can see by the nature of the business this is a great advantage when communication has broken down, or plans change rapidly and without forewarning.

Equipment

Because filming procedures demand portability, the standard deck for most multitrack location recording has been the Stephens 1" eight track. For film work, the Stephens machine is modified to accommodate sync, and has a portable power supply to allow it to operate in the field. As to sync, the machines have an installed 50/60 Hz quartz crystal, and a special resolving circuit and highly variable oscillator to control the speed. The machine usually runs at 15 ips, which gives about 25 minutes of recording time on a 10" reel of tape. One track is used for sync tone, leaving seven for audio.



equipment view, CALIFORNIA SPLIT set

For these decks, John Stephens built a DC-to-DC converter that changes 12 volts DC from a small car wet cell to the 60 volts of raw DC needed to operate the machine. The converter draws 2 amps in standby, and about 6 amps in record. This gives about a day's use from the battery which is recharged every night.

The obvious advantage of the multitrack is to allow the sound mixer to capture and isolate separate bits of dialogue and sound effects. This advantage cannot be realized if the miking technique does not fully utilize these benefits. Shotgun mikes on fish poles or booms clearly do not achieve acceptable isolation. It should be apparent that some means of gaining more isolation was necessary than the rather general overhead miking techniques employed for most mono sound, since the system now has the capability to essentially close-mike all the major characters. Obviously, artistic consideration prohibits them walking around the set holding a mike or dangling a cord down their pantleg, so the use of small, wireless microphones has become imminently appropriate.

Wireless Mikes

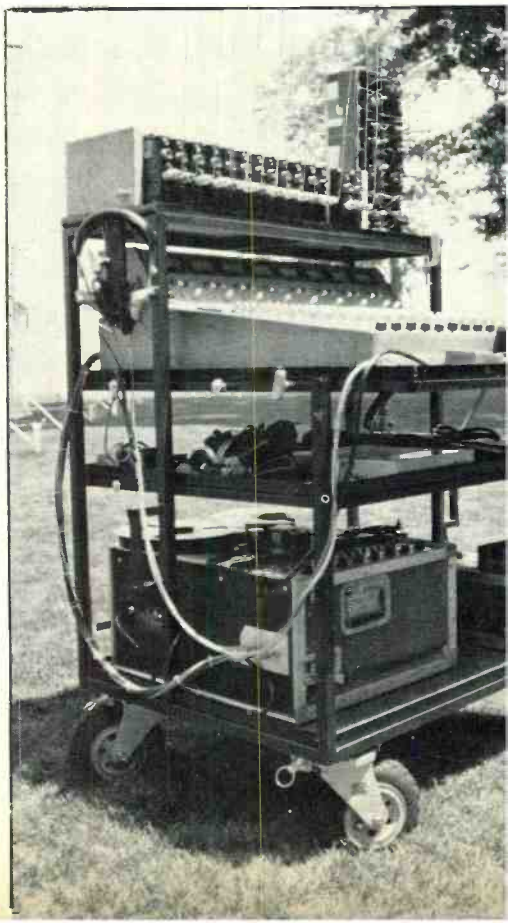
We use an English-made radio link from "Artech" with a Sony ECM-50 electret lavalier as the actual microphone. This combination seems to give us the best person-to-person isolation. Improvised dialogue makes it nearly impossible for a mixer to get an acoustic balance much of the time with all these mikes "open" on the set. Problems such as acoustic phasing (occurring when actors shift positions and/or speak into each other's mikes) or clothing noises are all isolated (more-or-less) on their own respective tracks. These are the things that have to be dealt with during the post-production phase. Although it is indeed a mass of information, these problems are handled in this format far more easily than if they were all married onto one soundtrack. This is not to say that great care is not taken to insure that problems such as clothing noise are kept to a minimum when placing the mikes on the actors. This technique is very important because the tracks are basically only as good as the mike work. It also means getting involved on certain levels of wardrobe planning. Further, not all miking is radio linked. Hard-line 'plant' mikes are also used when appropriate.

Unfortunately, radio mikes are notoriously unpredictable. In order to get consistent, quality recording using them. one must pull out all the stops. Difficulties other than clothing making rustling noises or muffling the microphones can arise, such as the human body's high body capacitance affecting the RF signal strength since the transmitting antenna is often directly against the body. The 100 milliwatts or so of transmitting power can be quickly dissipated. However, the receiving antenna seems to be the crucial factor in consistency.

I'm using a giant antenna these days which I feel increases the dependability of the wireless systems as opposed to the little 1/4 or 1/2 wave whips or vertical dipoles they are provided with. At first I tried a directional array of Yagis, three elements and a reflector. From there, I went to a circularly polarized Yagi, which has two elements in an 'X' fashion (two planes). This configuration gives better response and helps with cancellation problems. It is roughly three feet long with two foot-long elements.

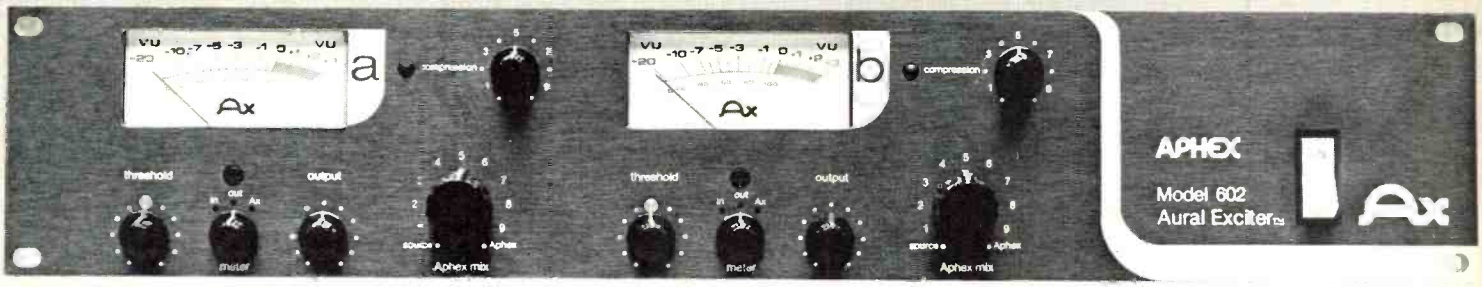
The high gain receiving antenna does seem to be a solution for wireless consistency. With problems such as hiding the transmit antenna or inability to use multi-antenna diversity receivers for film dialogue pick-up because the switching is noticable, you quickly learn you win or lose the battle with the antenna. I get the receiver as close to the actors as possible, (or what the shot will allow), and aim it directly at them.

equipment view



How Do You Get Real Aural Excitement For Under $30 A Minute?

Real Aphex.



The Aphex Aural Exciter™ gives you a sonic realism obtainable by no other means. And now, for the first time, and in response to your repeated requests, the Aphex Aural Exciter is available for purchase as well as rental. If what you're looking for is just a bright high end, get it with EQ—but if you want the kind of true spatiality, detail and presence that producers of over 4000 albums have insisted on, do what they did: get ***real*** aural excitement. Get Aphex.

Hear The Aphex Aural Exciter and the B & B Audio Products at the Los Angeles, A. E. S., Booth #115, Room #680.

Aphex West
7801 Melrose Avenue
Los Angeles, CA 90046
(213) 655-1411 TWX: 910-321-5762

Aphex Licensees
Aphex Audio Systems UK Ltd.
35 Britannia Row
London N18QH England
Telephone: 01-359 5275/0955
Telex: (851) 268279 (BRITRO G)
Aphex Chicago Ltd.
(312) 975-8117
Aphex Audio Systems Australia, Pty. Ltd.
(Sydney) Tel: 212-4920
TLX: (790) AA24035

Aphex Benelux
(Brussels) Tel: (02) 345.44.44
TLX: (846) 26409 (TEMBEL B)
Aphex Brazil
(Rio de Janeiro) Tel: 266-5117
TLX: (391) 1121008 (XPSPCBR)
Aphex Audio Systems Canada, Ltd.
(Toronto) Tel: (416) 363 8138
TLX: 06225500 (OCTOTOR)
Aphex Denmark
(Copenagen)
Tel: (01) 59-1200

Aphex France S.A.R.L.
(Paris) Tel: 251-4995
Aphex Germany, GmbH
(Frankfurt) Tel: (0611) 55.65.66
TLX: (841) 414073 (ROCK D)
Aphex Hawaii, Ltd.
(Honolulu)
Tel: (808) 521-6793
TLX: 7430148 (SOUND)
Aphex Israel
(Tel Aviv) Tel: 232-143

Aphex Italy
(Bologna) Tel: 051-76 66 48
TLX: (843) 511361 (BAUER I)
Aphex Japan, Ltd.
(Tokyo) Tel: (03) 253-9022
TLX: (781) 222-7097 (APXIEH)
Aphex Midlantic
(Washington D.C.)
Tel: (202) 363-1228
Aphex New York, Ltd.
(West Orange, New Jersey)
(201) 736-3422 (212) 964-7444
TWX: 710.994.5806
(APHEX LTD WOGE)

Aphex Norway
(Oslo) Tel: 14 93 71
Aphex Phillipines
Tel: 704-714
TLX: (722) 23071 (JMGPH)
Aphex South, Inc.
(Nashville)
Tel: (615) 327-3133
Aphex Spain
(Madrid) Tel: 267-5222

Aphex Systems (Suisse) SA
(Le Mont-Sur Lausanne)
Tel: 021/33.33.55
TLX: (845) 24107
(VOGUE CH)
Aphex Texas, Ltd.
(Dallas) Tel: (214) 351-8772
Aphex South Africa
(Johannesburg)
TLX: (960) 8-2440 S.A.

for additional information circle no. 77

USING THE MULTI-TRACK FORMAT FOR PRODUCTION FILM RECORDING

The Traditional Approach

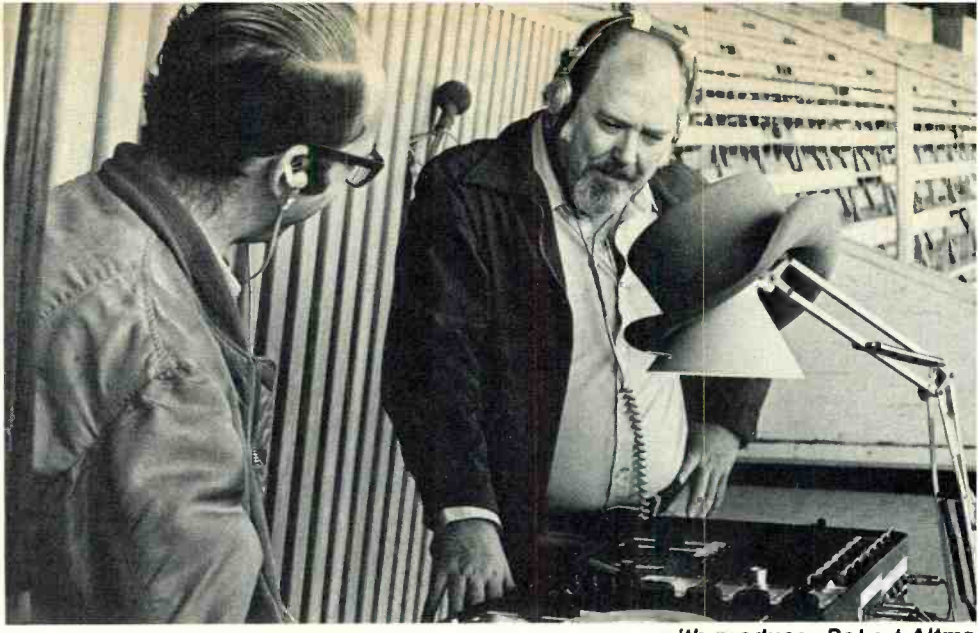
The alternative to this approach is the traditional single or two track recording that has everything — dialogue, effects, and background all on one or two tracks. Depending on the situation, this might be done with several wireless or conventional mikes combined through a mixer to the one or two tracks. Or one shotgun mike on a fish pole or boom may be used, or some combination of the two. My current multi-purpose favorite is the Sennheiser 815. What dictates extra mikes is if I am unable to extract from the sound field all the information I want with a single mike.

Ideally, then, with the single or two track format one tried to gather all this information (which is difficult), and at the same time maintain perspective (not as hard, and often easier than with multitrack and wireless techniques). The best of all possible worlds is to gather all information in a good balance while maintaining perspective. By doing this, much follying can be eliminated. This is the post-production technique of artifically re-creating the sound that was missed in production.

The boards that were used on the first few multitrack projects were not tailored for this application. We were forced to use two of them ganged together in order to get the required outputs. It became apparent that there was no stock film production board equipped to provide the outputs, or the monitoring capabilities required.

Different people, like the director, the boom man, the script girl, not to mention myself, all wanted to hear different mixes off the input. So, in 1976, to alleviate these and a few other shortcomings, Jack Cashin and I designed and built a new board. This board had four monitor busses so everyone could hear what they wanted. In addition, the monitor I used had a solo function that was built into the assignment strip allowing me to go through and listen to the inputs, without upsetting anybody else's mix. This was particularly important since we monitor in mono which makes it tough to figure out what is coming from an individual mike within the total mix. When you mash eight channels of dialogue into monaural and they are all at 100% modualtion, it's hard to listen critically for radios fritzing or clothing noise. So, the solo function is very important for assessing the individual components of the overall mix.

The board also had slating and clapstick functions built into it. One of the original sixteen modules was replaced with a slat function module. At the top of the module is a spring-loaded lever. Pushing the lever up connects the mixer's board talkback to the eight output busses. Pulling the lever down connects an external input to all eight busses. The slating function is not unique, but with film



. . . with producer Robert Altma

there is an added need to record the clapstick marker which is the point at which the editor syncs all the tracks. A separate clapstick mike is used if there is not an existing microphone near it. If there is, a 'Y' cord is used to split the signal between the slat and normal inputs. Releasing the switch returns the board to normal operation. This is an example of a film function that was built into a production board that one wouldn't ordinarily find in a music board.

Other board considerations include equalization, which, along with the use in production of most other processing devices, are controversial items. Most production mixing boards don't come with much and there is a definite group of mixers who don't feel it is appropriate. All processing, whether it's equalization, limiting, or the use of devices such as Dolby or Kepexes, can be trouble. If you make a mistake with processing, you can never retrieve it faithfully in dubbing.

The problem is matching the cut you're shooting with the previous or the next one. If it is heavily processed and impossible to match in re-recording, it's going to stick out like a sore thumb, and cause scenes and the picture in general to lose some of its consistency and mood. It becomes distracting and rather subliminally distressing because of the feeling conveyed by the sound and its fluctuating tone. It seems safest to do the best one can in the field with miking and boom techniques, and wait and solve persistent problems in dubbing, rather than compound them.

"Nashville" used Dolby and was probably the first film to do so. They wanted to encode the production tracks, but I resisted because I felt it was a tricky business at best. The place Dolbys can make a difference is in the transfer process because of the many generations in film work. The two places I feel it should be encoded are in either the initial transfer from the production tracks to film (1/4" to sprocket mag), or in the mix. The decision as to where to use them in the transfer process is based on just how good the tracks are and how many additional generations will be needed. The sooner it is done, the better it is in terms of maintaining transfer quality, though the alignment process complicates and compounds the potential for error through the rest of the chain.

With all this said, the equalization for the input modules was designed to be straightforward and practical. It favors dialogue to music, and consists of basic low and high end shelving, and a mid-peaking point at 3 kHz. It's set specifically at that frequency to pop the dialogue through clothing when body mikes are used. Again, it can be dangerous to get into the extensive use of parametrics and graphics in the field. I just want to put in a little edge so the re-recording mixer won't have to fight so hard for it.

Multitrack Problems in Post-Production

In regard to the post-production concerns which have been alluded to, a production mixer, whether they are working in single or multitrack format, should understand what is going to occur in a dubbing session so they will appreciate what the mistakes and miscalculations that occurred in the field can later mean in time, effort, and money. In the field one must always be thinking of how the tracks are going to be handled in editing. Extremely complete information about the tracks should be written down and organized clearly. All the paperwork must travel with the tapes.

I'm always thinking about the backgrounds,

USING THE MULTI-TRACK FORMAT FOR PRODUCTION FILM RECORDING

about match cuts, and the like. In multitrack, with potentially seven times the tracks, the chances are multiplied for something to go wrong or be forgotten. What's most frustrating is to get into an editing crunch at the end of the long process, and for lack of time the sound editors may not be able to listen to every track. What it comes down to is in multitrack you've got seven choices, and if you've got only three principals in a scene it could be easy to overlook what's on the other three or four tracks. That is, the editor may think nothing of importance is there. If they don't listen to them or check a well-kept log they may miss some effect. In single track, it's going to be listened to because it's the only thing to put with the picture.

Aside from the production mixer's approach to post-production concerns, let us consider the actual process of transferring and editing, and the multitrack influence.

The basic sound 'work unit' used in editing is the three stripe 35 mm magnetic film. The seven audio tracks from the 1" original master are transferred off in separate passes onto two three stripe magnetic film rolls. The extra track, if any, is single striped. The 'assignment' of tracks from the master to its appropriate three stripe mag film unit is usually obvious from the scene. If it is not, then a determination must be made by the director. It is sometimes useful to consult the editor in order to avoid combinations chosen from dailies which are difficult to work with on the editing bench. When these combinations conflict, then some

ansferring and re-arranging of the mag
s becomes necessary.

e Keller Engineering Manufacturing
1) eight plate editing machine is a flatbed
ng table which is modified to accommodate the multitrack format. The conventional one track, upright picture Moviola can be modified to handle two or three pictures and/or soundtracks, but not as conveniently. With the flatbed, the film goes flat on the table and can be handled more easily. It's fast and you don't have to mess with the reels.

Modifications to the stock KEM head assembly were pursued because until recently stock machines had only control switches on the back of the heads, thus allowing for only off and on modes. There was one amplifier and one pot, and no real balancing capability. To make them more useful and flexible for multitrack, the audio electronics were modified to include a nine channel mixer.

Advantages/Disadvantages

Robert Altman is and has been the driving force behind the application of this format to film. With it, a freedom in shooting style has been the result. Because it is multitrack the improvisation and overlapping of dialogue as it naturally occurs in real conversation whether on or off the screen is accommodated, plus there is the increased capacity to record certain sound effects and sub-conversations that would normally be lost if only the main dialogue were recorded. Mr. Altman is quite committed to the format. Within the single track approach, it is almost an impossibility to get what you want because of the technical and production considerations of the mike man and the mixer, and the artistic ones of the director. The results are potentially disastrous because there is no flexibility to the format. There is no fixing it in the mix, aside from looping, if the production track isn't close to being right.

I prefer to use multitrack so that we pick up extra effects, or if we're using two cameras with widely split angles, I'll cover the perspectives of each with separate audio pick-ups so that we can choose sometime later. You've got to remember in film sound that it is the camera's perspective you must capture, not necessarily what's most convenient to record. With multitrack, and wireless microphones, it has become common to use a couple of cameras and record the scene like a real-time event, thus the director is assured of having two angles where the actors' conversations and movements are absolutely overlapping in the same places making the cuts easier. The traditional way is to create the overlaps by taking a line that is filmed and recorded later and then move it to the correct cut.

It would be easy to assume that given all these tracks and the freedom from restrictions on the number of effects gathered with a single production track that multitrack would unequivocally benefit post-production effect gathering and dubbing. Well, it does — but the potential is there to be consumed in all the extra tracks, as illustrated by "Nashville," which used eight wirelesses on 25 actors. For "A Wedding" the format was stretched to its limits as 14 tracks, 16 radios, and 50 actors were employed.

During mixing the format has hidden as well as obvious advantages. On the obvious level, with reasonable isolation it's possible to individually equalize and tailor dialogue, as well as improve balances between actors and sort out phasing problems. A less obvious advantage is being able to leave the 'tipping,' or emphasis of a scene (audio-wise) until this stage of post-production. Although complete isolation of tracks is a rarity, enough isolation exists so that audience attention can be manipulated by the director in complex multi-dialogue scenes.

Nothing Comes Free

Nothing comes free though, and multitrack film work is no exception. The format has both concrete and more philosophical shortcomings.

First, and very concrete, it's expensive. Starting with the 1" tape which is costlier than 1/4", and from there everything else at least doubles and triples because of the quantity of information that's being generated in the field. Not only is the initial stock more costly, but because you're transferring and processing roughly seven times the information, costs continue to increase exponentially. In post-production, there is also a tremendous increase in expensive track work by the effects cutters who are handling the increase in dialogue pre-dubbing (combining and condensing scattered tracks to as succinct a form as possible). Using multitrack in production means they've got to sit down and glue all these individual elements together. Film editors usually feel they have enough problems cutting the picture without having to worry about seven soundtracks. If the multitrack approach doesn't have directorial and editorial support all the way down the line, it can become quicksand. It's a system you've got to prepare and commit to — there is no hedging the bet. To use or not to use multitrack, however, is a decision that is based

. . . on location, THE ROSE . . . two oclock in the morning

on more than cost.

At least part of this decision lies in the arena of taste, and therefore can't be argued. This format kills perspective. With multitrack, and its inherent use of radio mikes, each separate dialogue track has excellent quality. If someone turns to walk toward the door, they will sound the same as they did when they were facing the camera. They don't sound as though their position has changed in relationship to the other actors in the scene. What is lost is a feeling for the perspective of the environment. And the perspective is the mood whether it be an echoing hallway or a noisy street. It is the thing that gives life to the track. Without it, the movie no longer sounds like it looks. Though I do recognize the perspective problems, I feel if it is properly used this approach transcends that by using the multitrack more to bring the film to life with backgrounds and effects than for complex dialogue. The ideal situation is to keep the dialogue to just a portion of the available tracks and devote the rest to the things that will help the picture seem more real and alive.

In passing it may be relevant to make some caparisons between production sound recording and music recording. Both record sound and they are in similar businesses. From there, however, the similarities fade and differences grow. Certainly most of the equipment is basically the same, but the circumstances and the environment under which each record, one for an aural and one for a visual product, makes the jobs vastly different.

I must always think in terms of the end product, just as in making a record, but on a record the sound source is relatively constant. The music recordist in his studio must apply his or her talents to recording sound cleanly, processing it, and combining it with other sources, etc. In film, we have a free moving sound field that is changing almost constantly. Even if the sound sources themselves don't change, uncontrollable elements are always interfering with your field. There is a lack of that basic control and isolation that one has in a recording studio. Obviously, the differences are the result of this being a film experience with visual priorities rather than the aural priorities of recorded music.

Technically, filmmaking has its own set of problems to be solved. A recorder and a microphone does not a soundtrack make. Certainly you're not in a control room surrounded by mountains of outboard gear, working on an elaborate board or recording onto one or two 24-track machines. This fact only serves to make the two different, not one easier nor more difficult than the other.

□□□

ECHOES in Recording Studios

Incipient or **Discrete?**
Embryonic or **Full-blown?**
Integrated or **Segregated?**

by
F. Alton Everest

Echoes have had their share of attention in concert halls and large auditoriums but the word "echo" is less frequently heard in discussions of the acoustics of recording studios and control rooms. It is a nice short word which has often been used incorrectly to designate buttons on the console, but a distinction should be made between echo and reverberation. An echo is usually defined as a reflected wave which has sufficient amplitude and delay to make it distinct from the original sound giving rise to it. Reverberation is that sound which persists in a space after the source is turned off. The two, of course, are related in that both depend on a source of sound energy and reflections of that energy.

Compared to concert halls, recording studios and control rooms are usually much smaller rooms. The smaller dimensions result in a shorter distance of travel between successive reflections. The "mean free path" may be calculated from the expression 4V/S where V is the volume and S the surface area of the room. For example, in an auditorium 125 x 65 x 45 feet, the mean free path is 43.9 feet. In a studio 23 x 19 x 15 feet the sound travels an average of only 12.3 feet between reflections. As sound travels about 1.13 feet per millisecond it takes only 10.9 ms for sound to traverse this 12.3 feet. Thus, in terms of time, we can expect sound to start returning from walls, floor, and ceiling surfaces in the studio in a matter of only a few milliseconds. This short time element, as we shall see, is most important in the perception of echoes in studios.

Echoes — What They Are

Echoes are as complex as the original sound which gives rise to them, hence it makes sense to look carefully at the original sound. To keep things under control, a sample of original sound was homemade by going to a tape recorder and recording the immortal phrase, *"Recording Engineer/Producer"* in stentorian tones. This phrase was then played into a Bruel & Kjaer high speed graphic level recorder set for a writing speed of 500 mm/sec. The resulting trace of level vs. time is shown in Figure 1. Let us assume that this train of sound waves travels out and is reflected from a distant surface. The echo that is returned, for the purposes of this illustration, has exactly the same level variations with time as the original, but it is of lower level and it is delayed. Figure 2 illustrates the case in which the echo is 21 dB lower in level than the original and is delayed 110 ms. A delay of 110 ms tells us that the sound travelled a distance of 110 x 1.13 = 124 feet. This could be the echo from a reflective surface 62 feet away for a 90-degree reflection or the difference between the direct path and the path taken by the reflected component.

The echo in Figure 2 has been shifted downward 21 dB and to the right 110 ms until the original and echo touch at point A. Anytime the echo level momentarily attains the level of the original sound, such as at point A, the echo becomes audible. At least this is the hypothesis being followed in this example with justification to follow. Therefore, Figure 2 represents one condition of echo level/echo delay in which the echo is audible and, of

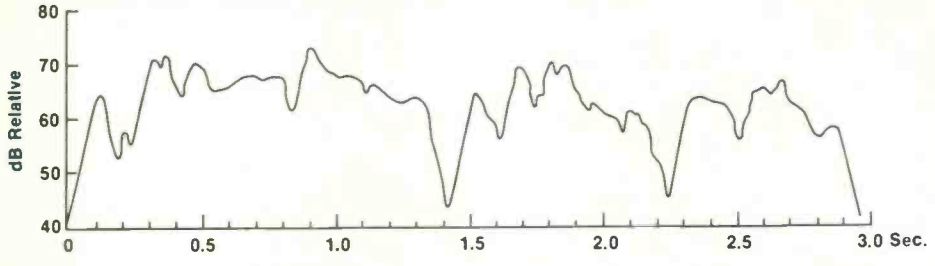


FIGURE 1
High speed graphic level recorder tracing of the spoken phrase, "Recording engineer/producer".

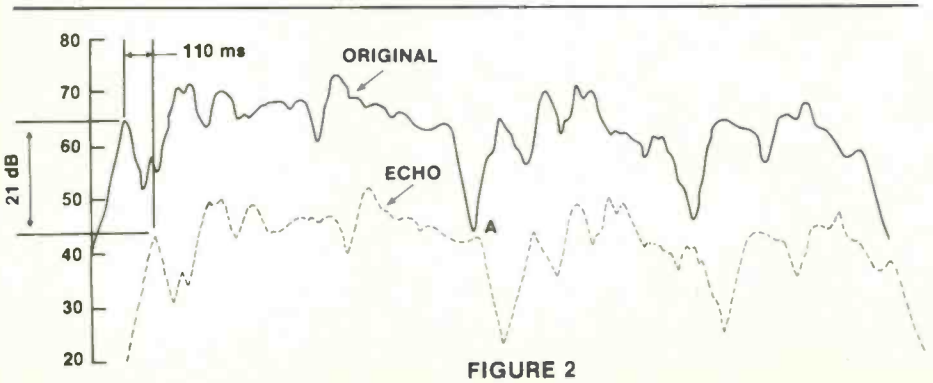
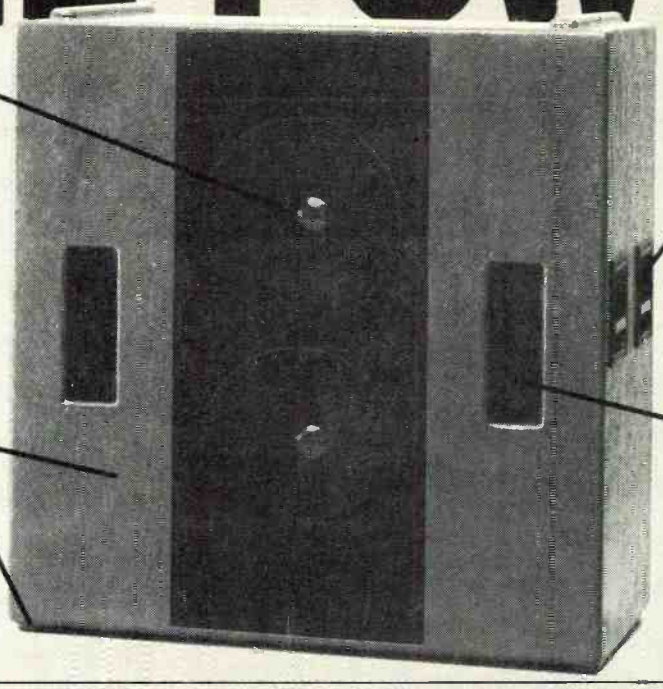


FIGURE 2
An echo of the signal of Figure 1 is simulated by displacing a tracing of it downward (for lowering its level) and to the right (to introduce a time delay).

THE POWER



Two Altec Lansing 421-8LF High Power, Low Frequency Loudspeakers for tight, clean bass; high SPL with punch

Output: 20 Hz to 80 Hz or above

Recessed handles

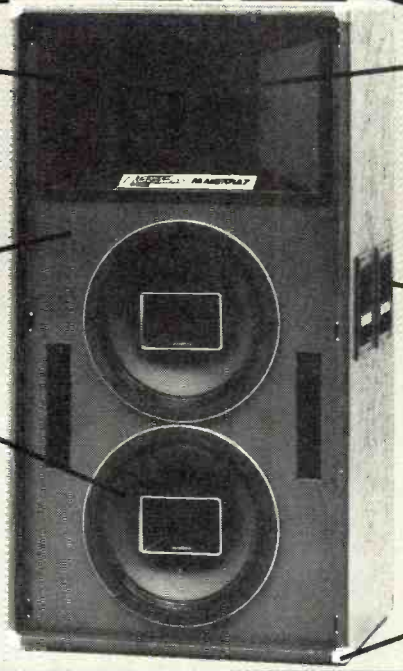
Fiberglass coated top grade plywood cabinets

Computer assisted enclosure design

Hardwood Skids, top and bottom

SS-1020-R Dual Subwoofer System

THE GLORY.



291-16B High Frequency Driver, with Tangerine® Phase Plug, and low mass diaphragm, for high power capacity, high efficiency, low distortion

Mantaray™ Constant Directivity Horn (90° x 40°)

Built-in saddle to secure driver

Very well braced, well damped fiberglass coated plywood cabinet

Recessed Handles

Recessed, molded fiberglass lid (not shown).

Two 604-HPLN 15" High Power Duplex Loudspeakers

SS-3210-R Three Way, Tri-amp Ready System

Steel Corner Caps

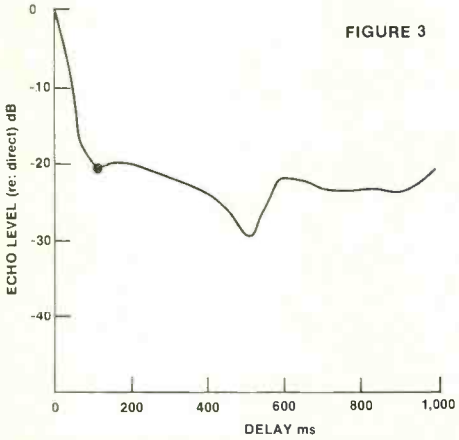
STANLEY SCREAMERS

ALTEC LANSING

1515 S. Manchester Ave.
Anaheim, CA 92803

Stanley Screamers are a totally new concept in professional sound reinforcement from Altec Lansing and Stanal Sound. There are eleven models in all, offering you the most versatile system choices possible. Baptized on the stage, raised on the road and proven by professionals, Stanley Screamers are the ultimate in sound reinforcement. For more information on Stanley Screamers, contact your nearest dealer listed on the facing page.

course, there are many others. Figure 3 is a plot of echo level vs. echo delay for just audible echo and our -21 dB echo level and 110 ms delay condition is shown as a black dot. The rest of the graph of Figure 3 was obtained by shifting the echo trace horizontally and vertically until the two traces touched and recording the delay and levels pertaining to each situation. Figure 3 tells us that echoes with short delays must be much stronger to be heard than echoes with longer delays, but the graph tends to level off for greatly delayed echoes.



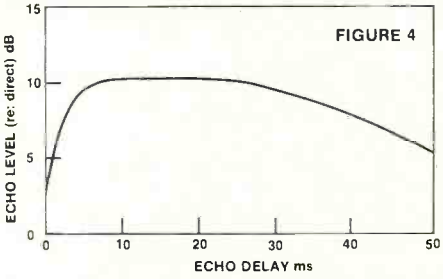
A correlogram derived from the signal recording of Figure 1 by the method illustrated in Figure 2. Each combination of echo level and echo delay resulting in echo level being equal to the level of the original yields one point on this graph. The heavy spot is the point derived from Figure 2.

The graph of Figure 3 is called a correlogram. It is only as accurate in determining the audibility of echoes of the *"Recording Engineer/Producer"* phrase as the assumptions underlying the procedure. These assumptions are, (1) that the spectrum of the echo is identical to that of the original sound, (2) that directional effects are negligible, (3) that the ear's decay time is the same as that of the graphic level recorder (about 50 ms for 60 dB in our case), (4) that an echo is perceptible if its level is equal to or greater than the level of the signal during any moment of their simultaneous presentation. It turns out that none of these are really too far off base. Dubout[1] ran many subjective tests for speech and demonstrated that the objective procedure we have followed in Figures 1 - 3 is verified by his listening tests to a remarkable degree, at least, for echoes of greater than 50 ms delay. Echoes in this shorter range will now receive special attention.

Haas Sense

Helmut Haas didn't exactly discover the "Haas Effect" but he surely brought it forcibly to our attention with his research. He made a significant statement when he wrote: " . . . unser gehörapparat die Schallintensitäten uber kurze Zeitraume hinweg integriert, ahnlich etwa wie ein ballistisches Messinstrument."[2] In *Lingua Californica* this says, "our hearing mechanism integrates the sound intensities over short time intervals similar, as it were, to a ballistic measuring instrument." Herr Doktor Haas set his subjects 3 meters from two loudspeakers arranged so that they subtended an angle of 45 degrees, the observer's line of symmetry splitting this angle. The conditions were approximately anechoic. The observers were called upon to adjust an attenuator until the sound from the "direct" loudspeaker was equal to that of the "delayed" loudspeaker. He then proceeded to study the effects of varying the delay.

A number of researchers had previously found that very short delays (less than 1 ms) were involved in our discerning the direction to a source of sound by slightly different times of arrival at our two ears. Delays greater than this do not affect our directional sense.



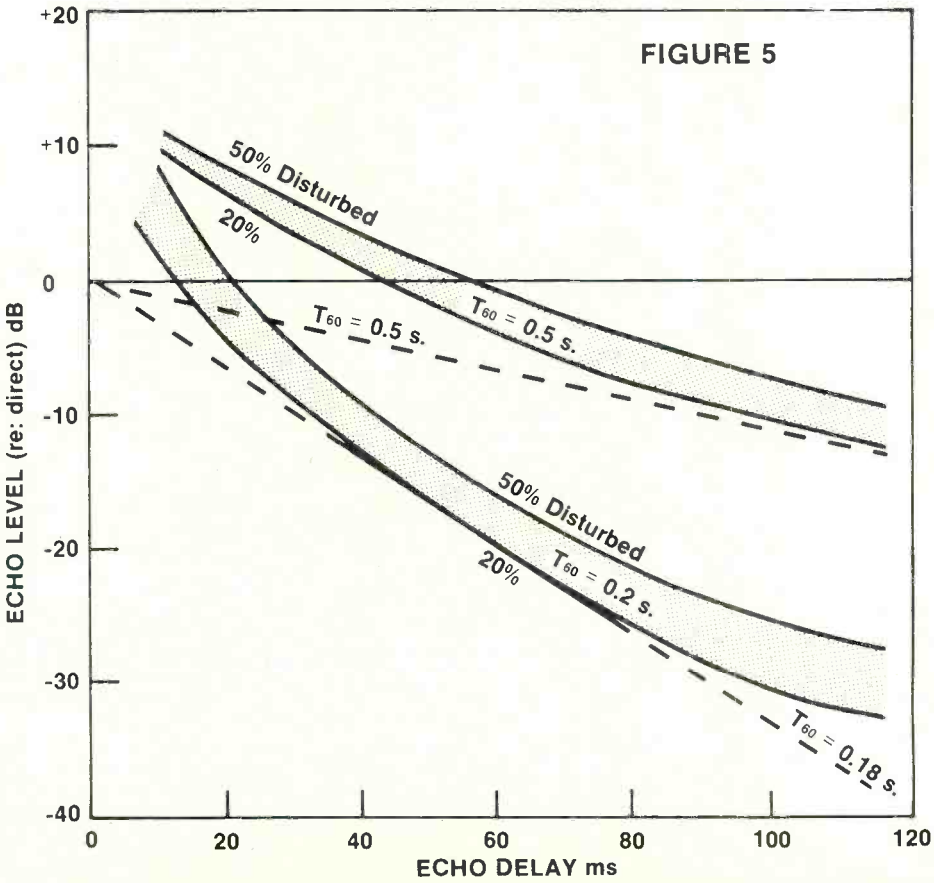
The precedence zone as determined by Haas (Ref. 2). This curve describes the amount the delayed signal must be increased in level to sound as loud as the undelayed, direct sound. The delayed signal is perceived as an echo only if it exceeds this value.

As shown in Figure 4, Haas found that in the 5-35 ms delay region the sound from the delayed loudspeaker had to be increased more than 10 dB over the direct before it sounded like an echo. This is the precedence or Haas effect. In a studio reflected energy arriving at the ear within 50 ms is integrated with the direct sound and is perceived as part of the direct sound as opposed to reverberant sound. These early reflections increase the loudness of the sound and, as Haas has said, result in "a pleasant modification of the sound impression in the sense of broadening of the primary sound source while the echo source is not perceived acoustically." This is exactly what happens in the live end-dead end approach to monitoring rooms.

The transition zone between the integrating effect, for delays less than 50 ms, and the perception of delayed sound as an echo is gradual and therefore somewhat indefinite. Someplace the dividing line at 1/16 second (62 ms), some at 80 ms, and some at 100 ms beyond which there is no question of the discreteness of the echo. For the purposes of this discussion we shall consider the first 50 ms, as per Figure 4, the region of definite integration.

Intermediate Delays

Haas' work, published in 1951, precipitated further investigations in many countries. Selections from the results of one of these[3] are shown in Figure 5. These tests were conducted in spaces having reverberation times of 0.5 and 0.2 second, comparable to some recording studios and control rooms. Only the shorter echo delays are shown as they best apply to studios. Curves for 20% and 50% of observers being disturbed by the echo are shown in Figure 5. This practice results from the experimental problems surrounding obtaining consistent results for reporting the onset of echo. Note the general similarity in shapes to the crude curve of Figure 3 which we derived from Figures 1 and 2 except that the method used in deriving Figure 3 does not incorporate the important integration effect for echoes arriving within 50 ms.



The results of two psychoacoustical listening tests conducted by Nickson, Muncey, and Dubout (Ref. 3). Speech signals were presented to the subjects along with the same speech delayed varying amounts and at varying levels. The tests were made in rooms having reverberation times of 0.5 and 0.2 second. The percentages of subjects disturbed by the echo are shown.

Now, from Advanced Music Systems

Finest Digital Delay Available

with *Pitch Change* and *Reverberation*

The DMX 15-80 is internationally recognized as the finest quality digital delay line made. Up to 4 seconds of delay is possible without loss of signal quality. Responsive keypad control is used for entry, storage and recall from the unit's 9 memory locations. Because of its microprocessor design, the unit easily adapts to allow extra effects—those now available, and those yet to come. This versatility assures compatibility with future signal processing developments.

The pitch-change option makes use of an advanced 16 bit microprocessor to perform intelligent splicing and minimize glitching, which is so evident in other harmonizers.

There is also a reverberation option which provides 9 programs of reverb.

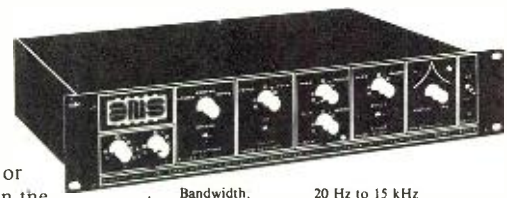
VCO, Regeneration and Lock-in add to the unit's flexibility and enhance its special effects capability. The 18 kHz bandwidth remains constant throughout the range of delay in this truly transparent processor. Typical distortion is 0.025 percent at 1 kHz. Signal/noise ratio: Better than 90 dB. Dynamic range: Better than 90 dB.

New Stereo Digital Delay

Now there's a two channel digital delay line engineered to the same high standard as the widely-respected DMX 15-80. The 15-80*S* is microprocessor-controlled for precise delay settings and instant and accurate recall. Maximum delay time is two full seconds on each channel at 18 kHz bandwidth. Delays are programmed with a resolution of one millisecond, and may be simultaneously entered into both channels to ensure phase coincidence. Regeneration controls are provided on both channels, and switches allow inputs to be paralleled and/or outputs to be mixed for special effects.

Advanced AMS digital technology gives the unit its truly transparent sound quality—18 kHz bandwidth, typical distortion of 0.025 percent at 1 kHz, signal/noise ratio: Better than 90 dB.

Two independent channels of delay—the equivalent of two DDL's—*but at a far lower cost.* Arrange for a demonstration today.



The Original Phaser/Flanger from AMS

. . . is now available in America. The DM 2-20 accurately simulates tape phasing in real time. Unlike most units of this kind the DM 2-20 uses two independent delay lines to allow true "over the top" phase simulation, which can be either manually or automatically swept.

Features include stereo output for that solid spatial sound and a ramp generator section to simulate the mechanical characteristics of tone cabinets. True cyclic pitch shifting is achieved with visible speed indication. Single or cross modulation is available on the delay lines, and chorus character may be modified by use of manual phase control.

A tapped, infinitely variable delay may be selected for automatic double tracking effects—slight pitch changing is also possible for enhanced realism. The unit can also be operated in a phase cancellation mode to allow a further range of effects.

Bandwidth.	20 Hz to 15 kHz
Signal/noise ratio:	72 dB
Max Phasing Frequency:	Infinity, made possible by the use of multiple delay paths.
Phasing range:	8 octaves within the audio bandwidth; continuous sweep no range switching.
Modulation section:	Frequency range: 0.05-20 Hz sinusoidal. Depth infinitely variable on one or both channels.
Delay time:	Infinitely variable up to 60 ms, tapped or half delay.
Remote control:	All functions are internally voltage controlled and are available externally as options.

The Most Advanced ams *Signal Processors*

—Engineered to exacting aerospace standards—

Don't miss the latest AMS digital effects equipment SEE THEM AT AES— BOOTH 667

For a demonstration or further information, contact Ian or Carole at

QUINTEK DISTRIBUTION, INC.

4721 Laurel Canyon Blvd., Suite 209, North Hollywood, CA 91607
Telex: 194781 • Phone (213) 980-5717

East Coast distributor: Empirical Audio / 3A Todd Place, Ossining, NY 10562 / (914) 762-3089
Canadian distributor: Octopus Audio / 69 Sherbourne St., Suite 315, Toronto, Ontario, Canada M5A 3X7 / (416) 868-0513

ECHOES

IN RECORDING STUDIOS

For short echo delays the curves of Figure 5 go above the zero level line which means that the echo level is higher than the direct level, that the integrating effect is present for these conditions. Because the conditions of this experiment are different from those of Haas' experiments, the exact shape of the curves differ somewhat from Figure 4.

An exponential decay is a straight line on a graph of dB vs. time such as Figure 5. A reverberation time of 0.5 second means that sound decays 60 dB in 0.5 second. A slight exercise in proportions tells us that sound would decay 10 dB in (10/60)(0.5) = 0.083 second. Plotting this point and drawing a straight line through it and through zero gives us the decay rate corresponding to T_{60} = 0.5 second. It is interesting to note that the broken line of Figure 5 for T_{60} = 0.5 second is more-or-less tangent to the 20% curve obtained in a space having a reverberation time of 0.5 second. This makes sense as we recall (1) that the 20% curve is not far from the threshold of echo perception, and (2) that reverberation is made up of all the echoes as they are reduced in amplitude with time. Apart from the short delay integration region, this really confirms the idea that when echoes are equal in amplitude to the direct signal, they become audible.

For the lower curve of Figure 5, obtained in a room having a reverberation time of 0.2 second, a broken line corresponding to T_{60} = 0.18 second is tangent. Observations of this type have led some researchers to suspect that these subjective, psychoacoustical experiments are only a fancy way to measure reverberation time! And they seem to be about right over a limited region. Such echo disturbance curves may be divided into four general regions, (1) less than 1 ms where directional effects are determined, (2) from 1 to about 50 ms where the integrating effect of the ear works, (3) an intermediate delay region determined largely by reverberation, and (4) the long delay region where the curves approach the horizontal. For studios and control rooms we are primarily interested in (2) and (3).

Echoes In Studios

Is it possible to hear echoes in an acoustically well treated studio or control room? We do know that the room boundaries give rise to reflections which, in a physical sense at least, might be called echoes. We also know that sound recorded outdoors in the absence of such reflections has a flat, dead character. We like what we hear inside. The sound energy is contained by the boundaries of the room and the containment is directly responsible for the differences between indoor and outdoor sound quality.

Have you ever stopped to think as you watch a motion picture that you are sitting in pitch blackness a substantial fraction of the time? The eye-brain mechanism smooths out the intermittent pictures on the screen with an integrating action not unlike that of the ear-brain mechanism. In the Haas region the primary and delayed versions of the original sound are combined by our ear-brain mechanism.

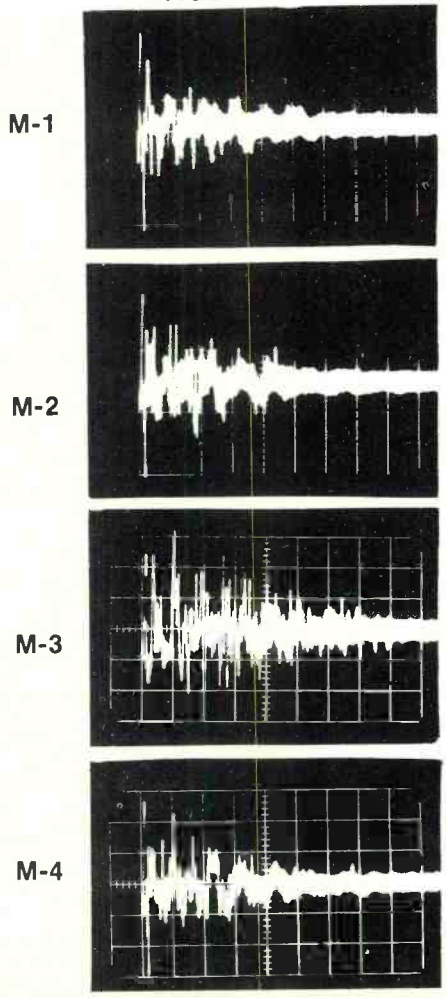
This integrating action combines the energy of all the echo spikes arriving within about 50 ms resulting in an increase in perceptual loudness and an improvement in quality. The "sound" of a studio is a direct result of this energy returned from room boundaries and integrated together by the ear-brain combination. We are conscious of the presence of these short-delay "echoes" even though they are not discrete. They could be called incipient echoes (not "insipient" which means "stupid"!), echoes just coming into being. The "livliness" of the room and the "body" and "substance" of the sound of a studio is a direct result of these short delay, incipient echoes.

The geometry of the room and the placement of absorbing materials in a studio affect the diffusion of sound in the room. If adequate diffusion prevails, the short delay, incipient echoes result in a pleasing studio sound. A large reflective surface can result in a "bounce" which deteriorates this sound.

Real World Application

We have sampled the results of sophisticated psychoacoustical tests, what do they have to do with recording studio design and operation? Let's examine a specific application. Figure 6 shows echograms recorded in a 16,000 cu. ft. studio in which problems existed. Human ears had no trouble hearing the problem, but were less successful in pinpointing its source. Impulses recorded on tape were radiated from a loudspeaker in the studio. The original impulses were of nice, rectangular shape and had a duration of 1 ms. They were far from rectangular, however, after undergoing recording and playback on tape

FIGURE 6

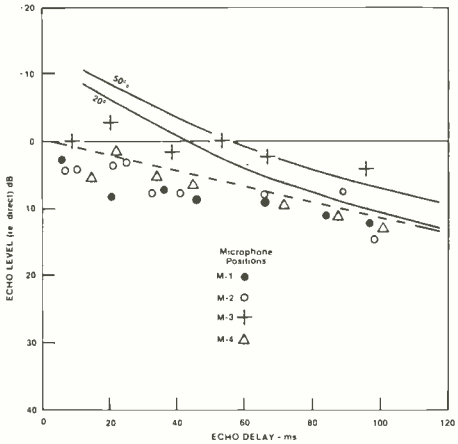


Echograms taken at four different positions in a studio of 16,000 cubic feet volume and having an average reverberation time of 0.51 second. The horizontal time scale is 20 ms/div.

machines and the loudspeaker twisted the pulses out of shape some more, but at least the radiated clicks were crisp and short enough to delineate any echoes from surfaces differing more than a couple of feet. The microphone was placed successively at four random positions in the studio. The echo pattern characteristic of each of the four positions is shown in Figure 6. In each case the arrival of the direct wave triggered the single sweep of the beam of the cathode ray oscilloscope. The vertical deflection is a linear arbitrary scale; the horizontal scale is 20 ms per division. Each spike represents a separate physical echo, although the ear integrates all spikes within about the first three horizontal scale markings (60 ms).

One thing immediately apparent from the echograms of Figure 6 is that the echo pattern changes considerably from point-to-point in the studio. Our desire is now to evaluate the audible effects suggested by each echogram. One way to do this is to compare these echograms with the results of psychoacoustical tests made by others. By a stroke of good fortune (achieved by a bit of maneuvering) we have just what is needed in Figure 5. The reverberation time of the studio in which the echograms were recorded is 0.51 second (average 125 - 2,000 Hz). This compares beautifully with the upper curves of Figure 5. The 0.5 second curves of Figure 5 have been reproduced in Figure 7. The plotted dots, circles, plus signs, and triangle spots represent specific peaks from the echograms of Figure 6. With the exception of microphone position M-3, practically all points fall below the 20% disturbed curve which means that they are probably inaudible. At position M-3, however, a number of peaks having delays greater than 50 ms fall well up in the disturbance region. The M-3 echogram is also unusual in that there is an echo at a delay of 20 ms that is 2.5 dB greater amplitude than the direct pulse. This could come about only by (a) loudspeaker directivity, (b) an obstruction in the direct path, or (c) a focussing effect of some sort. With such evidence, the next step is to return to this studio to see what is so special about the M-3 position.

FIGURE 7



The echo peaks of Figure 6 are plotted with the 0.5 second curves of Figure 5 to test for echo audibility. This test would indicate that echoes would be audible at microphone position M-3. The lone M-2 echo at 90 ms would probably also be audible, but less noticeable.

In Figure 7 the broken line again represents a decay rate corresponding to a reverberation time of 0.5 second. Note how the spots cluster just below this line. Well, why shouldn't they? After all, the echograms of Figure 6 are only highly detailed records of the first 100 ms of the reverberation decay. The echogram is to a normal reverbertion trace as a microscope is to bifocals. Figure 7 seems to lend further support to the idea that when the echo peaks raise their "pointy" heads above the reverberation line they become audible. We could have evaluated the echograms of Figure 6 almost as well by using the broken reverberation line of Figure 7 rather than the shaded psychoacoustical curve, particularly above 50 or 60 ms. Not that we dislike psychoacousticians, but that we love simplicity!

Another interesting case involved a suite of radio studios. The master control and production control rooms are of adequate, but acoustically minimum, size but the announce booth was, according to long-standing broadcasting tradition, very tiny. Recordings of clicks produced echograms similar to those of Figure 6 which were analyzed in a similar fashion. Anyone having studio experience knows that such a small room as the announce booth would have inferior sound. Sure enough, all echogram peaks for master control and production control fell well below the echo disturbance region, but those for the announce booth were in a separate class, landing high in the disturbance region. Over the past few years the procedure has been applied with encouraging results to many studios. It will be interesting to see if echograms can give solid physical data in studio evaluation which meets the acid test: how does it sound to the ear. □□□

References:

1 - Dubout, P., *Perception of Artifical Echoes of Medium Delay*, Acustica, Vol. 8 (1958), pp 371-378.

2 - Haas, Helmut, *The Influence of a Single Echo on the Audibility of Speech*, Jour. Audio Engr. Soc., Vol. 20, No. 2, (March 1972), pp 146-159. This is an English translation from the German by Dr. Ing. K. P. R. Ehrenberg, of Haas' original paper in Acustica, Vol. 1, No. 2 (1951).

3 - Nickson, A. F. B., R. W. Muncey, and P. Dubout, *The Acceptability of Artificial Echoes with Reverberant Speech and Music*, Acustica, Vol. 4 (1954), pp 515-518.

A supplemental list of other papers allied to this subject arranged in chronological order:

4 - Bolt, R. H., and P. E. Doak, *Tentative Criterion for the Short-Term Transient Response of Auditoriums*, Jour. Acous. Soc. of Amer., Vol. 22, (July 1950), pp 507-509.

5 - Muncey, R. W., A. F. B. Nickson, and P. Dubout, *The Acceptability of Speech and Music with a Single Artificial Echo*, Acustica, Vol. 3, (1953), pp 168-173.

6 - Lochner, J. P. A., and J. F. Burger, *The Subjective Masking of Short Time Delayed Echoes by Their Primary Sounds and Their Contribution to the Intelligibility of Speech*, Acustica, Vol. 8, No. 1, (1958), pp 1-10.

7 - Dubout, P., *Perception of Artificial Echoes of Medium Delay*, Acustica, Vol. 8 (1958), pp 371-378.

8 - Lochner, J. P. A., and J. F. Burger, The Influence of Reflections on Auditorium Acoustics, Jour. Sound Vib., (1964) (4), pp 426-454.

9 - Barron, M., *The Subjective Effects of First Reflections in Concert Halls — The Need for Lateral Reflections*, Jour. Sound Vib., Vol. 15, No. 4, (1971), pp 475-494.

10 - von Bekesey, Georg, *Auditory Backward Inhibition in Concert Halls*, Science, Vol. 171, No. 397 (12 February 1971), pp 529-536.

11 - Wallach, Hans, *The Precedence Effect in Sound Localization*, Jour. Audio Engr. Soc., Vol. 21, No. 10, (1973), pp 817-826.

12 - Queen, Daniel, *Temporal Considerations Differentiating Sound in Review Rooms vs. Theaters*, Jour. Soc. Mot. Pict. & Television Engrs., Vol. 86, (March 1977), pp 149-152.

in search of a better direct box

Carl Countryman

For a variety of reasons it is often useful to obtain a direct electrical feed from an electric or electronic instrument such as a guitar, synthesizer, or electric piano. These devices generally present a low level, high impedance source that will not interconnect directly with the low impedance balanced input found on most professional recording and PA consoles without an extreme loss of signal level and deterioration of frequency response.

The usual solution to this interfacing is to use a direct box, or DI box, as it is sometimes called. What should this device do and not do? How can these functions be accomplished and what are the tradeoffs involved?

An ideal general purpose direct box must accomplish several functions simultaneously. It should:

1 - Not change the signal at the instrument pickup. The instrumentalist should not detect a change in the volume or tone of his instrument. That is, the direct box should not affect the signal present at the instrument or allow the console input circuit or microphone cable to affect this signal. It should not add distortion or noise to this signal. It should not change the frequency response or level of this signal.

2 - Provide an optimum feed for the console. The signal fed to a standard low impedance microphone input should be a perfect replica of the signal present at the instrument pickup output. It should be close to the level that is expected from a microphone plugged into the instrument's amplified speaker cabinet so that it will be compatible with signals from other microphones on stage.

3 - Provide freedom from ground and power line related problems. The direct box should not introduce hum, buzz, or noise into the instrument pickup circuit or the console input signal. It should be able to completely isolate instrument ground from mixing console ground to eliminate ground loop currents that can produce hum, damage equipment and cables, and constitute a serious electrical shock hazard. This isolation should be effective for the highest peak ground voltages encountered in recording and touring work.

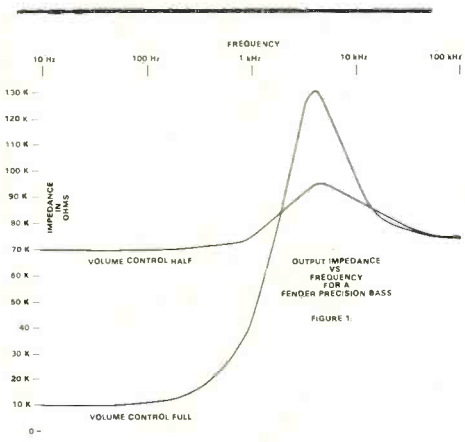
Traditionally, direct boxes have used a transformer with a stepdown turns ratio of about 10:1. A resonably constructed transformer can do a satisfactory job on the ground isolation requirements, but even a theoretically perfect transformer cannot achieve an optimum console feed without excessive loading of the instrument pickup. Further, it cannot prevent the console input circuit and microphone cable from affecting the quality of signal that's being fed from the instrument pickup to its customary amplifier.

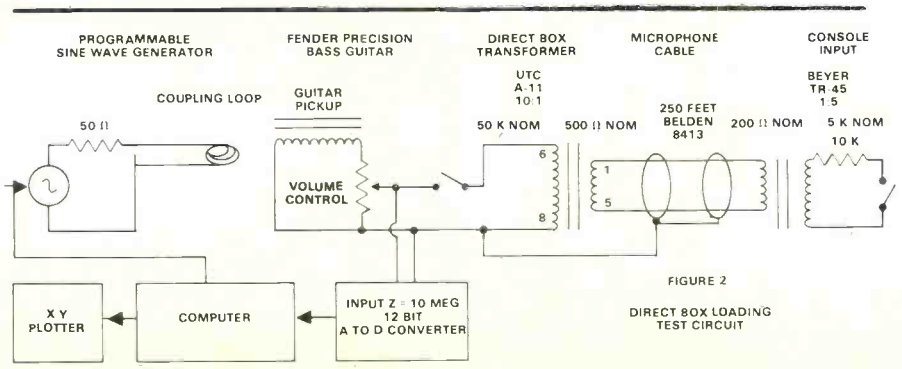
The Perfect Transformer?

How close can a transformer alone come to meeting all these requirements at once? With a perfect transformer, the major trade-off occurs trying to get enough input level for the console while not loading the instrument pickup objectionably. Let's use a Fender precision bass as an example of a typical input source. Figure 1 shows how its output impedance varies with frequency and volume control setting. At 1 kHz this instrument will produce an open circuit output of about .5 volt peak-to-peak from a 70 kilohm source impedance with its volume control set to half scale. Using these numbers and keeping the instrument volume reduction to 1 dB, which most (by no means all) instrumentalists would tolerate, we would need a transformer turns ratio of 60 to 1 and we would develop a level of -45 dB (Ref. .448 VRMS = 1 mW into 200 ohms) at the console input which is about 35 dB below the -10 dB typical level encountered with a microphone pickup on an amplified instrument. If we attack this trade-off from the other direction and design our transformer for maximum signal at the console we will need a turns ratio of 19 to 1. However, we will still only have -40 dB at the console input. This is 30 dB below microphone level and while it may be useable, it is certainly not optimum! This is at the expense of a 6 dB loss in signal at the instrument which is equivalent to reducing the output of a 100 watt instrument amplifier to 25 watts! This will have serious effects on volume and sustain.

Because even perfect transformers do not isolate loading, a portion of the capacitance of the microphone cable between the direct box and the console input will be transferred to the instrument pickup and act as if there were additional cable between the instrument and its amplifier. This will cause a reduction of high frequencies, and if the microphone cable is shorted, the signal to the instrumentalist's own amplifier will drop, thus putting him even more at the mercy of bad cables and equipment failures in the PA and recording equipment than if he were to place a microphone in front of his speaker cabinet. This same lack of isolation couples any loading effect of the console input circuits all the way back to the instrument pickup itself. Hence, the signal to the instrument amplifier is affected as well. This can cause additional adverse changes in tone and addition distortion as well as more loss of volume and sustain. The specifications of a transformer-only direct box, no matter how impressive, cannot guarantee how it will perform in service because their builders cannot take into consideration loading transferred from the console input circuit or microphone cable. With a practical transformer all these loading effects can be much worse.

We connected the test circuit shown in Figure 2 and made measurements of loading effects on an actual Fender precision bass guitar. Both the direct box and the console microphone transformers were types often used in these applications. We obtained a stable and reproducable test signal by exciting the guitar pickup with a single turn coupling loop and a programmable signal generator as is common practice in measuring the electrical response of magnetic tape heads. To generate the loading curves shown in Figure 3 we used a computer program that stepped the signal generator through the range of test frequencies while monitoring the guitar output with an analog-to-digital converter which works like a very fast digital voltmeter that can

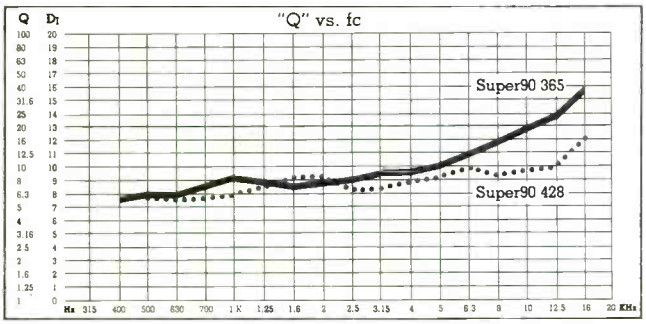




THE RADICAL RADIAL

In response to the demands of the sound professional we present a totally new kind of radial horn— the Community Super90.

OUR BEST YET. This horn is by far the most well behaved ninety degree radial horn we've made—and we've designed a few winners. Super90's are highly efficient; exhibiting smooth axial directivity with no vanes, obstructions or diffraction effects in the critical throat area. The result? A smoother, cleaner sound, but with a new dimension added.

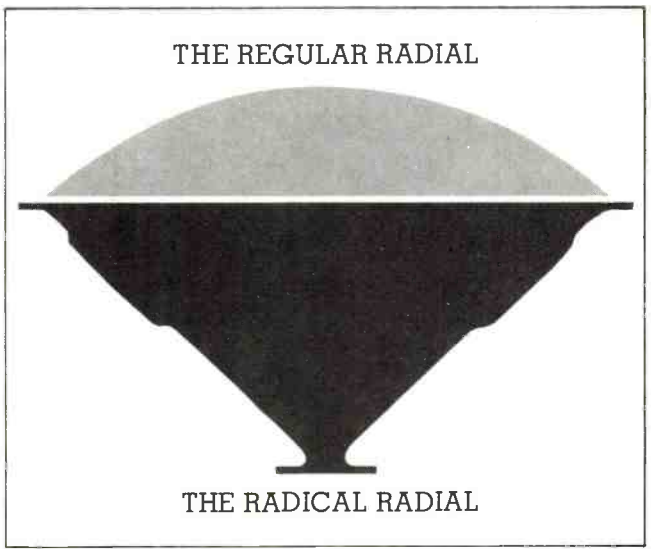


A NEW DIMENSION? Yes. *It's flat.* The front of this superb horn doesn't curve back in the familiar arc, it's flat, with straight, rectangular sides that make box mounting a snap and set-ups a breeze.

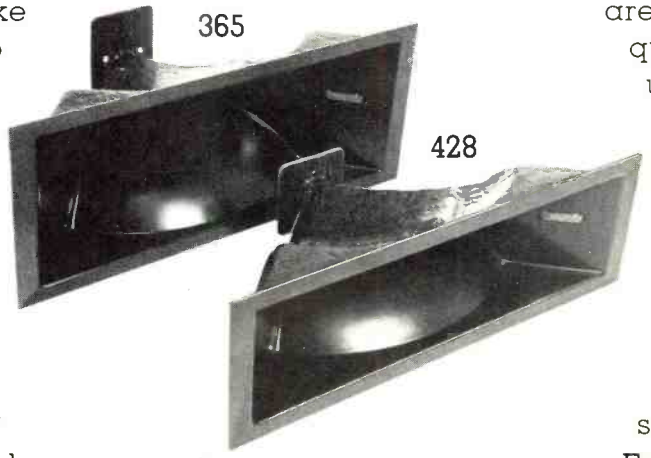
It's compact—measuring at least 7" less in depth from driver mount to the front of the horn.

It's stronger—greater structural rigidity means even less resonance than that of our standard radial designs.

We have two **Community Super90** horn designs available—**the Super90/365** (flare rate 365Hz, operating range from 600Hz and up, for 2" exit compression drivers) and the **Super90/428** (flare rate 428Hz, operating range 800Hz and up) which accepts 1" exit loudspeakers.



Community Super90's are the correct choice wherever a predictable, compact 90° radial is needed. Flush-mounted system installation is greatly simplified with the use of Super90's. In tour applications these horns are easily mounted in multiples and are the ideal solution for quick, hassle-free set-ups.



Community Super-90's provide you with the best of both worlds—radial horn performance superbly coupled with the packaging convenience of a straight horn.

From Community. The best there is.

Community

COMMUNITY LIGHT & SOUND, INC. • 5701 GRAYS AVENUE • PHILADELPHIA, PA 19143 • (215) 727-0900

be read directly by the computer. The set-up is shown in Figure 3. Since these reading were taken at the guitar, they represent the sound that the performer would hear from his own amplifier. As seen from the mixing console the loading effects would be even worse. First we let the program make a set of measurements with the direct box and associated circuits disconnected and store them in computer memory. We repeated this process with the direct box, microphone cable, and console input transformer connected to obtain another set of response measurements which included the effects of loading. These measurements were stoed in another section of computer memory. At each frequency, the program divides the measurement with loading by the measurement without loading so that only the loading effect itself remains. The program then plots these loading-only measurements against frequency on an XY plotter so we can see them. We made loading measurements with and without a terminating resistor after the console input transformer while the guitar volume was set full on as it is in standard studio practice. These not only show how the loading will vary with different console input circuits but illustrate how switching in or out a passive pad on the console could effect the guitar sound on stage during a show. A reduced setting of the guitar volume control increases its output impedance at most frequencies. We ran another set of measurements to determine how much this would increase loading. It is easy to see from the resulting curves why it has become standard practice to run the guitar volume full on when taking a direct feed.

If we use a field effect transistor (FET) amplifier to sample the signal from the pickup on its way to the instrument amplifier instead of draining off part of the signal as it goes to feed the console, as we must do with a transformer, we can easily reduce the total loading on the instrument pickup by 500 times or more when compared to a transformer-only type direct box. This is the approach that was taken in the design of the Type 85 FET Direct Box for Countryman Associates, Inc. There are several additional benefits of starting out a direct box design with an input amplifier. One is that the input loading is not only very low, but it is completely independent of anything after the FET amplifier. This kind of direct box design will not load the instrument pickup even when its output is connected to a shorted cable. It is also no longer necessary to run the guitar volume control full on to reduce loading or to get enough level at the console. The performer can be allowed to play his instrument and set his controls as he wishes. Another benefit is that the amplifier provides the signal to drive the console and we can easily have the same input level as we do with a microphone and even more if we want it.

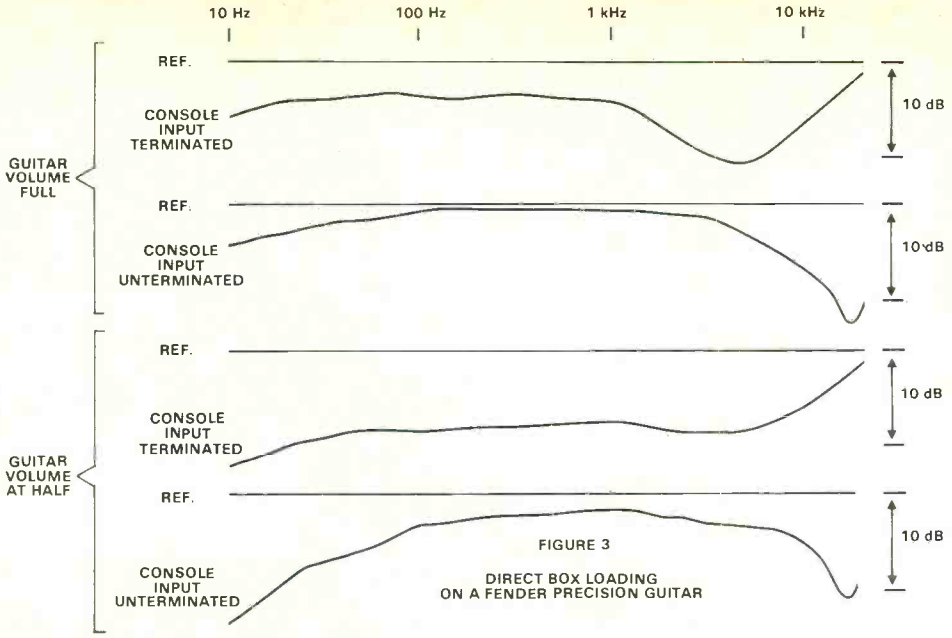


FIGURE 3

DIRECT BOX LOADING ON A FENDER PRECISION GUITAR

When we used only a transformer we had excellent ground current isolation. Now, with an amplifier in our direct box, how do we stand in this respect? Practical transformers are usually far from ideal audio components from a signal quality standpoint, and it makes much sense to try to eliminate them wherever practical. But is it possible to use our FET amplifier to eliminate the direct box transformer entirely?

When we used the transformer alone we had excellent ground current isolation that functioned well at voltages higher than we would ever encounter. We also had good immunity to noise and hum voltages between the instrument ground and the console ground. This property is called common mode rejection. With an ordinary FET amplifier we lose both our ground isolation and our common mode rejection. There are several amplifier circuits that can give us excellent common mode rejection. Even better than we could get with a reasonable transformer. Some of these circuits give us good ground isolation, but also have very excessive noise that makes them unacceptable for direct boxes. Other circuits have low noise levels, but cannot easily isolate grounds with the large voltage differences often encountered. (Ask a guitar player to show you the voltage difference that can exist between a guitar and a microphone sometime.) It seems we have simply traded our major problem from loading to ground isolation.

If we put a transformer between the output of our amplifier and the console input we can get back our excellent ground isolation. But what does it do to the other properties of our direct box? It turns out that it effects us a lot less than we would at first suppose. Most of the ill effects practical transformers cause to audio signals come from loading effects. These undesirable effects all become less severe as the impedance of the signal source feeding the

transformer becomes less. We are now feeding the transformer with an amplifier that has an output impedance of less than 20 ohms, not an instrument pickup with an impedance of many thousand ohms. We no longer need to be concerned with transformer loss because we can make it up with gain in our FET amplifier. This makes it possible for us to design a transformer with drastically reduced distortion and a straight edge flat frequency response from 20 Hz to 20 kHz.

Adding an amplifier before the transformer in our direct box design has virtually eliminated all the traditional difficulties with transformer-only direct boxes, but it has added a new one.

Phantom Power

Now we need power to run the amplifier, since the amplifier in our direct box has much in common with the FET amplifiers found in most professional condenser microphones, perhaps it could run from the phantom power used to run microphones. The only difficulty here is that the negative side of this power supply must be connected to console ground for it to function properly. This would seem at first to require us to connect console ground to instrument ground, thus completely eliminating all of our hard-won ground isolation. This is done in some of the less sophisticated FET direct box designs and severely limits their usefullness. In the Type 85 Direct Box design the problem is solved with a special circuit called a DC-to-DC converter. This circuit converts the DC microphone power to AC, isolates it with another special transformer, then converts it back to DC again to power the FET amplifier. For use on microphone circuits without power the Type 85 can also operate on a 9 volt battery.

Even though the combination of an FET amplifier with a transformer is very clean, most of the signal degradation that does occur is caused by the transformer. It would certainly be desirable to eliminate it if we could do so without generating other problems. The amplifier has eliminated our loading effects so all we need is a better way to couple the audio with maintainable ground isolation and good common mode rejection. It must stand at least 360 volts (in Europe) of ground difference while working, and much more without permanent damage. Let's look at some of the ways this may be possible.

On The Future of DIs

One way that comes to mind is to use a wireless microphone transmitter with the instrument. It may be a little expensive, but it does eliminate the shock hazard nicely. Seriously, though it is possible to incorporate a much simplified transmitter and receiver into a single enclosure, hence leaving them electrically isolated. Aside from the obvious complexity of operation it is difficult to design even simplified circuits of this type with noise and distortion specifications as good as a two dollar transformer. With enough improvement, however, there is no theoretical reason why this technique could not result in a superior direct box without an audio transformer.

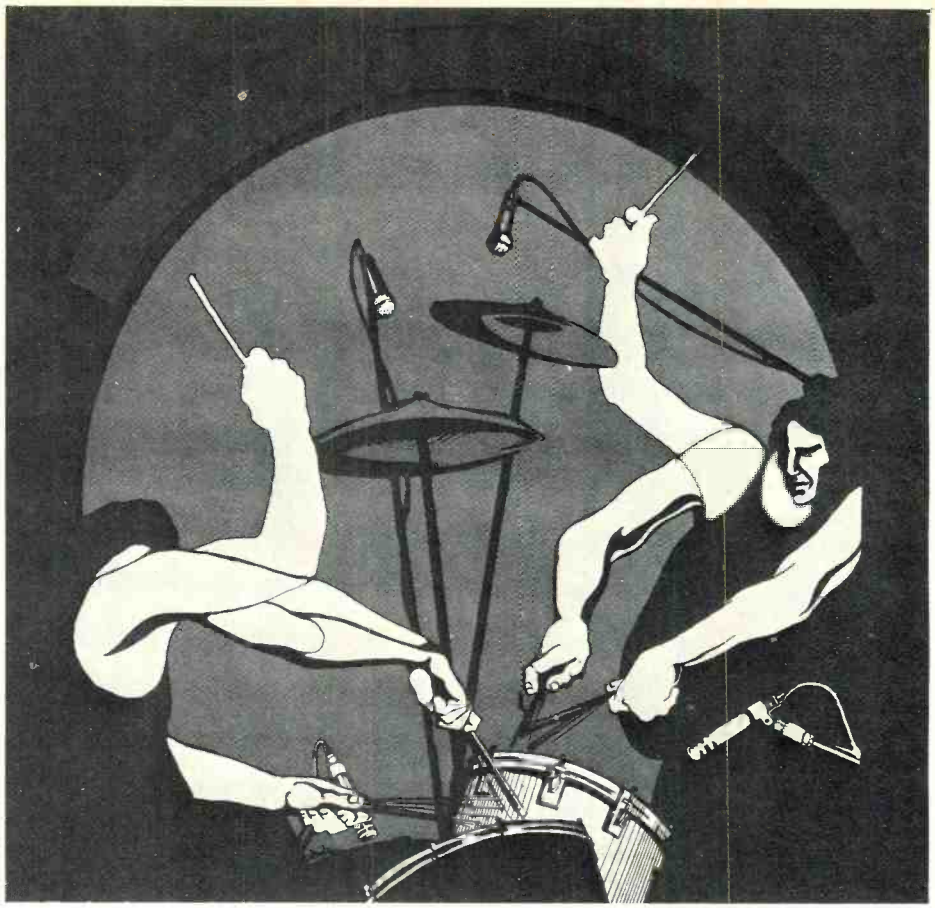
By pushing the state of the semi-conductor art to its present limits, it is possible to build a differential amplifier with low noise and just enough common mode range to make a direct box that will work under most circumstances. With care, it could provide a cleaner signal than the amplifier-transformer combination. It would consume at least 10 times the power of the Type 85, so compatible powering with conventional microphones would be out and non-rechargeable batteries would be impractically expensive. If enough people were sufficiently interested one could definitely be produced at some price and it could be very clean.

Another interesting approach that has some things in common with the radio link method is to transmit the audio with light, using an LED or solid state laser. The signal could even travel all the way to the mixing console (or the next state for that matter) on a fiber optic light guide. Ultimate ground isolation. This already works well with digital signals, but with the present generation of solid state light sources it is not practical to reduce distortion to levels better than a transformer and still maintain a decent signal-to-noise ratio. Look for this situation to improve in the near future.

Let's convert the audio from analog to digital from right in the direct box. Neat idea. Then there are at least a dozen ways to couple it to the console without any additional noise or distortion. In fact, it would be a good idea in an all-digital audio system to have all the analog-to-digital converters (and digital-to-analog converters, too) electically isolated. It would not add that much more hardware and we could kiss all of our ground loops goodbye.

Since many of the techniques that enable us to make better direct boxes also apply to designing better microphone inputs and, for that matter, audio processing equipment in general, I think we can expect continued improvements in direct box design as listeners become progressively more discriminating and motivate designers to constantly peck at the weakest links in audio processing systems.

□□□



DRUM TUNING FOR THE STUDIO ENGINEER

by Robert Hodas

Increasingly these days, engineers are being put into the position of having to create a new drum sound or imitate those of someone else. The purpose of this article will be to help engineers/mixers to understand the how's and why's of drum tuning; a guide to assist in putting a drum kit into tune so that the ears can make creative decisions based on valid tuning. The article will also want to stress the importance of cooperating with the drummer. The drummer must be comfortable playing or there is little likelyhood that his best possible performance will be recorded.

Five well-known drummers, spanning the spectrum of musical styles; jazz, rock, country, funk, and disco have contributed their methods and ideas on tuning, as well as drummer/engineer interaction. All of this is meant to assist the engineer to better understand a drummer's needs.

The Physics of the Drum Sound

To better appreciate the nature of the drum sound the physical properties of a circular vibrating membrane ought to be understood. Thus, for a head which is equally tensioned in all directions the formula for the frequency f_1 of the lowest mode (the fundamental) is:

$$f_1 = 0.766/D\sqrt{T/\sigma}$$

"D" is the diameter of the head in meters, "T" is the tuning tension of the head in Newtons per linear meter, and σ is the density of the head in kilograms per meter.

The fundamental mode and five partials are illustrated in Figure 1. These frequencies, though theoretical, have been substantiated by studies such as those performed by Obata and Tesima.[1] A drum head behaves the same as a struck string in that all modes vibrate simultaneously.

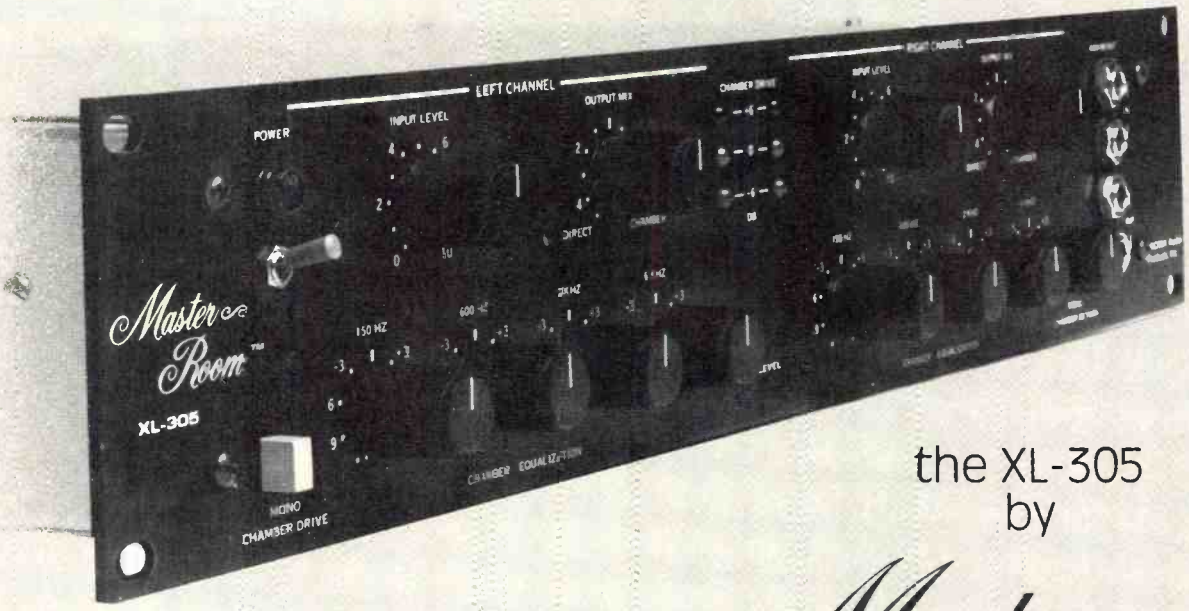
Concerning sound energy, the fundamental (a) radiates the greatest amount, followed by the second mode (b) with the higher modes contributing only a small amount of energy. But sound energy in this case is not connected with tone. The fundamental moves the greatest amount of air because the entire head is moving in phase. Because of the damping

— the author —

Bob Hodas began studying drums and percussion at age nine, continuing through college with percussion specialists from such fields as African and Middle Eastern rhythms. He has worked as a session drummer since 1971 in various studios around the country where he developed an interest in engineering. After a wrist injury in 1977, engineering became a full-time career. During 1978 and 1979 Bob toured with the Doobie Brothers as a drum sound specialist, tuning drums and mixing 26 channels of drums and percussion for concerts, television, and radio programs. In May he will assume the position of Vice President/General Manager of Record Plant, Sausalito, California.

Incredible...

the "Acoustic Chamber Synthesizer"™



the XL-305
by
Master Room™

- Totally new design approach
- The sound of a live acoustic chamber
- Natural sound, even on percussion
- Self-contained rack mount unit
- Full two-channel stereo

The Master Room XL-305 is a totally new design approach in reverberation technology. For the first time, the qualities and properties of a live acoustic chamber are available in a rack mount unit at an affordable price. There is a natural sound on percussion, as well as voices and all other musical instruments. This quality has not been obtainable from other compact reverberation devices. The XL-305 exhibits no unwanted side effects; it's as natural as a live chamber itself.

To hear this new advancement in reverberation, see your professional audio dealer and ask for a demonstration of this exciting new unit. Hear the XL-305 "Acoustic Chamber Synthesizer" for yourself, and you too will agree . . . It's INCREDIBLE.

MICMIX Audio Products, Inc.

2995 Ladybird Lane Dallas, Texas 75220 (214) 352-3811

for additional information circle no. 90

— the drummers —

Aynsley Dunbar is a rock drummer of great respect in the U.S. and Europe. He recently joined Jefferson Starship to record the platinum album "Freedom at Point Zero." His professional career began in 1967 with Aynsley Dunbar's Retaliation, and continued with David Bowie, Herbie Mann, Frank Zappa, and Journey, to name just a few.

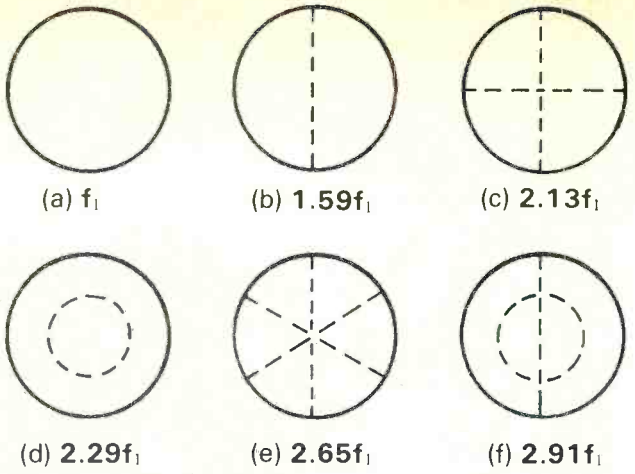
Larrie Londin began his recording career at age 15 and by 19 had five gold records. NARAS voted him Most Valuable Player for 1977 and 1978. Londin has worked on numerous television shows and movie soundtracks, and his recording artist credits include Dan Hill, England Dan and John Ford Corley, Dolly Parton, Olivia Newton-John, and Elvis Presley. His favorite personal album — Jackson Hawk, "You Can't Dance." His favorite other drum recording — John Guerin with O. C. Smith, "For Once In My Life."

Bernard Purdie is a much imitated drummer who developed many of the funk beats used by today's drummers. With credits too numerous to list, the past year has seen Purdie doing sessions for Steely Dan, Cheryl Lynn, Roy Aires, Herb Alpert, and the soundtrack for "Hair." Purdie has recently formed his own eight-piece group called Purdie Good. His favorite personal album — "Aretha Franklin Live at the Fillmore." His favorite other drum recording — Dave Garibaldi with Tower of Power, "Back to Oakland."

Hal Blaine began session drumming in 1958 and has since worked on over 160 gold records. Along with television spot work in the past year, Blaine has worked with such artists as John Denver, Martin Mull, Jerry Lee Lewis, the Beach Boys, and the Captain and Tennille. His favorite personal album is Richard Harris, "McArthur Park." His favorite other drum recording — Gene Krupa with Benny Goodman, "Sing, Sing, Sing."

Shelly Manne is a consummate musician, bandleader, and composer. A veteran of the Big Band era, Manne has won countless awards and Down Beat Polls. His varied style has been heard on numerous movie and television soundtracks while his recordings range from his own band to those of Ornette Coleman and Oliver Nelson. His favorite personal album — Shelly Manne, "My Fair Lady." His favorite other drum recording, Tony Williams on any Miles Davis album.

Figure 1



MODES OF VIBRATION OF A CIRCULAR MEMBRANE

factor of the air, this rapidly radiated energy quickly dies. The fundamental, then, is heard basically as the initial attack.

Responsible for the tone and generating the second greatest quantity of energy is the second mode (b) with one diametral nodal line. This mode, and those of the higher partials are not heavily damped as is the fundamental. Each section of the partial radiates 180 degrees out of phase, and by cancelling the adjoining sections sound radiation loses energy less rapidly than the fundamental. Thus the tone rings on, with higher partials contributing overtones.

For a quick and simple verification (the eyes know, now tell the ears), hit a tom dead-center with a drumstick. A blow dead-center will generate maximum energy of the fundamental and a thud will be heard with not much tone. Next, strike the drum about halfway between the center and the rim. This generates energy in the second mode's area of greatest amplitude and less in the fundamental. Listen to the tone and overtones that were lacking when the drum was struck dead-center.

Drum Heads

Selection of drum heads is important as their thickness and style will have a great deal of effect on tonal quality. Since there are so many styles of heads manufactured today, a mixer's ears ought to reveal more about the sound a particular style of head produces than any description on paper. However, it can be generally stated that the transparent and smooth, white heads seem to have maximum tone, while heads such as controlled sound dots or hydraulics have tone damping qualities designed into them. Thinner heads have the most attack with slow decay times, hence more tone. Thin heads also seem to have the least projection. Thick heads have a duller attack, very fast decay time, and good projection. Medium thickness heads ride between these two. Listening is the key to deciding which head is best for a particular application, but it is primary to consider the power of the drummer who is going to be hitting the heads. Thickness relates to durability, and a rock drummer who plays with war clubs will go through thin heads almost faster than they can be stocked. **Larry Londin** told me, "I use Emperors (heavy heads) because I hit the drums real hard. If some guy puts a Diplomat (thin head) on I could go through it halfway through a tune, and ruin the take."

The importance of selecting the right head may be illustrated by another example. Consider the jazz drummer who has trouble relating to a clear or CS head on a snare drum. These heads typically do not provide the necessary friction of a coated head for brush work.

A look, for a moment, at the types of heads the drummers are using will be interesting. All of them use Remo heads with the exception of **Aynsley Dunbar**, who uses Ludwig heads. **Shelly Manne** and **Bernard Purdie** like the coated Diplomat (thin) on all of their drums. **Hal Blaine** uses clear Diplomats and **Larry Londin** uses clear Emperors (thick) on all toms. Blaine chooses Diplomats for tone, while Londin chooses Emperors because of his power. Dunbar uses a clear 1000 DB Rocker (medium gauge) on his toms. On top of the snare Blaine uses coated Diplomats, Londin uses coated Emperors, and Dunbar, coated 1600 DB (heavy). All use a respective snare head on the bottom. Purdie, Londin, and Dunbar use plastic kick drum heads. Manne and Blaine use calfskin, which they feel is worth the extra trouble in tuning for the better tone.

Calfskin? You ask!

Isn't calfskin what drummers of old used?

Clearly, (no pun intended) plastic has some

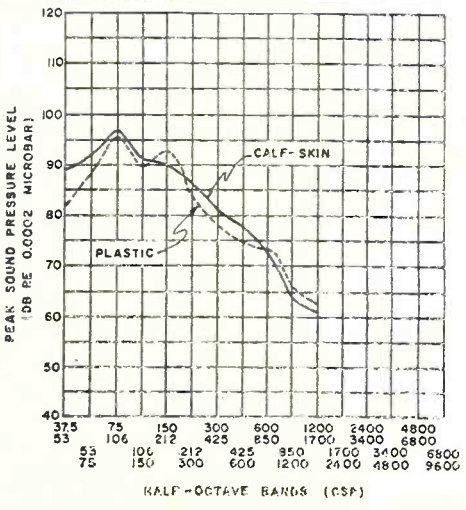


Figure 2: Peak sound spectra of bass drums with calfskin and plastic heads. The drums were tuned to concert tightness and played with a single stroke.

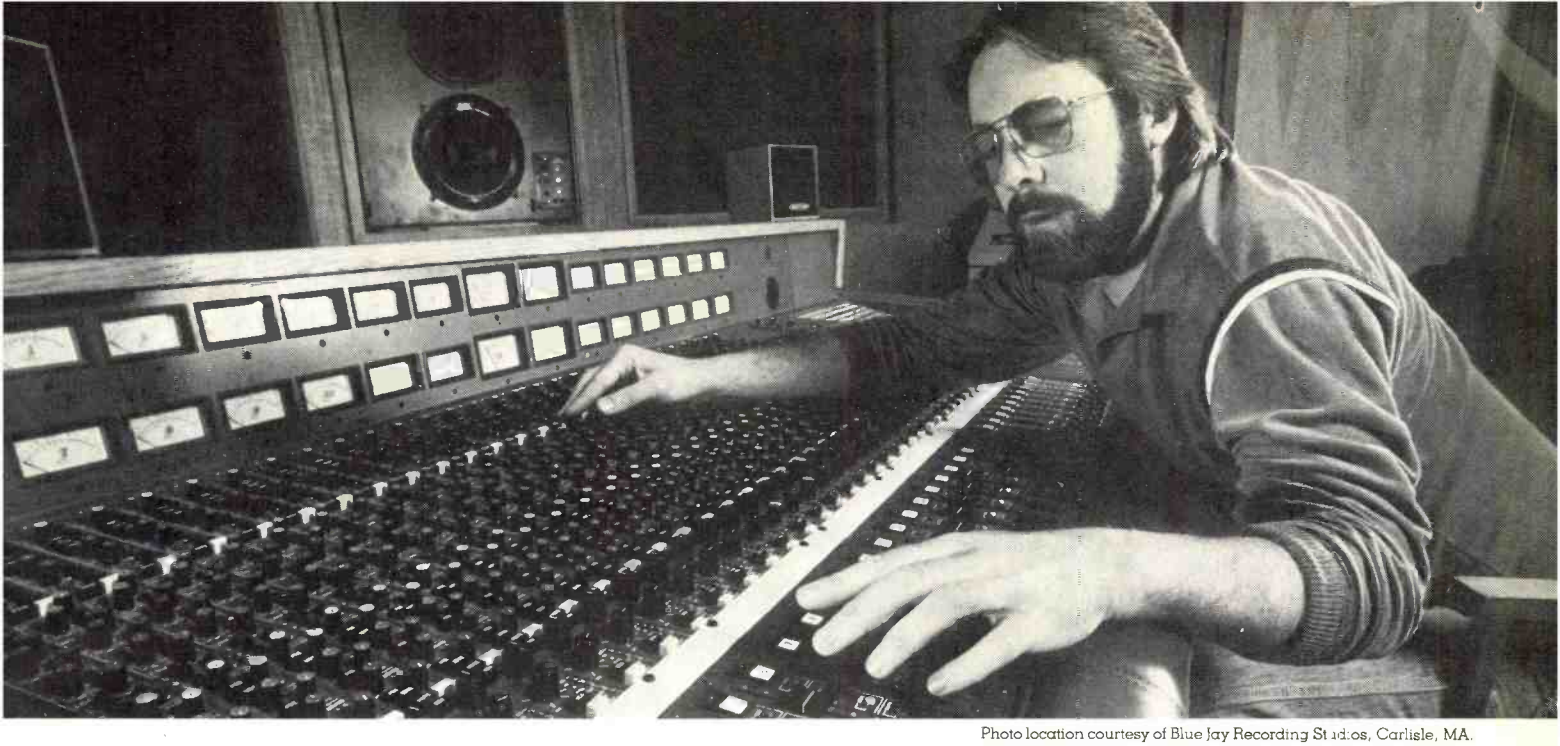


Photo location courtesy of Blue Jay Recording Studios, Carlisle, MA.

LOW DISTORTION AND LOW NOISE ARE THE LEAST YOU SHOULD EXPECT FROM A VCA.

We think a voltage controlled amplifier is the heart of your console.

That's why the new dbx Model 2001 not only delivers a distortion and noise combination as low as any you can find on the market today. It also goes a lot further.

The 2001 maintains its specified performance and musical clarity regardless of input and output levels. Its 50MHz bandwidth, widest in the industry, means you can add more than 30dB of gain without worrying about high frequency distortion or attenuation. And unlike other VCAs, the Model 2001 won't "thump" when you mute or duck a channel.

INTRODUCING THE STATE-OF-THE-ART DBX MODEL 2001.

The unique dbx 2001 package requires a minimum of external circuitry and trim for greater reliability and easier installation while providing thermal stability.

Ever since we developed the very first VCA for professional audio recording in 1972, we've paid attention to the little things that make a VCA more reliable and easier to use.

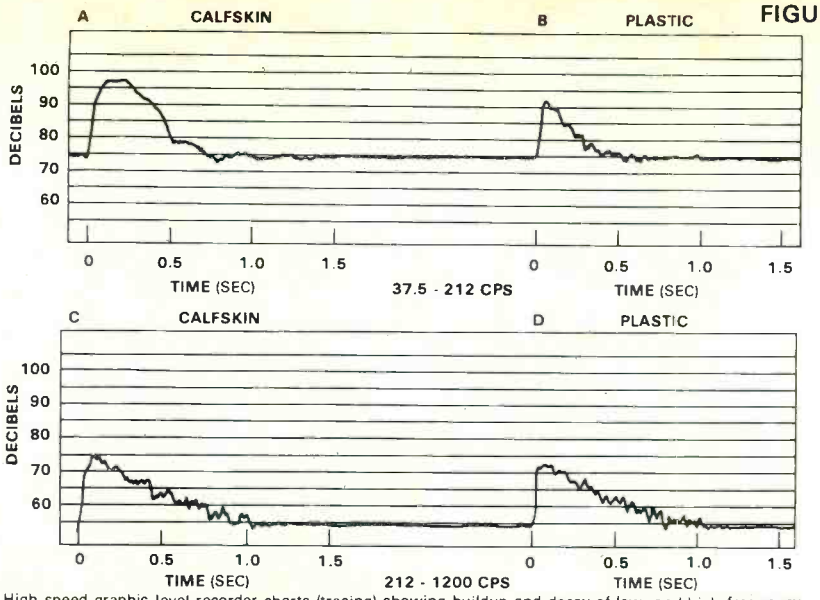
Which is probably why most consoles manufactured today use dbx.

Write for details on our complete line of high-performance VCAs. And be prepared to raise your expectations.

dbx, Incorporated, 71 Chapel Street, Newton, MA 02195. 617/964-3210.

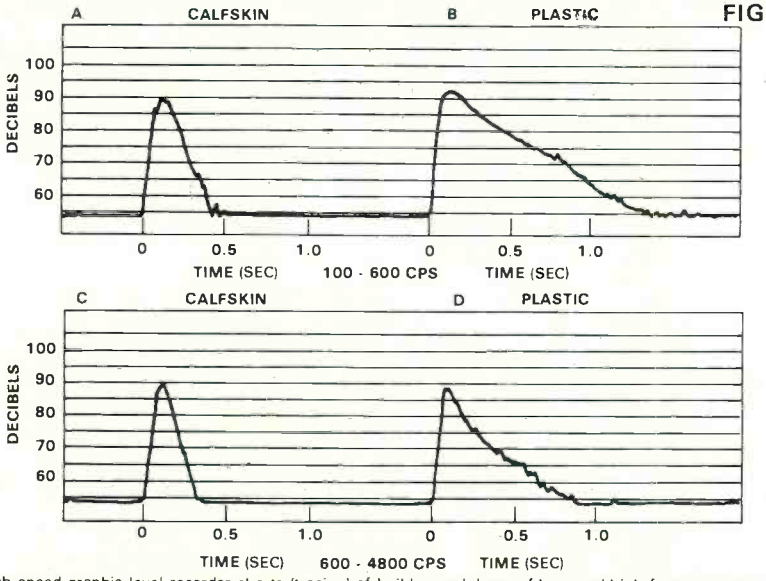
dbx®

FIGURE 3



High speed graphic level recorder charts (tracing) showing buildup and decay of low- and high-frequency components of bass drum sounds. Calfskin and plastic heads are compared for the concert tightness adjustment, the drums being played with a single stroke.

FIGURE 4



High speed graphic level recorder charts (tracing) of buildup and decay of low- and high-frequency sound components for normal field drums with calfskin and plastic heads, played with a single stroke. The ordinate is quasi-peak sound pressure level.

great advantages over calfskin in terms of tuning consistency in variable climatic and environmental conditions. This is especially critical in concert applications where lights and crowd levels may change stage temperature by 30 degrees, to say nothing of changes in humidity, as well. So, it is true that plastic can be used in places where calfskin doesn't stand a chance. But in a studio with controlled temperature and atmosphere calfskin heads, when they can be obtained, may provide a very desirable sound.

Hardy and Ancell[2] compared calfskin to plastic heads in tests that pose some interesting similarities and differences. In their bass drum experiments both types of heads gave equal maximum output at 75 - 106 Hz and decayed at the same rate (Figure 2), but the plastic head had another peak at 150 - 212 Hz, about 3 dB louder than the calfskin, with its decay less uniform. The calfskin has lower frequency information approximately 6 dB louder in the 37.5 - 75 Hz region. These differences are clearly audible, with the calfskin having richer bottom end. Figure 3 also demonstrates the difference of low frequency information between the two heads.

Similar experiments were performed with field (marching) snare drums. While spectral analysis of the two heads were quite uniform, the decay characteristics reveal important differences (Figure 4). Though peak levels are similar, the plastic head has a much longer decay time. This results in extended ringing, which is easily heard. Calfskin was also found to have a larger tension range than plastic, allowing a greater range of tone selection.

'Fiberskyn 2' is a new head recently introduced by Remo, which has received impressive comment. This head possesses some of the advantages of both plastic and calfskin. Being a plastic, the head survives temperature and humidity changes with ease, though it apparantly doesn't quite have the tonal range of calfskin. Sonically it is typified as having a warm bottom end without the ringing or the hard plastic attack typical of plastic heads. 'Fiberskyn 2' could turn out to be a fine studio head.

Mounting and Initial Tuning

With the preceeding as a guide to the type of

sound as well as the type of head to be used, mounting and tuning is the next step. The classical even-tuning method is by far the easiest and best for an initial tuning.

Obviously, to begin with the head is placed on the shell with the hoop seated over it. The lugs are hand-tightened until they meet the hoop firmly. This gets the process started on an even basis, and if the tension is kept even throughout, in the long run, it will be easier to produce the desired tone.

Now, using a drum key, starting at the twelve o'clock high position, tighten each lug one full turn. Move clockwise around the drum tightening the lugs in the sequence shown in Figure 5.

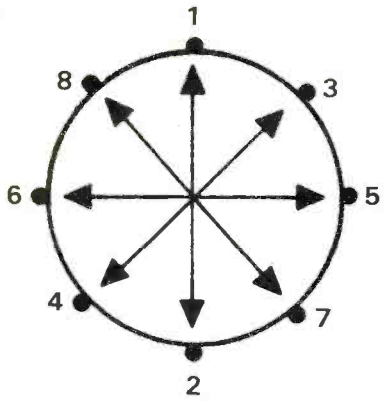


FIGURE 5

Tightening lugs in opposing order insures that the head is seated evenly. Once completed, repeat the process again, tightening only one half turn of the key.

At this point a deviation from the classical method of mounting has grown out of the use of plastic heads. (It must be emphasized that this deviation must not be used for mounting calfskin heads.) With the drum placed on the floor, shoes removed, stand on the head in the center of the drum. Why? For very much the same reason that a guitar player pulls on newly installed strings before a first performance with them. It is an initial stretching so that the head does not go flat when first played. There is little need for worry about breaking heads when standing on them in this manner. Plastic heads are designed to withstand a minimum of 3,900 pounds of tension. It is even possible to bounce a little on each head. A cracking noise accompanying this procedure is perfectly normal. There isn't any need to get paranoid. The noise is only the head separating a bit from the rim bond. Of the more than 500 heads this author has changed during the last couple of years, only one has broken. It was found to have been imperfectly manufactured.

Standing on the bottom head of a snare drum is neither necessary or advised.

Important: Continuing, using the same tightening order, the lugs should now be tightened another quarter or half turn until the desired pitch is reached.

Fine tune each lug by lightly striking the head, one to one-and-a-half inches from the rim, continuing to adjust the tension until the tone is the same at each lug. A strobe tuner can be a valuable tool for use at this point in the process. If care has been used to maintain even tension from the start, fine tuning will be relatively simple; if not it can turn into a real chore.

Once the top head has been installed satisfactorily the process is repeated on the bottom, if the drums are to be used with two

DRUM TUNING

heads.

Uneven tension tuning will be mentioned later on.

The Two Head Question?

Are two heads better than one? The answer is far from definitive. Londin, for example, uses one head on his toms for must sessions, but finds that New York engineers frequently request him to use two heads. Blaine uses one head for concert and rack toms with two heads on the floor toms. Manne has the same setup as Blaine, yet prefers the sound of double heads. Purdie also prefers the sound of double heads, but like Manne he will remove the heads at an engineer's request. Dunbar uses two heads on all his toms. All the players use only one head on their kick drum.

Although single-headed drums have become the vogue, two heads on toms is the traditional way of playing and a good engineer should know the techniques of both single and double head tuning. Some basic rules can be used which demonstrate how the relative tension between top and bottom heads affects the tone. With the top head more loose than the bottom head projection is at a maximum. The tone will be very open, and the initial attack is heard at a minimum. This type of tuning can be very effective if the sound being sought is for a note bending effect, where the decay sounds like 'Baarooomm'. Dunbar likes this method, usually tuning the bottom head a fourth tighter. He also feels this cuts out some undesirable ring.

With the top head tighter, and the bottom looser, the tone is typified as closed, with the emphasis on attack. This tuning is more brittle and notes tend to bend upward, if at all. Purdie, for one, likes this tuning because of the attack and ring.

Even tuning of both top and bottom gives a pure sound with no note bending. Studies show that with even head tension the fundamental operates at a maximum. Measurements of the bottom head of a drum show the existence mainly of fundamental, demonstrating that air coupling is not affected by the higher partials. As stated earlier, higher modes dissipate very little energy. On occasion, when he plays double heads, Londin uses even-ratio tuning as does Manne and Blaine.

The tendency in recent years has been away from double heads and toward removing bottom heads. This allows for greater projection and a broader range of tuning. This practice seems to have been popularized by Hal Blaine who first used it on a Frankie Laine record called "Don't Make My Baby Blue." At that time he was using a set of metal timbales which he tuned low, and used as a set of toms. The idea blossomed into a custom built set and then a production model called 'Octopus' by Ludwig. Blaine tunes his toms just below the mid-range of the drum. This allows for a deep tone and an interesting note bending. His sound became so popular that producers were known to rent his kit just to have that sound on their sessions. Londin also utilizes the method of tuning his drums very low. In fact, he now uses a 14-inch tom as a floor tom since engineers were having trouble getting the low end on tape that had been created by 16- and 18-inch toms.

Odd Tension Tuning

A tuning trick sometimes used by Londin and Manne for certain rock applications is that of odd tension tuning. This involves loosening one lug of an otherwise evenly tuned drum in order to get the note to bend. This method will involve some experimentation on the user's part. Londin feels this type of tuning works best on small drums as the larger heads tend to flap if too loose.

The Drum's Resonant Properties

Like a guitar or violin, whether fibreglas or wood, every drum has resonant properties that should be taken into account when tuning. The most pleasing tone will come from a drum that is tuned within the range of the shell. All the drummers interviewed feel strongly about this.

Until recently, no one had taken into account the resonant properties of shells when designing tom-tom stands. Manufacturers actually support their drums by attaching stands directly to the shell, thereby greatly restricting their resonance. Studies by Obata and Tesima demonstrate "... the presence of a remarkable amount of vibration in the body corresponding to the fundamental of the membrane." In their comparison of a drum resting on a stand as opposed to one suspended, the suspended drum demonstrated a rise in pitch of the fundamental and reduction of damping. Higher modes of vibration remained virtually unchanged. This can be proven empirically with a quick and simple experiment. Strike a tom mounted on a stand, listening to the fundamental and projection. Then remove the drum from the stand and, holding it by the rim, strike it again. A great increase in resonance and projection will be noticed, along with a longer lasting fundamental.

New mounting hardware which suspends the drum by the rim, allowing the shell full resonant advantage, has recently been invented by Gary Gauger, of Minnetonka, Minnesota. The new product will be marketed under the RIMS trademark, and having listened to the prototype it seems to be a significant breakthrough and improvement in allowing true tonal and acoustic freedom for the instrument.

Tuning the Kit

None of the drummers tune their drums to specific notes. The spread of a kit may be tuned over an octave with defined intervals, but not to any particular notes. Londin spaces his drums in thirds. Manne's drums are a minor third or fourth apart. Blaine says he likes to tune his kit high to low with the snare acting as soprano, the toms in a low octave run, with the

kick drum on the bottom. Dunbar shoots for a melodic run, but no specific interval. Purdie says of tuning to notes, "If you tune to a specific note, a fill could interfere musically with a certain passage, or if you hit a tom that is the same note as the bass player you're going to wipe him out."

A quick word about kick drums. Even tension here is a must as any note bending is undesireable. A loose head will produce lots of slap and attack, and almost no tone. The tighter the head, the more tone and boomy quality the bass drum will yield.

It is important to stress that what fits best in the particular piece of music is always a product of intense listening. At the extremes would be disco with a real flat thud and lots of attack, to the jazz idiom where the preference is for lots of boom from two heads on the kick.

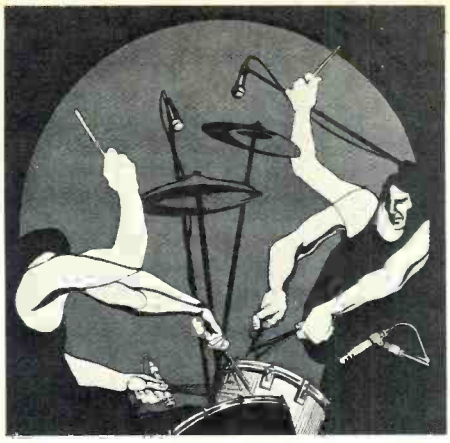
Lastly, a discussion of the snare drum, the backbeat of the session, is in order. The snare drum heads are of two different thicknesses with a batter on top and a thin snare head on the bottom. The top head excites the lower head just like the tom, and the lower head vibrates against the snares producing the distinctive snare sound. Snare heads come in three thicknesses, the thinner the head the more it will vibrate. Several general tuning principles can be stated: Tuning the batter head loose will produce a fat, deep, dead sound while a tight batter will produce a dry, crisp, bright sound. A loose snare head (bottom head) will give less snare buzz with a deeper tone. A tight snare head will give a brittle, crisp snare response. The one thing that many engineers forget is that the snare drum is just like a tom and should be tuned as such . . . with the snares released. Then when the desired tone is achieved, the snares are applied, the sound ought to be a killer. Too many engineers have been observed struggling to get a good sound on a buzzing drum with no real idea of what the drum's tone is without the snares applied. Always release the snares, tune the drum, then re-apply the snares.

There is probably no way to tell anyone tuning a snare drum how much tension to apply to the snares. By trying the following simple listening test the correct amount of tension on the snares should become readily apparent. Start with the snares fairly loose and buzzy. As the drum is hit, slowly increase the snare tension while listening to the change in buzz. When the snares can be heard beginning to choke the drum, tension on the snares should be backed off a triffle. This ought to produce a drum that is not overly buzzy, yet is crisp and open.

A couple of human factors tips to the engineer who tunes drums may be in order. How hard a drum is hit will affect the sound. Obviously! The time spent working with the session's drummer on the tuning and the setup, before the tape rolls, is very well worth the effort. A different drummer will hit harder or softer, thus changing the tone. It may be that what sounded great when the drums were tuned won't make it onto the tape once the session begins. The more easily the player interfaces with the technology the better the end result. The player must feel comfortable hitting the drums. If he has to do a double roll across toms that feel like sponges to him, for example, it is guaranteed that the performance isn't going to be a "10."

Damping

Once the drums are in tune undesirable overtones and prolonged ringing may still be in evidence. This will be the case, more often



DRUM TUNING

than not, with thin heads rather than thick heads. Damping is the normally used cure for these conditions. It should be stressed, however, that damping should be used to refine a drum's sound, but not make up for a poor tuning job. All of the drummers mentioned prefer to use damping sparingly, only when necessary. The sole objective of damping is only to subdue overtones, not to affect the fundamental and secondary which create the drum's true tone.

The elimination of these overtones can be accomplished by a variety of damping techniques and materials. The use of gaffer's tape, tape over tissue, foam, or cloth is well documented. Blaine likes flower decals, the kind used to decorate bathrooms. He applies one of these to the head (again, no pun intended) in question, then tears off petals until the desired tone is found.

Personally, the best thing I've found is taping Stayfree Mini Pads to the offending membrane. They are cheap, easy to find, and can be cut to any desired size. Their layered construction makes them an ideal energy absorber when secured to a head with gaffer's tape. In application, the pad is normally completely covered by tape (Figure 6). However, leaving one edge exposed (Figure 7) allows the pad greater freedom of movement, becoming an excellent vibration damper. Occasionally a whole pad is used on a badly ringing floor tom or a snare drum to get an especially fat dead sound. For those who like to cut a hole in the front kick drum head, one or two whole pads are taped to the inside of the front head. This prevents the high sympathetic tone and ring set up by the batter head which can interfere with a good kick sound. Since these pads are plastic-backed, always tape them with the absorbant side to the head. While talking about the kick, suffice it to say that the industry standard for damping the batter head is a blanket or pillow leaning against the head inside the drum.

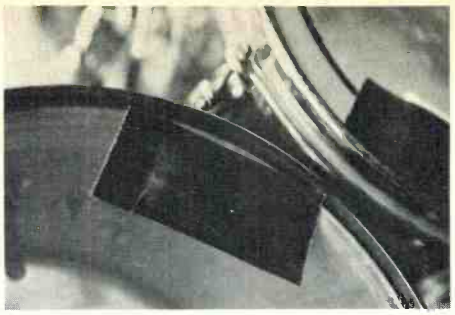


FIGURE 6
Fully Taped Damping Pad

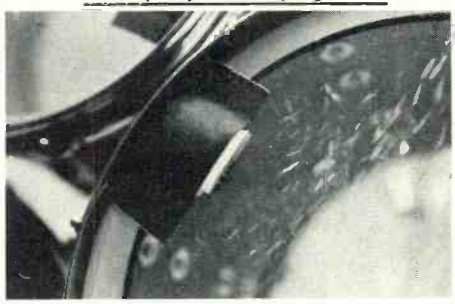


FIGURE 7
Damping Pad Taped on 3 Sides

Absorbing vs. Mass Load Changing

While pads dampen by absorbing energy, small pieces of tape or Blaine's decals move with the head and can have the effect of mass loading. By adding mass to the drum head one can actually raise the frequencies of the normal modes. By changing mass position with respect to nodal lines, one can alter the amount of desired effect. Adding mass at the point of maximum excursion will produce a maximum change.

For example, if we attach mass to the center of a drum head we will be affecting the fundemental at its point of maximum excursion. The second partial, however, remains unaffected as the centered mass sits on its nodal line (Figure 8A). If the mass is moved away from center, halfway to the rim and perpendicular to the nodal line, it will have a maximum affect on the second partial and less of an affect on the fundamental with no affect on the second partial. By changing mass position and size one could affect the relationship of the modes, seeking a more harmonic drum tone.

Finding the nodal lines is not as difficult as one would first assume, and proficiency comes quickly. Using a small piece of Minipad, about an inch section, and starting at twelve o'clock on the drum head, the pad is moved clockwise around the head, while striking the drum with a stick. Only enough pressure is applied to the pad with the finger to keep it in place. The pad is positioned about an inch or two from the drum rim, depending on the size of the drum. The drum is struck off center to emphasize

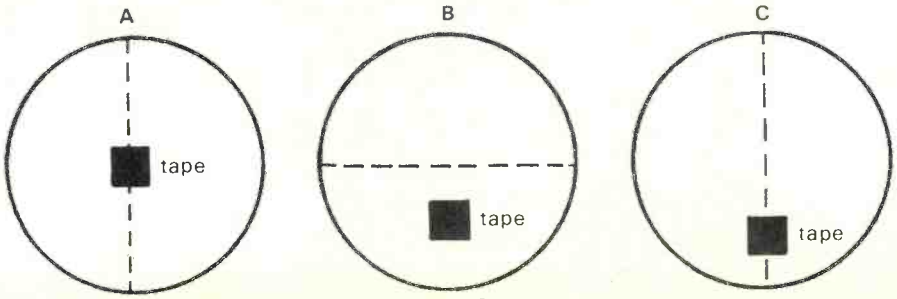


Figure 8
Placement of mass on drum head with respect to nodal lines.

FIGURE 9
Snare Damper At Work

partials, (it has already been established that there are no nodal lines in the fudamental). By striking around the drum, spots where the pad damps the tone and spots where the drum rings free will be noticed. Areas that ring free signify the presence of a nodal line. Once these areas have been identified, mass addition, or damping, can be added to yield the desired sound. It ought to be remembered that even head tension is critical to accomplish this procedure successfully.

The annoying tendency of the snares to rattle during tom fills or when in close proximity to amplified instruments has always been a pet peeve of good recording engineers. If the philosophy of the engineer is to solve the problem acoustically, rather than electrically, (some of us have endured the hardship of growing up in this business without a rack of noise gates), solving the snare rattle problem should be approached from the mechanical standpoint. Taping up the bottom head and snares choked the drum too severely so I developed a damper (patent pending) that rests on the snares to control the buzz (Figure 9). Placement of the device is critical as there is a limited area in which to damp the head in order to eliminate the sympathetic vibrations. This damper has been used for the past two years by the Doobie Brothers drummers, and has proven very effective both in the studio and in live concert.

Damping can make a critical difference in a good drum sound, and learning to use a minimal amount of damping effectively or inventively is worth the time it takes to experiment. A drummer will not enjoy playing a kit covered up with tape, towels, cardboard and wallets.

Hardware

We must briefly mention the affects of hardware on the sound the drum kit produces. There are aspects of these components that certainly affect recording. Nothing is more annoying than rattling hardware on a drum track. This simply cannot be fixed in the mix, so it must be fixed before the session ever starts. Some of the worst offenders in this regard are the internal dampers which have a tendency to loosen up and rattle (they aren't efficient as dampers anyway). It is suggested that all internal dampers be removed from the set. Unused lug receivers on toms with only one head are especially susceptible to rattles. Lug receiver spring buzz is easily cured by removing the receivers from the shell and packing them with Vaseline or felt.

Where microphones are mounted on cymbal or drum stands with microphone clips the possibility exists that resonances from the hollow stand tubes will be transferred to the microphone. A cure for this is to fill the hollow stand tubes with silicone. At the very least, always shock mount microphones set up in this manner.

Dunbar has a sure fire method for keeping his drums in tune during sessions. He threads nuts onto the lugs before screwing them into the receivers. Once the drum is in tune he tightens the nuts down on the receiver so the lugs can't vibrate loose. This is a really sensible approach for the power hitter.

Dunbar also has a suggestion to engineers about recording cymbals. Many tape up cymbals to cut down prolonged ring. Unfortunately, this also cuts out the brilliance and life of a cymbal. So, instead of taping and damping, select a smaller, thinner cymbal with fast decay.

Drum Booths

A quick word on drum booths. From Aynsley Dunbar, "I hate 'em!"; from Shelly Manne, "I might as well stay in my living room and set up my drums and run a long wire to the studio." All but Blaine felt the same way about booths. Musicians grow-up playing next to each other, communicating by eye contact and "feeding off each others vibes." The great majority are much more comfortable with an open acoustic balance than with a headphone mix that usually has too much of one thing or not enough of another.

A big drum sound is usually obtained in a big room making use of ambient microphones. Most of us are most comfortable listening in an environment that has a mixture of direct and reflected sound. Recording in this type of room, many drummers feel, adds life to a sound that is too dead and sterile in booths. It is not our purpose in this article to get into room acoustics; but every room has its most advantageous spot for drum kit placement. Suffice it to say that most drummers prefer to cut tracks in a room where they can interact with their compatriots. Learning to take advantage of microphone bleed might be an advantage for these types of sessions.

The problem facing engineers today, many times, comes down to the question of product versus art. A studio drum kit can save time and money for demos and spots, but will probably not properly reflect the sound a group is trying to present on an album project. The industry has seen a lot of attempted duplication of "hit sounds." It is not the purpose to pass judgement on this practice, what this article has attempted to do is suggest some tools needed to work with a drummer's own sound and provide some insight for individual experimentation.

I would like to give special thanks to Aynsley Dunbar, Larrie Londin, Shelly Manne, Bernard Purdie, and Bill Carpenter, of Remo, for their time and the thoughts contributed to this article. □□□

References:

1 - E. T. Kornhauser and D. Mintzer, *On the Vibration of Mass Loaded Membranes,* JASA Vol. 25, No. 5, 1953, pages 903-906.

2 - H. C. Hardy and J. E. Ancell, *Comparison of Acoustical Performance of Calfskin and Platic Drumheads,* JASA, Vol. 33, No. 10, 1961, pages 1391-1395.

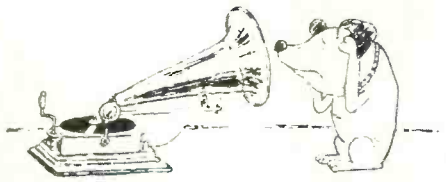
3 - J. Obata and T. Tesima, *Experimental Studies on the Sound and Vibration of Drum,* JASA, Vol. 6, 1935, pages 267-274.

4 - J. Backus, *The Production of Musical Sounds: Musical Instruments,* W. W. Norton & Co., 1969.

5 - A. Leitner, *Vibrations of a Circular Membrane,* American Journal of Physics, Vol. 35, 1967, pages 1029-1031.

6 - A. H. Benade, *Fundamentals of Musical Acoustics,* Oxford University Press, New York, 1976, pages 136-145.

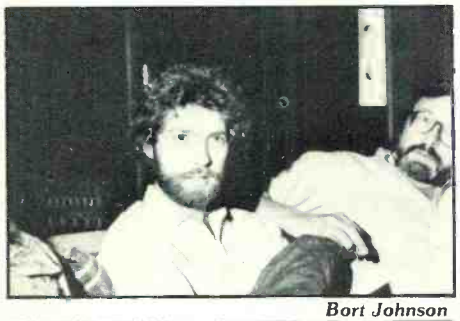
MAINTENANCE ROUNDTABLE



The maintenance engineer is the bearer of bad news. Although he isn't put to death for such information as were the messengers in days of old, he is not looked upon with favor when he must inform an anxious and sometimes intense client or clients that the thirty or so string players can take a half-hour break while the mixing console undergoes minor surgery. After all, it's his responsibility to keep the equipment in perfect operating order. He is the one who fixed it last. If that's not enough, some studios view the members of the maintenance department as the villains responsible for all down time and the exorbitant expenditures for useless items like spare parts and test equipment.

Jerry Jensen

The fact of the matter is that every recording studio owes its reputation for quality and dependability to those generally faceless few who are on call to return any piece of equipment to optimum efficiency, at any hour of the day or night. Now, with the dawning of a new decade, the role of the maintenance engineer seems to have gone beyond mere competence and responsibility for technique expertise.



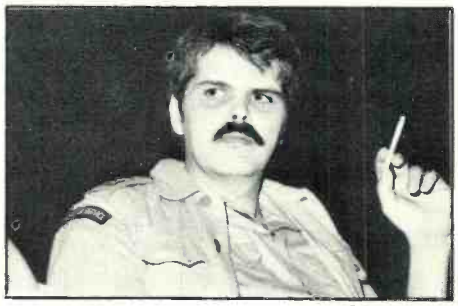
Bort Johnson

'Head Games' . . . the Non-Technical Aspects of Studio Maintenance

"You literally have to know how to do everything," says Capitol Records' **Jerry Jensen.** "If there are twenty string players out in the studio and the mixer has a flat tire in West Covina, you better know how to start the date."

Many times what needs *fixing* is not exclusively an electrical or mechanical problem, and the key words are diplomacy. Jerry has experienced situations where "maybe an engineer's forgotten to push a button or something. You have to go down to the studio and straighten the situation out without making the mixing engineer look like an idiot. Anyone who can't be tactful and discreet will have a tough time in this business."

Bart Johnson, of Indigo Ranch in Malibu, describes walking into a control room to remedy a problem during a session as "an event requiring a unique blend if objectivity, perceptivness, and social grace."

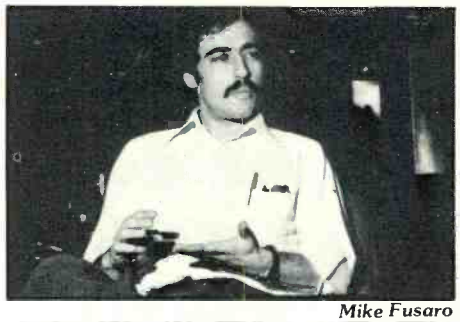


John Sands

John Sands feels it's necessary to develop the ability to "cloud men's minds so that they cannot see you. In that way there will be a tendency for the creative people in the room to look upon the maintenance engineer as an extension of the equipment." This is a valuable asset in the sense that many times only the engineer knows that there is a problem. Maintenance can then slide unobtrusively into the control room, repair the malfunction, and leave without upsetting the session. "It helps to be able to carry on a pleasant conversation," muses John. "There's a magic involved in doing one thing and making it look like you're doing something else, while all the time it appears effortless."

Everyone present agreed that checking on sessions in progress was a good habit to develop. In that way the maintenance engineer can build a good rapport with the client, answer questions, and generally reassure the client that everything is in good working order. This clears the creative minds of any thoughts of possible technical difficulties. In the event that something does go wrong, maintenance is a non-threatening part of the situation. He is familiar with the setup in the studio at the time the trouble occurs, and repair procedures generally progress faster and more efficiently.

Peter Butt



Mike Fusaro

With so many demands on the maintenance engineer, it's imperative that he not alienate himself from anyone in the studio. In studios where the maintenace function has fully matured and open cooperation will exist with the studio/manager in order to know well ahead of time what client is booked into which studio, so that the right equipment can be installed and checked out before the session begins.

At the other end of the scale, the best and most open communication must also be developed with the second engineers. John Sands has found that a little education goes a long way. "All our seconds have some maintenance experience which takes a great weight off the maintenance department. Although they don't get in and fix things, they have the ability to troubleshoot problems intelligently." That type of planning has almost eliminated the call at four o'clock in the morning to the sleeping maintenance man who is told "you better come down to the studio, everything is fouled up," when in reality only a speaker fuse has blown.

Jeff Hanson

Of extreme importance, it was pointed out, is not to intimidate the seconds, especially if there is a history of problems too minor to call maintenance for, or to write trouble reports for. For example, suppose a trouble report is filed and the investigating maintenance engineer finds that nothing is wrong. Is that the fault of the second? No! A problem probably did exist, perhaps as a result of improper set up or an intermittent problem (i.e., a patch cord). In treating situations like this it is of primary concern not to give the second the feeling that he shouldn't report all anomalies.

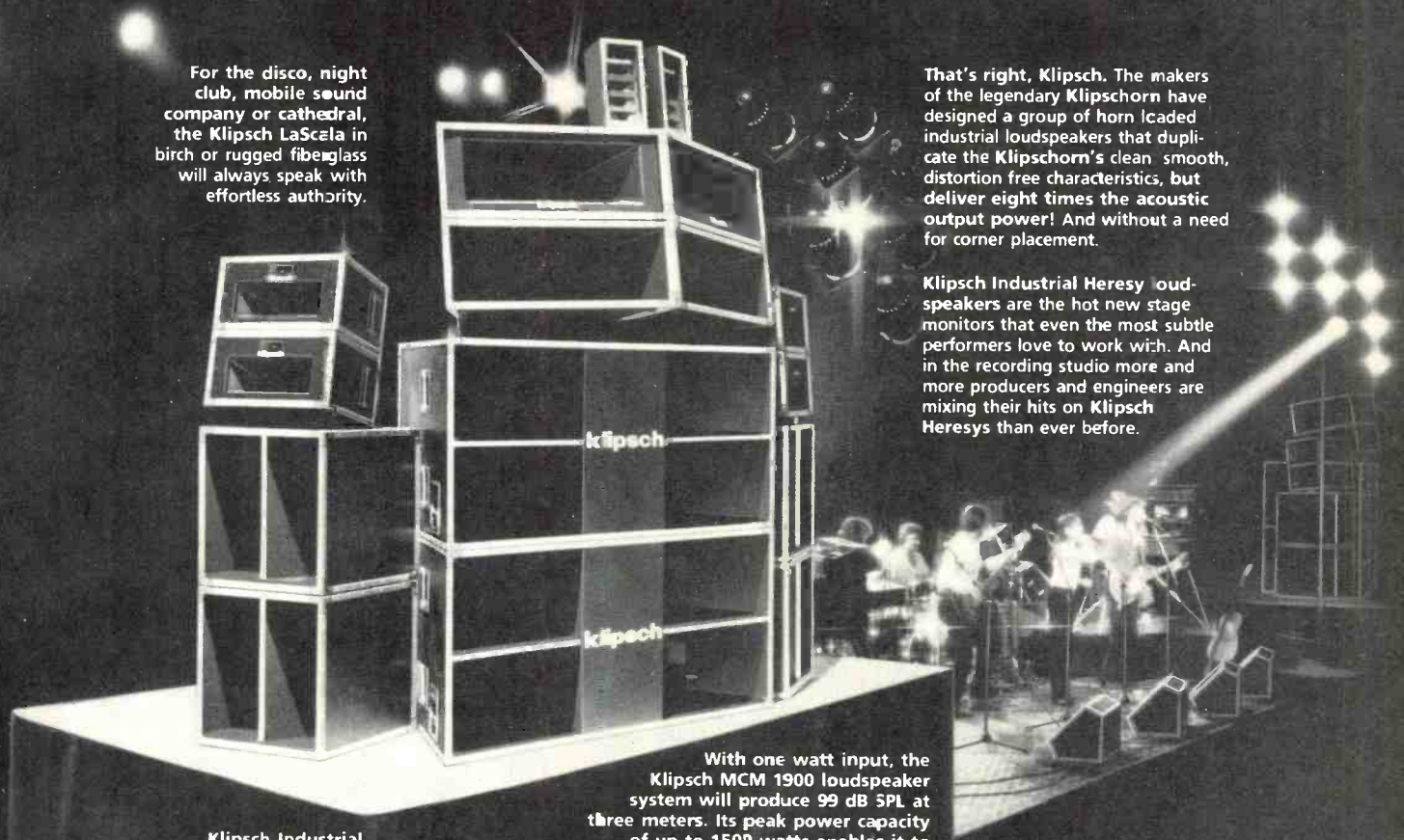
Too many trouble cards (reports) is always better than not being told about a problem.

Heider/Filmways' **Peter Butt** shares his knowledge freely with the seconds, but, as he says, "not in a way that makes them look like dummies. When a problem does come up, I'll

M U S I C

KLIPSCH INDUSTRIAL:

From nightclubs to concert halls, we'll take your breath away.



For the disco, night club, mobile sound company or cathedral, the Klipsch LaScala in birch or rugged fiberglass will always speak with effortless authority.

That's right, Klipsch. The makers of the legendary **Klipschorn** have designed a group of horn loaded industrial loudspeakers that duplicate the **Klipschorn's** clean smooth, distortion free characteristics, **but deliver eight times the acoustic output power!** And without a need for corner placement.

Klipsch Industrial Heresy loudspeakers are the hot new stage monitors that even the most subtle performers love to work with. And in the recording studio more and more producers and engineers are mixing their hits on **Klipsch Heresys** than ever before.

Klipsch Industrial loudspeakers are real crowd pleasers, so don't let the customers down. Let them listen to Klipsch and they'll keep comin' back again and again.

With one watt input, the Klipsch MCM 1900 loudspeaker system will produce 99 dB SPL at three meters. Its peak power capacity of up to 1500 watts enables it to throw 100 dB SPL a full 50 meters. That puts wide, clean, high-powered sound throughout concert halls, theaters, auditoriums, opera houses, coliseums, even outdoor amphitheaters.

And the audiences love it. They can hear the "mix" in each performance from any seat in the house. And, they can feel the punch that drives them to standing ovations.

A Legend in Sound.™

klipsch®

Klipschorn, Klipsch LaScala, Klipsch Heresy and MCM 1900 are registered trademarks of Klipsch & Associates.

Special thanks to RAM Sound of Tuscaloosa, Alabama for their kind assistance with this ad.

Please send me free information on the entire line of Klipsch Industrial loudspeakers. Send me the name of the nearest industrial dealer, too.

Name

Address

City State Zip

Mail to: Klipsch and Associates, Inc.
Box 688 Hope, Arkansas USA 71801
Or call: 501-777-6751 REP

for additional information circle no. 98

MAINTENANCE ROUNDTABLE

Mike Fusaro — Automatt, San Francisco: Mike's earliest contact with electronics came while he worked at a TV repair shop from the age of ten through high school. High school offered the opportunity to gain experience in the audio/visual department. After school and on weekends, he installed professional antenna systems. The electrical and sound reinforcement work that he did in high school led him into sound and lighting for the theater program at San Mateo College, though he had his eye on being a commercial pilot. Instead he met a friend who needed someone to build a console for a small recording studio. He traded his knowledge, expertise and time in order to learn how to edit and record. When the studio had to move because of construction, Mike went along and began to work at Coast Recorders on Folsom Street (San Francisco) as a technician engineer. One morning the first engineer didn't show up for a session, and Fusaro got his break doing multitrack recording. He crossed the Bay and worked for Fantasy (Berkeley) for one year as a recording/maintenance engineer. Then an opening came along to work for CBS' new studios which were located in the same Folsom Street building as Coast. As maintenance/recording engineer, he got to record and mix artists such as Elvin Bishop, and Steve Miller. When the Automatt took over the facilities from CBS, mike decided to stay on in the capacity of maintenance consultant. He's been in the same building through three different studios over the course of the last thirteen years.

Peter Butt — Wally Heider Recording, Hollywood, California: Peter attended RPI (Rennsalaer Polytechnic Institute) in Troy, New York, and the University of Buffalo, also in New York, as an EE student. Mathematics courses were welcome electives for the EE program, and Pete's love for the subject had him scheduling as many as possible. His first job was in nuclear instrumentation, and then telemetry with the RCA Service Company. A desire to learn more about communications led Butt first to Electronic Communications doing military technical rep work, followed by a stint in space communications field work for Magnavox Research Laboratories, and finally, a post as broadcast engineer for station KFAC. He gained valuable experience as a record cutter for Mattel, and as a tape duplicator for SuperScope, which led to becoming an independent consultant to Capitol Records in the same capacity. Maintenance engineering at Westlake Audio, in Hollywood, paved the way to his present position at Wally Heider's, Hollywood. In addition to maintenance engineering, Pete is a consultant to JVC Cutting Center and Mobile Fidelity Sound Labs in the field of electronic equipment construction and design, and is technical editor for *R-e/p*.

TROUBLE REPORT

STUDIO	DATE	TIME	ENGINEER	SESSION (SBSR W.O.)	FIXED — TIME AND DATE. BY
					EQUIPMENT AT FAULT

SYMPTOMS .BE EXPLICIT. INCLUDE ENVIRONMENT OF PROBLEM

PATCH

MAINTENANCE DISPOSITION REPORT

DATE RECEIVED	REPAIR TIME BEGIN	REPAIR TIME COMPLETED	WORK INTERUPTED?	REPAIRED BY / SEE OVER ALSO

DIAGNOSIS

PARTS SENT FOR REPAIR OR ORDERED

TO/FROM

WARRANTY?

DATE SENT OR ORDERED	DATE RECEIVED

PARTS USED:

COMMENTS

say, 'Here's a typical problem. Watch out or this one.' Never be too proprietary about your technical knowledge. I think that's a sign of very serious insecurity. It irritates a lot of people you interface with. Try to explain what's going on in simple, understandable technology."

Sound Labs sets aside two mornings a week, one for each of the two studios, when they do not book time. Those mornings are strictly for maintenance and check-out, and it's been a policy since the studio opened. "We find it's advantageous to have the seconds come in and help." Sands adds that, "They feel they're part of the maintenance program and it helps them fill out trouble reports." "It pays to train the second to make sure they do correctly whatever they do. If they have a little bit of self-taught knowledge," **Mike Fusaro**, from the Automatt in San Francisco feels, "they may try to repair something themselves — like switching two playback cards. In the process of switching back, I've seen where record cards have been substituted by mistake. But I don't want to tell them not to do it again. The next time he may be able to fix something minor instead of calling me at five in the morning. Training is always worth it, even if it only leads to accurately filling out trouble reports."

If Sound Labs schedules a major modification, all of the seconds are invited to be there. They are all considered part of the maintenance department. Conversely, if sessions are booked back-to-back, the second can call on the maintenance department to give them a hand in tearing down and setting up for the next session.

Since this program has been instituted, the maintenance staff hasn't worked overtime in over a year. If the seconds do need help, a phone call to one of the maintenance staff at home gets them the information they need to iron out most problems. This gives the maintenance engineers more free time and saves time for the client during sessions.

Naturally, there are failure situations which are beyond the ability of a typical second engineer to fix; a multitrack power supply, perhaps. However, for example, if a lamp in the "stop" light of a Studer A-80 VU2 goes out instructions ought to have been given to the seconds on how to replace the bulbs without blowing out the power supply. This may not seem critical, but in the case of this Studer machine, the lamps are used as logic loads. When the lamp goes out, the machine develops a mind of its own which can obviously wreak havoc with a session.

Lights on the equipment in the studio seem to have a peculiar Karma affect on clients. Any blown lamps seem to be a visual psychological alarm to the non-technical client that things might not be working right . . . that maybe the

. . . continued on page 143

We'll deal you a winning hand---

The people and the products...
We have them both.

a|i|c

audio industries corporation

1419 NORTH LA BREA • HOLLYWOOD, CALIFORNIA 90028 • (213) 851-4111 • TLX 67-7363

from INPUT to OUTPUT . . .

Mixing Desks — Master Tape Recorders
Reverberation and Delay Systems
Digital Automation and Signal Processing Equipment

FACTORY-FRANCHISED DISTRIBUTORS for:

MCI SMPTE AUTOLOCK

MCI AUTOMATION SYSTEMS

MCI CONSOLES

MCI MULTI-TRACK RECORDERS

MCI BROADCAST RECORDERS

MCI MASTERING RECORDERS

Exclusive Western Service
and Distribution for MCI

AKG	DBX	Ivie Electronics	Quantum Audio
Allison Research	David Clark	JBL	Sennheiser
Amber	Dolby	Koss	Shure
Atlas	Echo Plate	Lexicon	Superex
Auratone	Editall	MRL	3M (Scotch)
BGW	Electro Voice	Master Room	UREI
Beyer	Eventide	Neumann	White Instruments
Crown	Inovonics	Orban	Xedit

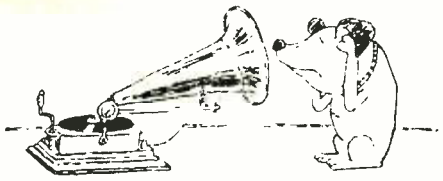
SHOWROOM & SERVICE / 1419 N. LA BREA AVE. • HOLLYWOOD, CALIF. 90028 (213) 851-4111 • TLX 67-7363

audio industries corporation

SHIPS FROM STOCK!

Get fast delivery . . . and selection-in-depth from **Audio Industries'** vast inventory of professional equipment. Put us to work for you . . . call us for a quotation, a custom designed product, or a consultation.

Just One Call Does It!



MAINTENANCE ROUNDTABLE

session won't go well.

Trouble cards should be filed after every session where a malfunction occurs. Seconds or mixers should put as much information on trouble reports as possible. The important things to include are: which studio, which machines, the client, the time, date, and who is filing the report so they can be questioned about the set up and events leading up to the trouble. Santa Barbara Sound Recording has instituted the use of cards with a lot of boxes that just need to be checked off similar to a multiple-choice questionnaire. **Jeff Hanson** has found it's quicker and easier to be specific, especially since the cards are usually filled out during a session when time is short. "If they're working around the problem there usually isn't enough time to be specific, and after a session it's sometimes difficult to remember."

Teamwork between second and maintenance is especially helpful when really critical problems occur. The second, most agreed, must be able to "read" a maintenance man during a time of crisis, and then if need be, calmly get the client and his entourage out of the control room so the repairs can be done quickly and efficiently. Nothing, it was said, is worse than trying to repair equipment while the client is trying to carry on with his session, or attempting to *assist* maintenance in order to shorten the downtime. In the event that the breakdown cannot be remedied in a reasonable amount of time, the best course of action is to inform the client immediately that the session has to be called off. Delaying this inevitable action will always cost time, money, and unneeded aggravation for all involved.

When Sound Labs books a client whose session deals with many players, horn or string overdubs, a backup maintenance engineer is always on duty. In such situations time is too valuable to use any more of than is absolutely necessary.

Upon entering a malfunction situation the demeanor of the maintenance man was of significant discussion. The maintenance man must avoid overcomplicating the situation. Everyone, contributing to this round table, agreed they were able to get in and out of the studio much faster by approaching the task in a completely open frame of mind. John tries to make his mind "a complete blank and set it for maximum input. In this way I can find out if there is a problem and exactly what it is." Repairs can be facilitated if the mixers would accurately relate the circumstances leading up to the malfunction and what was in fact happening rather than rattling off their conclusions(i.e., a complaint of low speed is actually a result of incorrect tension).

In the rare case that a recording engineer practically throws a questionably inoperative piece of equipment across the room while relating in rather explicit terms that he has no faith in it, diplomacy is again the key word. The maintenance engineer doesn't want to create a scene, but on the other hand, neither does he want to be the scapegoat. Opinion as to how to handle such an occurance fell into two categories. Sometimes the mixing engineer is wrong. The equipment does work. A point should be made to the recording engineer that that is the case and he was mistaken. Others felt that the technician should take the equipment out of the room, "walk it around the block," and then place it back in the line up. Mention that something was fixed even though in reality nothing was wrong. Let the engineer try working with it again, but this time keep an eye on him. Make sure that the gear is being used properly. If he is misusing it, politely and simply inform him of the correct operating procedures. By approaching the confrontation this way, the maintenance engineer looks like he's on top of the situation. The recording engineer must save face.

Should Maintenance Men Have 'Golden Ears'?

The most valuable piece of test gear in a studio is a set of reference ears. They can tell whether something is really wrong even if the test instruments say there isn't.

With all the new gadgets available for studio use, program material becomes a necessity for accurately assessing their performance. Mike Fusaro has found that, "if you put a tone through some of these 'black boxes,' the readout on the scope looks horrible. You have no way of knowing what it's supposed to do unless you have also conducted some listening tests with the equipment."

Test Equipment

A great deal of the equipment used in recording is so sophisticated that it's not feasible to repair it in-house (i.e., processor board of a Necam computer, digital delays). The cost to tool up with all the digital gear, and the time spent in learning how to use the gear and how to fix the equipment is prohibitive on an individual studio basis.

When asked how their benches were stocked, all present had a similar complement of test instruments. A good two channel scope, with a fifty Megahertz vertical bandwidth minimum, and a low distortion oscillator are musts. Jeff prefers the battery operated Sony Tektronics scope because it's portable and it's floating — not hooked up to the AC line. Digital Multimeters (DMM) are good for determining speaker levels, and their extreme accuracy is excellent for finding null points, but the general opinion is that they are not versatile enough. A DMM will not test a semiconductor junction. Mike has found that, "a DMM's readouts just don't tell you enough. I'll check it with an analog meter because I can watch the rise time and read the logic pulses. The one single piece of equipment you can do the most with is a VOM or a VTVM. The best I've found is the Simpson analog VOM."

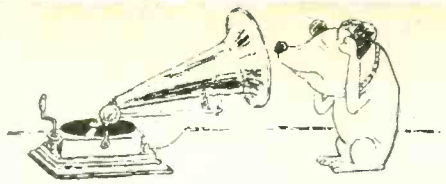
Bart Johnson has an HP-339 — oscillator, distortion analyzer, and AC voltmeter all in one box. It also has band limiting capabilities which are usable in the AC voltmeter mode, which was not the case in the earlier models. He found that with the earlier models as long as he was in the isolated Malibu Canyon, where Indigo is located, worked flawlessly. When he tried using it in Los Angeles about two blocks from radio station KMPC, he found the active filters to be susceptible to RF. "I could watch it on the scope and listen to the station simultaneously."

A spectrum analyzer is extremely useful — more so than a wave analyzer — because a portion of the spectrum is displayed on a CRT. A photo of the trace provides a permanent reference to all the bumps and valleys. The instrument also has the ability to do sweeps (rapid displays of response) and check filters to the point of seeing whether or not there is a 2 dB boost or cut at any given frequency. Pete Butt uses this piece of equipment not so much for solving problems, but for proof of performance and preventive work. "A spectrum analyzer is invaluable when I'm looking for gremlins. It will do a 20 to 50 kHz sweep in 15 seconds. With the Hewlett-Packard 3580A I can patch into the console and compare channels by memorizing a standard trace."

A frequency counter was recommended as well as a fish scale and flutter bridge for adjustment of the transport mechanics, especially servo-control machines. Pete suggests "keeping the flutter meter on the deck and observe what the meter is doing in relation to the adjustment being made." He

Jeff Hanson, — Santa Barbara Sound Recording, Santa Barbara, California: When Jeff was seven or eight, his uncle, a radio instructor for the military, would bring along small electronic gear — radio, intercom — for Jeff to play with. He soon was hooking up extra speakers to the family stereo and making other minor modifications around the house. That curiosity carried into high school, and eventually, into college. Hanson received his degree, an Associate of Arts in Electronics, from Laney College, in the San Francisco Bay Area. He became so inspired during his last year at Laney that he transferred to California Polytechnic, in San Luis Obispo. One of his roommates at Cal Poly was "a sound freak" who got Jeff involved in sound and tape recording. After receiving a BS in Engineering Technology, he and his roommate went to work in Ojai in 1973 at Two Dot Studio, a quality 16-track garage studio owned by Dean Thompson. The entire studio moved to Santa Barbara in 1976, and has become a top studio. Jeff is Technical Director at that facility.

Jerry Jensen — Capitol Records, Hollywood, California: Jerry was an EE (electrical engineering) student at Carnegie Tech, in Pittsburgh, where he studied computers and got involved in digital work. At the end of two years he transferred to the University of Washington (Seattle), and graduated with an Electronic Art degree. During that time Jerry made his living as a programmer and as a studio musician (classically trained pianist and French horn instrumentalist). This close association with a studio environment led to an interest in tape recording and machines. He soon found himself doing maintenance in some of the studios and learning recording. He also was director of a non-profit synthesizer studio for which he designed and built several new modules. In 1975 he moved to Santa Monica to work with an acoustical consultant designing theater systems. Within three months he was hired as a maintenance engineer at Capitol. Jerry became Supervisor of Electronic Maintenance shortly thereafter, and has held that position for the last four years.



MAINTENANCE ROUNDTABLE

always adjusts the pinch roller tension for minimum flutter after its been 'ballparked' with a fish scale. "You'll get about half as much flutter this way." To measure tape speed, Pete has a strobe wheel manufactured by Dubbings which he finds is very accurate.

Of course, maintenance of the test gear is essential to keeping the equipment 100% reliable. Everything on the bench should be checked, and regularly sent to a calibration lab — at least once a year.

Maintenance And The Choice of New Gear

When it comes time to acquire new equipment for the studio, the maintenance engineer, according to the round table, ought to be involved in the purchasing decision. Because it's his responsibility to keep the gear operating at all costs, he must be twice as critical of new gear as anyone else involved. For this reason our sampling concluded that it's not wise to depend solely on the manufacturers' spec sheets.

It was felt that specification sheets should only be used to find out what the expectations of a piece of equipment should be. The manufacturer, it is believed, builds a certain margin into the spec sheet to compensate for variables he feels he can't control.

Their feel was that there is really very little to be learned from the typical spec sheet. For example, the sheet will rarely include information as to whether the item will slew limit, or what the transient or square wave responses are. Those points can only be determined on the bench on in the studio.

Luckily, many companies will allow studios a trial period where the manufacturer will supply their equipment to the studio for inspection and everyday use before any purchase is finalized.

"I [Jeff] even got Ampex to give us a 24-track 1200 machine for a week. That's unheard of. If the equipment is something I'm not familiar with, I'll have to use it first before I purchase it. You have to ask for the favor."

Actually, many companies prefer to provide a demo unit. After a couple of weeks, if it's quality gear and useful, the studio will virtually become dependent on it and *have to have it.* The gear ought to sell itself, because at that point, it's indispensable.

Whether the equipment sells or not, the manufacturer is often offered valuable feedback on how the machine held up during normal working conditions. He can win both ways, if the appraisal is accepted in a constructive manner.

One company, who makes a fancy piece of digital equipment, gave it to Capitol to try out. "We hooked it up to radio program material in the shop and it seemed to work okay. When I put an oscillator signal through it, it worked fine up to 20 kHz, but instead of the anti-aliasing filter protecting the range about 20 kHz, the filter wasn't working at all. If we had put it in the studio without test it could have been an expensive error."

In terms of major equipment acquisitions the maintenance engineer can't afford to make a mistake. An error in judgement could be with him for many years to come. Occasionally, however, a successful producer will request a particular piece of gear and the studio buys it. Jeff reports having tested one piece of equipment that had 2% distortion and the read-out was terrible. But everyone else like the sound, so they bought it.

The group also observed that very often the designers of equipment are insulated from the practical working environment of the studio. This causes misinformation about the range of dynamics of amplitude occuring in the acoustic field — for example: transient attack time. A certain limiter is used with great success in the broadcast field where recorded music is always being played back. Those same limiters cannot be used in a recording situation, because the live music creates sharp transients and a wide range of dynamic levels. The limiter just can't handle them.

The maintenance engineer has to have a great deal to say about the purchase of a new piece of equipment. As Mike put it, "He's the only one who can make evaluations for quality of production, dependability, and serviceability."

Nearly all the new equipment that comes through the front door can benefit from modifications done at the expense of time and money by the studio. It was pointed out that studios could help each other out immensely by trading that knowledge among themselves. Unfortunately, some studios tend to be proprietary with the attitude of "our studio is hipper than yours, because we have some kind of magic thing in here." Bart mentioned one studio that "doesn't allow an oscilloscope in the control room for fear that someone somehow will patch in and find out some of their secrets. That's a sign of insecurity. Everyone would be much better off sharing information and equipment. It has nothing to do with competitiveness." Jerry illustrates that fact by mentioning, "After the interview, Bart and I are going to run over to Capitol. He needs a relay and I have some extras. I've borrowed floppys (floppy disks used for computer information storage) from John, and he's done the same from us." To illustrate the point further, Dean Jensen came up with a design for an amplifier that looked promising, and Indigo had some cards made. Sound Labs purchased them from Indigo, and the cost of development and production was less for both companies.

Manufacturer Interface

It has been said the worst thing that can happen to a manufacturer is to have his customers talk to one another about a product. When maintenance people complain about particular problems they are experiencing, the manufacturer often will reply that they've never heard of that problem happening with their machine before. But tech people do talk to each other and very often they know that Capitol and Motown had the exact same problem as Sound Labs.

"The manufacturers should be worried about us a little bit. I'm [Mike] bent out of shape by some of the things they allow to get through to us. They check out the equipment like any of our seconds would check it out, and that's not nearly good enough. For example: We got a new machine that's supposed to have such great punch in capabilities. After the first couple of days we started getting complaints. we checked it out, put in a spare card, and it still did the same thing. Much later that night we found out they had the wrong values and the wrong parts in the machine. We sent them back abd they replaced them. The damn thing wasn't doing near what it was supposed to be doing. Or, we went down the wiring blocks of a console we had just installed and found a quarter of the solder joints were cold. In a piece of equipment like that you would never suspect it." Those things happen on minor as well as major pieces of equipment, and they're never found until some oddball problem brings them to someone's attention.

Bart Johnson — Indigo Ranch, Malibu, California: Bart has worked extensively in the audio/visual field, and he feels that that background is responsible for his good overview of systems engineering. His involvement in A/V started at Nova Lighting, a concert lighting company based in Minneapolis, Minnesota, and a division of Nova Engineering, doing audio/visual installations in stores, corporate board rooms, etc. With three years experience under his belt, Johnson headed for Communications Arts, the largest multi-media production house in the mid-West, whose clients include General Electric, 3M, and Westing-house. As electronics engineer for 2½ years, Bart was interested in all aspects of Communications Arts' business — from architectural input to systems construction and installation to production of software. Another year passed free-lancing for Multi Media, also in Minneapolis, before he headed West to visit an old friend from Nova. Richard Kaplan, the old friend, had just started Indigo Ranch and persuaded Bart to stay in California where he has been for the past four years.

John Sands — Sound Labs, Hollywood, California: John spent three years at Northrup Institute (Inglewood, California) studying aeronautical engineering, and then dropped out for the "hands-on" experience as an airframe and power plant mechanic. Another shot at formal education, this time for a second class radio telephone license to work on avionics — aircraft radio and radar. He continued until he also had a first class license. A spur of the moment decision to accept an offer from ABC-TV affiliate KPLM, in Palm Springs, gave John's career an abrupt change of direction. After five years as chief engineer at KPLM, he simultaneously worked as a radio announcer and chief engineer at KCMJ, and as assistant chief engineer at KPFI. Sands then came to Los Angeles to work for ABC-TV, in Hollywood, but was stolen away by Tom Hidley at Westlake Audio to become the field engineer assigned to supervise the construction of Westlake designed recording studios. Two years later an offer to travel with Stevie Wonder was too much to refuse, and he signed on as maintenance engineer and monitor mixer for the 1974 tour. Back in town while employed by Joe Buckley, at Communication Distribution Systems, Armin Steiner called and asked John to join Sound Labs. He's been there for the last five years as chief engineer of technical services.

Now, Hear the Magic of UREI Time-Aligned™ Monitors in The Hartford Room at AES.

UREI QUALITY OF COURSE

The UREI Time-Aligned™ monitor speaker family now has three members. They all include UREI 800 series Time-Aligned™ crossover networks, Altec custom 604 duplex drivers with UREI H.F. horn for extended and more uniform H.F. response, and pressure controlled apertures for excellent damping, high efficiency and low distortion. Contact your dealer for a demonstration now.

Model 813. An industry standard for typical control rooms. Includes a 604 and one 15" L.F. driver with a 3-way TA™ network in an 11.5 cu. ft. enclosure.

Model 815. The ultimate for larger control rooms and studios. Has dual 15" sub woofers for extended L.F. response and higher power handling, a 604, and a 3-way TA™ network, all in a 13 cu. ft. enclosure.

Model 811. Ideal for small control rooms, disc-cutting or mastering rooms, and audition rooms. Includes a single 604 with a 2-way TA™ network in less than 6 cu. ft.

Model 817. Retrofit front panel and damping kit for the Westlake TM-1 enclosure. Same components as Model 815.

Time-Align and its derivatives are trademarks of and licensed by E. M. Long Associates

UREI 8460 San Fernando Road, Sun Valley, California 91352 (213) 767-1000

Worldwide: Gotham Export Corporation, New York; Canada: E. S. Gould Marketing, Montreal

Official Listening Posts for UREI Time-aligned™ Monitor Speaker Systems:

CA **Alco Paramount Electronic Corp.**
79 South Third Street
San Jose, CA 95113
(408) 297-7111

Audio Concepts, Inc.
7148 Santa Monica Blvd.
Los Angeles, CA 90046
(213) 851-7172

Audio Industries Corp.
3449 W. Cahuenga
Hollywood, CA 90028
(213) 851-4111

Bananas At Large
802 Fourth Street
San Rafael, CA 94901
(415) 457-7600

Express Sound Co.
1833 Newport Blvd.
Costa Mesa, CA 92627
(714) 645-8501

Leo's Music Inc.
5447 Telegraph Ave.
Oakland, CA 94609
(415) 653-1000

Sound Genesis
2001 Bryant Street
San Francisco, CA 94110
(415) 285-8900

WAH Sound
1115 "R" Street
Sacramento, CA 95814
(916) 444-5491

Westlake Audio Inc.
6311 Wilshire Blvd.
Hollywood, CA 90048
(213) 655-0303

Westwood Music
1611 Westwood Blvd.
Los Angeles, CA 90024
(213) 478-4251

CT **Audiotechniques**
652 Glenbrook Rd.
Stamford, CT 06902
(203) 359-2312

FL **Discount Music Center, Inc.**
456 N. Orange Avenue
Orlando, FL 32801
(305) 843-2025

Harris Audio Systems, Inc.
1962 N.E. 149th Street
N. Miami, FL 33181
(305) 944-4448

HA **Jim Walters Co.**
5017 Kalanianaole Hwy.
Honolulu, HA 96821
(808) 531-8195

IA **Electronic Engineering & Supply**
712 North Street
Burlington, IA 52601
(319) 752-0381

ID **Intermountain Sound**
P.O. Box 802
2019 North Midland Blvd.
Nampa, ID 83651
(208) 467-7431

IL **Bridgewater Custom Sound**
160th & Halsted
Harvey, IL 60426
(312) 596-0309

Gill Custom House
8813 W. 95th Avenue
Palos Hills, IL 60465
(312) 598-2400

MN **AVC Systems, Inc.**
1517 E. Lake St.
Minneapolis, MN 55407
(612) 729-2351

MO **Mr. Music's Rock Shop of Springfield, Inc.**
1950-V South Glenstone
Springfield, MO 65804
(417) 883-4543

MD **Techniarts**
8555 Fenton St.
Silver Spring, MD 20910
(301) 585-1118

NJ **Professional Audio/Video Corp.**
384 Grand Street
Paterson, NJ 07505
(201) 523-3333

NY **Calf Audio, Inc.**
157 Gray Rd.
Ithaca, NY 14850
(617) 272-8964

Harvey Radio Co.
23 West 45th Street
New York, NY 10036
(212) 575-5204

Martin Audio Corp.
423 W. 55th St. (6th floor)
New York, NY 10019
(212) 541-5900

OK **Ford Audio & Acoustics, Inc.**
4800 Interstate 40
Oklahoma City, OK 73108
(405) 946-9966

OR **Brownell Sound**
3601 S.E. Concord
Milwaukee, OR 97222
(503) 659-0394

PA **Barclay Recording & Electronics**
27 Haverford Station Rd.
Haverford, PA 19041
(215) 649-2965

TX **Abadon/Sun Inc.**
P.O. Box 6520
10330 Kotzebue
San Antonio, TX 78217
(512) 824-8781

Arnold & Morgan Music
510 S. Garland Rd.
Garland, TX 75040
(214) 272-3591

Houston Cinema & Sound Equip. Co.
10503 Rockley Rd.
Suite 100
Houston, TX 77099
(713) 933-7180

Westbrook Audio Inc.
11836 Judd Court
Suite 336
Dallas, TX 75243
(214) 699-1203

VA **Audio Technical Services Ltd.**
239 Mill Street, N.E.
Vienna, VA 22180
(703) 938-5115

WA **Puget Sound Audio**
5105 N. 46 Street
Tacoma, WA 98407
(206) 759-4701

WI **Flanner & Hafsoos Music**
2500 North Mayfair Rd.
Milwaukee, WI 53226
(414) 476-9560

And our own studios:

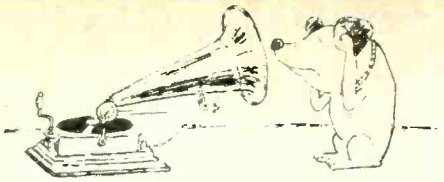
United/Western Studios
6000 Sunset Blvd.
Hollywood, CA 90028
(213) 469-3983

Coast Recorders
1340 Mission
San Francisco, CA 94103
(415) 864-5200

LOOK TO UREI FOR ALL YOUR AUDIO SIGNAL PROCESSING AND SPECIAL INSTRUMENTATION NEEDS

■ Graphic Equalizers ■ Parametric Equalizers ■ Filter Sets ■ Compressors ■ Crossover Networks
■ Metronomes ■ Delay Lines ■ Response Plotters ■ Broadcast Consoles ■ ANCA™

for additional information circle no. 100



MAINTENANCE ROUNDTABLE

A prominent speaker manufacturer seems to be a common sore point. "Their salesman wines me [Bart] and dines me, tells me I'm a professional user — a preferred customer — and he's a professional salesman. I'm supposed to get preferred treatment, but I end up waiting in line like the home hi-fi user. It's not just them, but all across the board."

Automatt also had trouble with the same supplier. They received some new speakers, they claim required the replacement of every component in the box. Part of the problem Mike blames on the distributor who took the defective merchandise and, instead of just replacing them, they returned them to the factory for re-work. Hence, a two-week wait. "If it was up to us, we would have pulled those speakers, and cancelled the order. Anything — information or parts — can be moved from one end of the country to the other within 24-hours. All of a sudden it takes two weeks to get from a company a component that the distributor should have had in stock. The only reason he doesn't is because those parts are failing all over the place. We should get together and fight back against these companies. They should help and respect us. If we have the devotion to wear a paging unit all week long and be on call 24-hours a day, the companies should come at least half-way and get us the parts we need within 24-hours."

The service a studio gets is certainly a function of manufacturer policy and their dedication. But it is also dependent on how the problem is approached. Jeff is in Santa Barbara, an area by comparison more remote than San Francisco. He reports having capstan motors delivered to his door within 24-hours and power supplies from Florida within the same time frame. "I didn't have to jump up and down at all. When you do, they turn off to you." MCI, Studer, and even Ampex, the giant of them all, were praised for their exceptional customer service and quality products.

Service Manuals

Service manuals didn't receive such glowing comments. If the maintenance engineer is lucky, he'll actually find a large crossout and the word 'wrong' written over the errors in many manuals. If not, he may see the sun come up, and feel the after effects of numerous cigarettes and cups of coffee before he realizes that the pin numbers are wrong, or the diagrams are mis-printed.

Another source of irritation crops up when the manufacturer is called for technical help, and the company representative is more of a salesman than a technician. "We've sold 6,000 of these machines and nobody else had this problem!" There are exceptions, but this seems to be the general rule of thumb. Jeff has found that the problem is locating the right people in each company. "We've laboriously gone through the rank and file, and found the one person we can develop a rapport with. Only then do I find that the tech help I get from the company is good. They're very cooperative, and in many cases, they've given me their home phone numbers. Be persistent until you find the right person. There are many people with major companies who really do care, who want to help and who are able to help. I've called and actually asked to talk to the people who designed the machine, because even the tech people weren't sure about some of the questions I've had. Again, be persistent!"

Whether the company is large or small does not seem to enter into the determination of how responsive they will be to suggested modifications from everyday users in the field. It depends on the company. The big companies are committed to production with a capital "P" — thousands of machines and hundreds of employees. To initiate a change would cost them large sums of money and take upwards to a year to implement. That doesn't mean they won't listen or help with a problem. MCI was mentioned as a good "big" company for updating and modifying as well as being receptive to consumer-made modifications that they can incorporate into their production. MCI, it was felt, is a very human oriented company.

Documenting Modification

One primary job of the maintenance engineer is documentation of studio modifications. The story is told of one engineer at Capitol who kept all of his modifications in his head. When he left, all his work had to be re-built. Documentation, on the average, consumes up to fifty per cent of a technicians time.

During the course of the discussion concerning equipment modifications, several potential problems to be aware of were mentioned. The following specific information could save hours of wasted energy and frustration.

All the 3M machines periodically have to have their bearings changed. Instead of purchasing the bearings from 3M, the Aircraft Bearing Company, in Culver City, California, has comparable if not better product for less money.

Pete recommends that since the bearings with the light lubricant in them are very hard to find, bearings with grease in them may be substituted if the following procedure is followed. Purchase a light mineral oil from any drug store for about 50¢ a pint. Put the bearings into a sauce pan along with the mineral oil and a deep fat cooking thermometer. Cook it all for about three hours at 230 - 240 degrees Fahrenheit. Throw away the mineral oil that's left. The brown scum on the top of the oil will be the grease that was originally in the bearing. The bearings with the light oil in them will run much smoother, more efficient, and with less resistance than the ones normally purchased off the vendor's shelf.

Bart recently had some speakers re-diaphragmed — the whole set from tweeter to woofer. The speakers were returned certified good as new, but they tested out 3 dB less efficient than spec. The cause is probably magnetic deterioration which the company overlooked during the reconditioning. Buyer beware!

Parts Inventory

Without replacement parts, everything grinds to a halt. Finding the right part within a given time frame is usually more complicated than the repair procedure itself.

The first rule for ordering parts: *Get the name of the person you talked to.* Take the time to develop a rapport with the supplier or salesman so that he becomes sympathetic to your needs. Always place any future orders with him and no one else at that business.

Parts Guides that are a must for a any maintenance engineer are:

Electronic Engineering Master
United Technical Publications
645 Stewart Avenue
Garden City, NY 11530

Electronic Buyer's Guide
McGraw Hill Publishing
1221 6th Avenue
New York, NY 10020

One common pet peeve is the manufacturers' use of house part numbers which semiconductor part manufacturers use. Recommended guides include:

RCA-SK Series Replacement Guide (SPG-202X); Identifies foreign and house part numbers; cross reference your parts to theirs, then look up specs on their parts.

GE Replacement Semi-conductor Cross Reference Guide (PRO-4311R)
Identifies house part numbers.

General Electric Company
316 East 9th Street
Owensboro, KY 42301

Often the manufacturer will select a beta-match or noise performance as they sometimes say in parts lists. The 1200 manual gives the nearest field equivalent or else no equivalent is available. Loose leaf books that are cross references of all their part numbers vs. the EIA standard part number are handed out at Ampex training seminars. They might be obtainable from customer service or an area rep.

A partial list of reliable parts houses appears below:

TAW Electronics
4215 West Burbank Boulevard
Burbank, CA 91505
(213) 846-3911
Capacitor house
Resistor house

Hamilton Electro Sales
10912 West Washington Boulevard
Box 2647
Culver City, CA 90230
(213) 558-2121 — Sales
(213) 558-2131 — Service
Semi-conductor specialist; will be honest about stock; will back order.

Liberty Electronics
124 Maryland Street
El Segundo, CA
(213) 322-8100
General line distributor

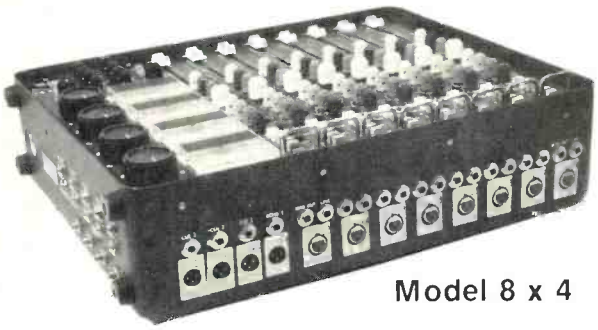
Sunray (lamps)
3303 Harbor Boulevard, H-2
Costa Mesa, CA 92626
(714) 556-3630
(213) 870-8628
Huge inventory of lamps and lights.

Kierulff
2585 Commerce Way
Los Angeles, CA 90040
(213) 725-0325
Allan Bradley components; boxer fans.

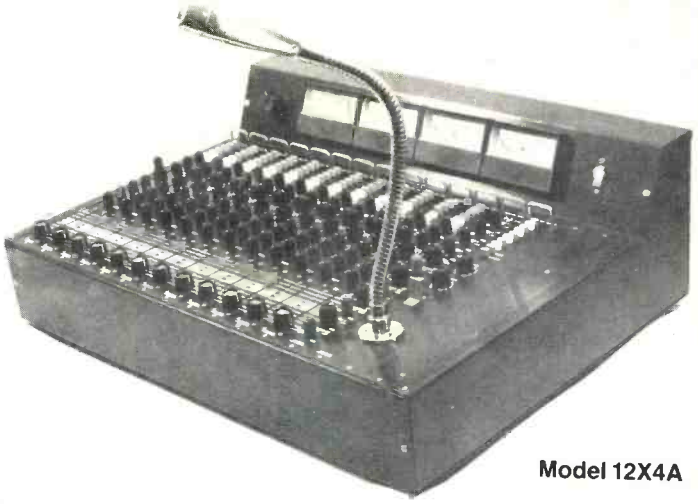
Temtron Electronics, Ltd.
138-69 Francis Lous Boulevard
Rosedale, NY 11422
1-800-645-2300
Vacuum tubes, mikes, mixers, general audio parts.

□□□

Rugged high performance low cost mixers



Model 8 x 4



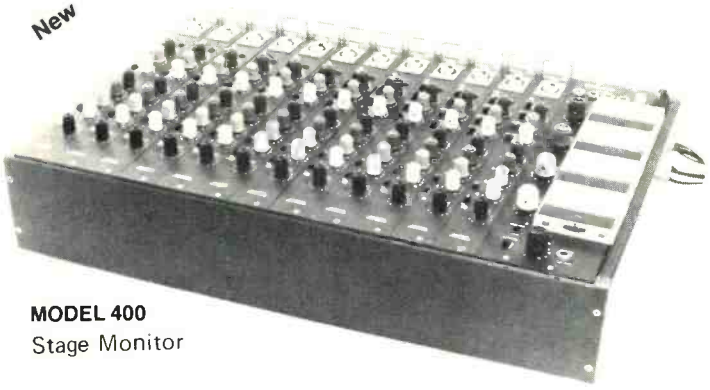
Model 12X4A

MODEL 400

• Mainframes for 8, 16, 24, or 32 inputs •

PROFESSIONAL MIXING CONSOLES FOR 4 OR 8 TRACKS OR 4 OR 8 STEREO SUBMASTERS AND UP TO 32 INPUTS

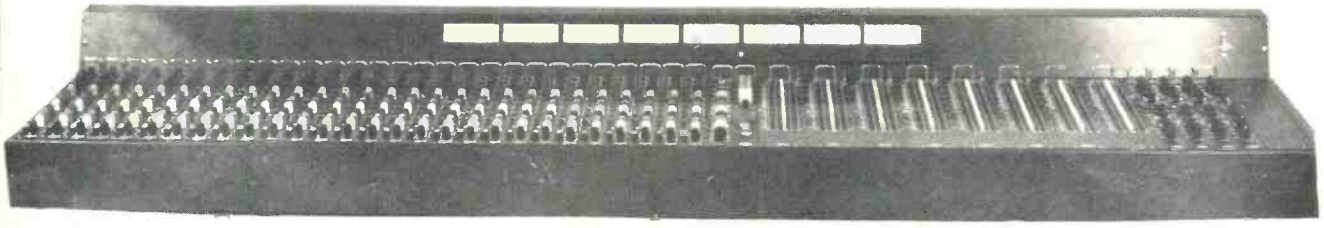
New



MODEL 400
Stage Monitor

Over 500 INTERFACE ELECTRONICS mixers are now in use in recording studios and sound systems and wherever high performance at low cost is needed. These mixers have been used in making gold records and they are also specified by many rock groups for road use because of their ruggedness, reliability, flexibility, immunity to stray fields, and high performance — equal to or better than that of consoles costing many times more. Mainframes are available for 8 to 32 inputs, and modules can be ordered as needed.

MANY OPTIONS AND CONFIGURATIONS ALLOW YOU TO HAVE IT JUST AS YOU WANT IT.

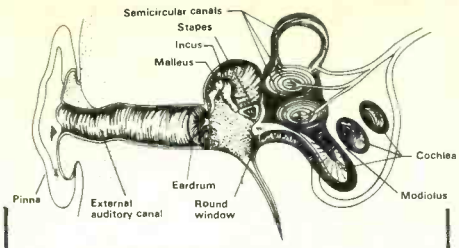


STAGE MONITOR mixer Model 104L makes eight independent mixes, uses color coded knobs and large lighted VU meters, optional headphone monitor,

Above: 28-in, 8-out matrix with eight 1/3 octave graphics and eight 18db/octave tuneable crossovers, for CONCERT SOUND of St. Louis.

INTERFACE ELECTRONICS

3810 WESTHEIMER • HOUSTON, TEXAS 77027 • (713) 626-1190



LAW AND THE dB

The Legal Liabilities of Using High Level Sound

Martin Polon

Society has developed a series of rules to govern behavior in most situations. The enforcement of these rules as law is the thin veneer that keeps civilization a stable living environment. But the over-application of control seems to leave things worse than if the free enterprise system had operated of its own accord. The 1980s could well be the decade of legal disaster or survival, for the performance of popular music at high sound levels. The high level performance environment, be it studio or concert, bears the seeds of its own potential destruction with the expected enforcement of existing safety laws.

The creation of legal restrictions on the working conditions of employees, began with the muckraking exposure of terrible job conditions around the turn of the century. The use of machinery and chemicals had become commonplace, without any regard for the consequences to those who were in the working environment. Abuses were costing workers years off their lives, and in some cases the very life itself. It was common to hear of a man who had been crushed to death in a large machine, or of a woman who was scalped in a textile mill, or of a child in the meat packing industry who fell into a sausage-making machine. The loss of hundreds of lives in the Triangle Shirtwaist fire was publicized across the nation.

The reaction to all of this, when exposed, was codified as a series of laws designed to protect workers from on-the-job abuses. The Workman's Compensation system was put into effect across the nation to provide paid medical care and cash support for disabled workers. The net result of this activity was to create what seemed a relatively safe working environment during the 1930s and '40s. The '50s saw great advances in technology, spurred by developments from World War II and by the Cold War. It was at this time that safety experts discovered that a second kind of hazard was still in residence on the job. This new hazard was invisible pollution; based on years of exposure to a particular toxic condition or substance. Death and disability from cancer, emphysema, stroke, cardiovascular disease, etc., became regular occurences for workers exposed to arsenic, cadmium, asbestos, coal, radium, uranium, and many other substances. Again in the 1960s and early 1970s, laws were passed to police industry from exposing workers to invisible pollution.

Whither rock and roll, Horatio? What has all of this to do with popular music? The connection is found in the use of high level sound; for reinforcement, for studio monitoring, and for broadcasting. High sound levels expose the body to a particular form of invisible energy. There is evidence to support the theory that high level sound (especially above 100 to 110 dB (A)) can seriously degrade and deteriorate whole body, and hearing functions, especially with long term exposure (see *dBs Can Be Hazardous To Your Health*, R-e/p, October 1979). What is more important, the use of sound at any level in excess of 90 dB (A) can place the entire context of concert, recording, or any other entertainment format into violation of the statutes designed to protect employees from on-the-job hearing damage.

There are two kinds of statutory situations that can be expected to become a part of entertainment environments in the coming decade. The emphasis placed on safety enforcement and personal injury actions has increasingly focused on the entertainment scene. The result of a tragedy, such as the one at Cincinnati, is to further focus the attention of regulatory bodies on the operations of the music entertainment industry. The two regulatory areas to be considered are *Workman's Compensation*, and *Occupational Safety and Health Act (OSHA)*. There are a number of strong incentives for the music industry to avoid these, as we shall see. The best route for such avoidance would be a moderation of sound levels in use so that at no times would levels in excess of 100 to 110 dB (A) be used with unprotected employees.

Although there are well established correlations between whole body damage and high level sound, the vast majority of the laws governing exposure to sound are designed to prevent damage to the hearing mechanism. The use of amplified sound at high levels is a fairly recent phenomena, and the expected physical impact on the human body (other than hearing), will probably not manifest itself in quantity for some time. The enactment of laws protecting employees usually is triggered by long term epidemiological trends. So at present, especially in terms of Workman's Compensation and the Occupational Safety and Health Act (OSHA), the enforcement emphasis is on hearing damage to employees. It is interesting to note that the responsibility for damage is based on employment, as far as the work safety laws are concerned. The safety position of the audience is defined as separate from that of the employee; although the dividing line can disappear in civil court.

The definition of employee is also variable. The position of the artist and often the sound and/or lighting technicians can be that of contractor or vendor. This does not remove the threat of enforcement, but does blur the direction that enforcement could take. The bottom line remains that any enforcement that occurs in an entertainment producing environment can produce restrictions (i.e., limits) that will make sound monitoring, reproduction, and reinforcement illegal, at the levels normally used in popular music today.

Precedence

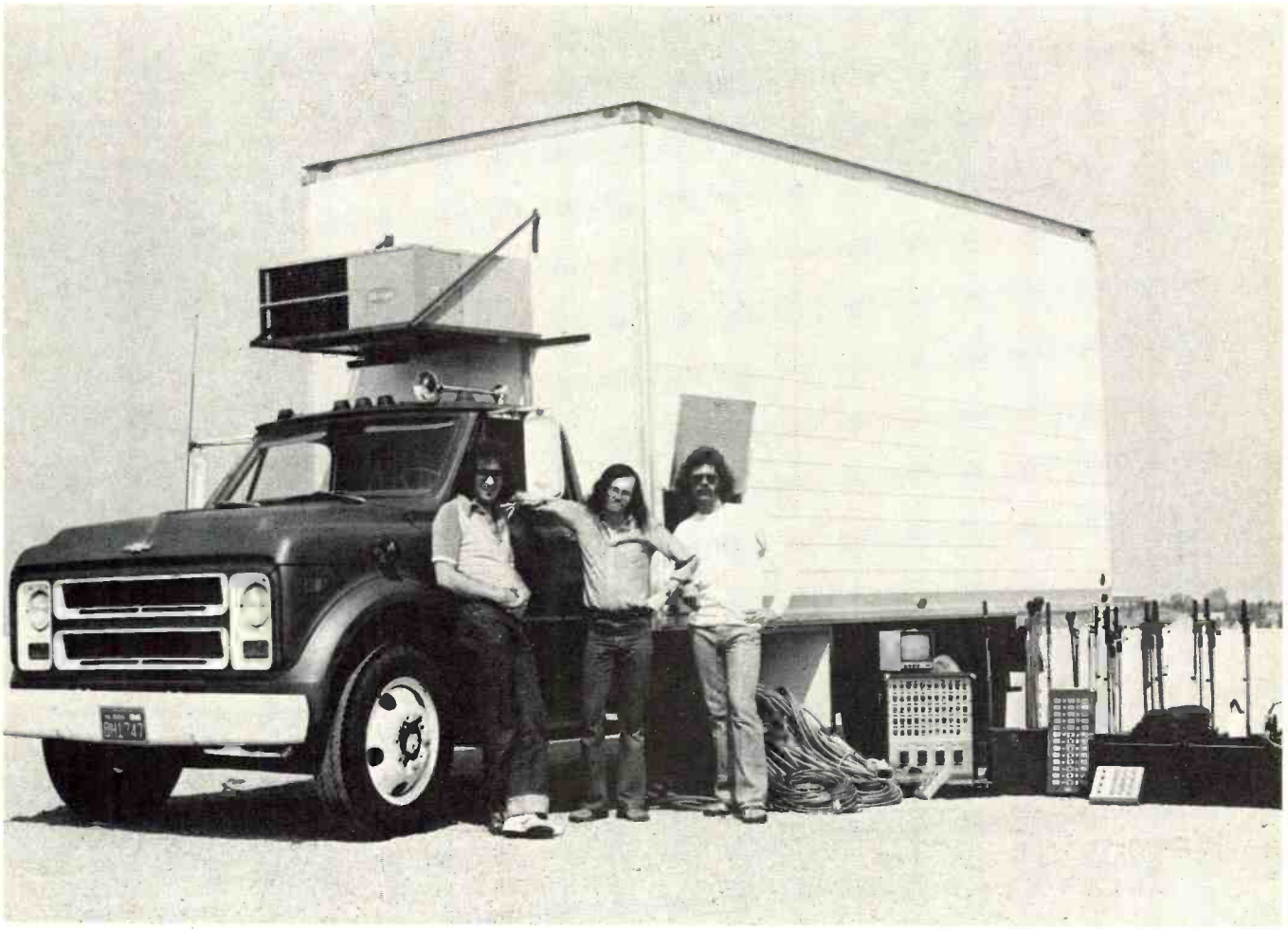
One of the first real attempts to clamp down on the use of amplified music *in performance* was undertaken by the Leeds Council (England) in the beginning of the 1970s. Using the blanket authority granted by the Leeds Corporation Act of 1906, the Council imposed a statutory limit of 96 dB (A) on all musical performance situations in the area. Other cities in England, including London, took a detailed look at the possibility of imposing similar restrictions. This is the kind of action that provides a precendent, although in this case that precedent has been diluted through time and other actions. It does serve to illustrate why action should come from within the industry, rather than have a local government body impose hard and fast regulations. It is interesting to note that the Leeds action was intended to protect audience as well as employees, with its legal limitations.

The interconnection between Workman's Comp., OSHA, and the other liabilities is difficult to define precisely. It is sufficient to say that enforcement in one area can lead to the entry of other enforcement units or further involvement in liability actions. The question of employee status can become important here since an employer is generally liable only for the direct employees of the unit, in terms of Workman's Compensation, with the contractor or vendor assuming responsibility for their own supplied staff. In contrast, an OSHA violation would be charged against the promoter, or owner of the business where the amplified sound is being used; irregardless of the payroll origin of the various employees. In liability cases, the end result depends on the sum total of all of the facts admissible as evidence in a case. If all of this seems vague, it is meant to be. The involvement of legal proceedings is an extremely variable process that ties up all of the parties for long periods of time; with the outcome often being unclear. The operators of sound equipment using high levels will be well served by taking cognizance of the potentials for enforcement and court action, and avoid these situations if possible.

The instrumentation used to measure sound for legal purposes must conform to certain standards for accuracy and calibration, and be checked periodically. The technique for measurement will usually depend upon hand-held sound level meters of the type 1 or type 2 standard, and/or a dosimeter. The sound level meters in use today for professional monitoring of levels conform to four standards. The type 1 meter is a precision unit, equipped with impulse characteristics, peak-hold, and impulse-hold features, in addition to having a square-law meter and/or a digital readout. The type 2 sound level meter is a general purpose meter. Type 3 meters are used for sound level surveys, and the type 4 meters are designed for special purpose usage. A sound level meter consists of a calibrated electret, or piezo electric, or condenser microphone which detects the sound pressure and converts it into an electrical signal that is processed by an input amplifier. The amplified signal is fed to a calibrated attenuator which establishes a particular sound level range, and then to a selected weighting network which shapes the frequncy response of the unit, and then to an output amplifier to compensate for the weighting network. An output attenuator, and a rectifier, feed the analog metering. Digital display can supplement or supplant the analog metering.

All measurements made for regulatory or legal purposes are based on the so-called "A" weighting, which has a substantial low-frequency roll off. The "B" weighting, originally designated to show human response to moderate sound levels, is seldom if ever used. The "C" weighting is an approximation of a linear response to sound pressure waveforms. It occasionally is used to establish the presence of low frequency energy, and is quite useful in determining the low frequency composition of a musical sound source. There is a "D" weighting which was established to provide a single number for subjective evaluation of aircraft noise. It is not standard to all meters and is not relevant to amplified audio measurements. The rationale behind the use of the "A" weighting is stated in an U.S.

AFFORDABLE REMOTE RECORDING



Houston Recording now has MCI's newest 636 series automated console for use on your video, radio, live, album and demo projects. Contact us to see what we can do for you.

9340 Foothill #32, Cucamonga, CA. 91730 714-987-0379

Environmental Protection Agency (EPA) monograph:

With respect to both simplicity and adequacy for characterizing human response, a frequency-weighted sound level should be used for evaluation of environmental noise. Several frequency weightings have been proposed for general use in the assessment of response to noise, differing primarily in the way sounds at frequencies between 1,000 and 4,000 Hertz are evaluated. The A-weighting, standardized in current sound level meter specifications, has been widely used for transportation and community noise description. For many noises the A-weighted sound level has been found to correlate as well with human response as more complex measures such as calculated perceived noise level or the loudness level derived from spectral analyses. It is concluded that a frequency weighted sound pressure level is the most reasonable choice for describing the magnitude of environmental noise. In order to use available standardized instrumentation for direct measurement, the A-frequency weighting is the only suitable choice at this time.

The dosimeter is a small device that uses a miniature microphone placed just at the entrance to the ear. This feeds into the unit, which is about the size of a pack of cigarettes and which is placed on the person. It does not provide peak or individual readings, but rather a compilation of the total exposure for the person being monitored. It can be likened to an audio version of the radiation film badge. Whichever tool is used by safety professionals, the basis for monitoring will be the concept of hearing damage based on exposure to sound levels in excess of 90 dB (A).

Workman's Compensation

Workman's Compensation is available to employees in most states of the Union, plus the District of Columbia and Puerto Rico. Federal employees are also covered by a compensation system. The application for employee relief from damage to hearing, resulting from exposure to high sound levels, has increased from 10% to 50% in the various states for the past several years. The process of claiming compensation is an involved one, and in effect penalizes both the worker and the employer. The employer is placed in jeapordy by the filing of the claim, because it pinpoints a violation for the scrutiny of Occupational Safety and Health enforcement. The employee can be denied future employment in audio if a disability is granted, since in a de facto way, the employee acknowledges seriously degraded hearing. It would seem unlikely that future employers would hire a mixer who could not hear all of the frequencies necessary to mix, or who could not distinguish a large band of frequencies. Of note, is the fact that any employer who denies an employee access to or time for compensation treatment or other prescribed remedies risks significant penalties under the enabling statutes for Workman's Compensation and the Occupational Safety and Health Act.

The chain of action that leads to a completed Workman's Compensation action can be characterized as follows:

High Energy Sound Exposure of Employee = Presence, Absence, and Use of Hearing Protectors = Number of Hours of Exposure Per Day = Number of Years of Exposure = Potential Hearing Loss = Filing of Claim With Appropriate Agency = Medical Screening = Audiological Screening = Measurement of Hearing Loss = Legal Determination of Percentage of Capability Lost = Decision on Rates of Compensation for Loss.

Ostensibly, the use of this system maintains neutrality for all of the parties involved. In practice, the contest for a settlement becomes a tug of war between the employee and the employer's insurance carrier, which is often a state-chartered agency. The point is, that dependence upon compensation after damage is a poor alternative to preventing the damage in the first place. It is interesting to note that the compensation provided for total hearing loss can be very small in many states. The laws were written with the loss of life and/or limb in mind.

It is interesting to contrast the burden of proof when comparing the functions of Workman's Compensation with OSHA. In a compensation situation, the burden of proof is on the employee; i.e., the employee has to submit to medical examination and must be able to have damage diagnosed beyond a shadow of a doubt. In the case of enforcement of the OSHA rules, the employer has to be able to prove that there is no violation; and that the working place is indeed in compliance, no matter what the cost. This point can be best illustrated by quoting Chapter I, paragraph H, of the Occupational Safety and Health Administration's "Field Operations Manual:"

The employer's economic cost of abatement will not be considered to be a factor in the issuance of a citation. However, if the cost of utilization of effective engineering or administrative controls, or combination, which would bring the employer into compliance with permissable exposure limits would so seriously jeopardize his financial condition as to result in the probable shutdown of his establishment or a substantial part, then only a personal protective equipment program should be required in the interim, and an extended abatement date should be granted to permit the extended implementation of feasible engineering or administrative controls taking into account the employer's financial condition. The burden of proof of economic infeasibility rests upon the employer. Any abatement date based on economic grounds shall be approved by the Regional Administrator.

The basis for all OSHA enforcement is the section of the OSHA rules known as the noise standard 29 CFR 1910.95 (b) (1).

When employees are subjected to sound levels exceeding those listed in Table G-16, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels within the levels of Table G-16, personal protective equipment shall be provided and used to reduce sound levels within the levels of the Table.

Table G-16 — Permissible Noise Exposure

Duration per Day Hours	*Sound Level dB (A) Slow Response*
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
½	110
¼ or less	115

As a consequence of the enactment of the OSHA regulations, several decisions made by the Occupational Safety and Health Review Commission have further enlarged the scope and technique for enforcing the above regulations. One of the most significant decisions allows spot or one-time measurements to be taken and interpolated if job task time and sound level are clearly established. The so-called "grab" reading can be used, based on an evaluation of the working process, to establish violations of the limits imposed by the G-16 table.

Specifically, in the case of *Secretary of Labor Versus Weyerhaeuser Company*, the principle of violation was defined as that period of time in which the exposure exceeded the limits of Table G-16, even if the other exposures were below the exposure minimums. The incidence of any exposure over the maximum allowed for time and energy establishes overexposure; regardless of any subsequent or antecedent exposure below the exposure minimums. In the same case, and in *Secretary of Labor Versus Sun Shipbuilding and Drydock Company*, the principle of evidence gathering is established based on the discovery of levels in excess of the allowable maximums, when other evidence is presented showing this to be the normal condition in the working place. The difficulty for the Government in proving cases of violations is usually found where grab readings of 90 or 92 dB (A) have to be interpolated to cover the entire eight hour working day. In the case of levels in excess of 110 dB (A), the use of one or at most two grab readings would indicate violation.

Above 110 dB

The point of this for the reproduction of audio at high levels is that the presence of large amplifiers, and high energy dissipation loudspeakers in a working environment designed for audio could, when coupled with high grab readings, constitute violation. The reading of a level of 122 dB (A), will constitute a violation on the spot, since there is no allowable exposure duration at that level.

The sound reinforcement and music recording industry has had virtually no interference with audio reproduction from the use of safety regulations up to this point. The exception to this has been the use of various local community noise regulations to cause outdoor or unshielded indoor popular music performances to be suppressed in lieu of creating major disturbances to nearby homeowners. The future seems to indicate a thrust towards greater enforcement as the safety community becomes aware of the potentials for high level damage and violation. The professional literature in the Journals of the Audio Engineering Society, The Acoustical Society, and in the areas of environmental medicine have shown the level of current interest in regulating maximums for popular music.

The suggestion that the industry self-regulate has been made before, and in several quarters. The reaction has been one of falling on so-called "deaf ears." The difficulty with this response is that the OSHA regulations do not deal with the musical content of the sound levels; just the level itself. The imposition of personal hearing protection in the form of earplugs or over-the-head muffs can be of value; but only if used in concert situations to protect band members and stage staff. The across-the-board imposition of such devices would cripple the monitoring of music as we now know it. The concept that violations cannot be directed at the music mixer because he or she controls their own volume is also without basis in fact. The enforcement history of OSHA has established that employees who do not heed the established safety norms of their own accord, such as not using protective devices, can be terminated from on-the-job service. Employer liability continues irregardless of employee attitudes towards the OSHA regulations.

Nobody suggests that the audio and music industries have been given careful evaluation or concern in the creation or use of daily safety regulations. But, the regulations are in existence and it would appear that the gradual increase of perceived levels tolerated, is going to bring the amplification of music up against regulation. It would seem virtually impossible to defend a studio environment where 115 to 120 dB (A) levels are used consistently, or in performance where concert sound levels exceed 125 dB (A) for the entire duration of the concert. The impact of regulation seems to be horrific, and one can only hope that there is a trend towards moderating the use of high-level amplified sound from within the audio profession rather than from without! □□□

'RULES' for playing the INDEPENDENT PRODUCTION GAME

by DAVE PELL

A producer's role in the record industry is very similar to that of a director in the medium of motion pictures. The producer supervises and is responsible for every aspect of the recording, from the selection of material and laying of rhythm tracks, through sweetening, vocals, and the final and open to my suggestions, I sign them to a production agreement. While a formal contract, hammered out by a competent music attorney is desirable, it isn't absolutely necessary. A simple letter of agreement, committing the producer and the group to the key stipulations will serve to define and seal the relationship. Should a record company desire the services of the group, a more specific and detailed document would then be in order.

The duration of my agreements run for nine months, commencing on the date of the finished recording. This allows me enough time to get a reaction from both the major and the secondary labels.

It is very important that the ownership of the physical tape be clearly understood by both parties. Tape is a major expense in a speculation production. Costs range from $40.00 for a reel of used 2-inch tape, to $140.00 for a reel of new Scotch #250. If at the end of our agreement the group wants the tape, I'll be glad to give it to them in exchange for the monies I've invested in their sessions. Keep in mind that in this business, everything is negotiable and the group could include in the letter of agreement the reversion of tape ownership.

On many occasions a group has left a producer and then become successful. What about the status of the producer's tape? The group could bargain for a short line in the agreement to the effect that the masters produced herein will not be releaseable through normal channels at a later date. Conversely, the producer might argue that the tapes will remain his sole property and that they could be released at his discretion. The outcome of these kinds of bargaining issues are usually determined by the attractiveness of the group to the producer or vice versa, or by whose desire is greater to record or be recorded.

Publishing

Music publishing is an area of major importance, therefore if the group writes original material, I want to be the publisher. As publisher, I then have the power of using it as a tool to sweeten the deal for my artist or group when I submit them to a record company. Many labels will talk publishing before they'll consider a recording contract and the enterprising producer, armed with the rights to the group's publishing, operates free of encumbrance. Some record firms will give advances for product and will further enhance the deal at the prospect of publishing rights to a new group. This is especially profitable when the two

. . . continued overleaf -

THE AUTHOR

Dave Pell has been actively involved in the West Coast music business since the late '50s. He was a featured artist with many of the top bands of that time, including stints with Les Brown, Benny Goodman, and Harry James. In the early '60s he produced over 400 albums while vice president of *Top's Records.* He then went on to assume the position of creative director of *United Artists Records,* and was there for 12 years. During that time he produced many albums, including 11 albums with Vicki Carr. Some of the hits he had with her were, "It Must Be Him," and "With Pen In Hand." In 1967 *MCA Records* launched a new label, *UNI Records,* and Dave was chosen to head that operation. A few years later he was asked by Berry Gordy to become creative head of *Motown's* new West Coast operation, MOWEST. He was also an active participant during the formative period of the *Reprise* label, first started by Frank Sinatra. Dave produced the first Basie-Sinatra album as well as a number of records that utilized the talents of the entire roster of Sinatra's friends who were signed to the label.

With the re-emergence of jazz as a competitive product, Dave is playing on the records he has been producing.

Dave is also a professor teaching record production at Dick Grove Music Workshops, UCLA, and Golden West College.

"RULES"
for playing the
INDEPENDENT PRODUCTION GAME

aspects, recording and publishing, are not cross-collateralized.

Many artists fantasize about one day owning a publishing empire. Realistically, unless an artist is extremely industrious and energetic, it is usually counter-productive for them to operate their own firm. A professional music publisher acts as more than just a collection agency for mechanical royalties. Publishing is a business, and a proficient publisher knows how to enhance the value and insure the longevity of a copyright. Performances, lead sheets, commercials, and overseas monies are the factors that make a copyright important, not the singular task of collecting from record sales. Income from the sale of sheet music and folios can literally double the productivity of a song. Those of us in the industry get our lead sheets from the publisher when we decide we're interested in a song. Middle America must purchase sheet music at the retail level.

Artists today are recording less frequently. Even major stars record only an album a year. This trend has created a problem for publishers regarding material they are hopeful of, but have yet to place. Most songwriters' contracts provide, that in the event the publisher is unable to secure a recording, or fails to have sheet music printed for sale, within a year, all rights are returned to the writer. On several occasions I've received calls from producers who, though interested in a new tune I've submitted, are unable to record it within my contract period. When this happens, I'll explain the situation to the writer in hopes he'll grant me the additional time necessary to close the deal. It is a tremendous kick for me, as both a producer and publisher, to creatively cast the right song... for the right artist.

Recording Studios

By far the simplest creative decision a producer can make, is his choice of recording studio. Los Angeles lists 165 studios and there are countless others that are garage and basement affairs. Budget is a consideration, but even with a limited budget, a little research and thoughtful shopping will lead you to a clean facility within your price range. Remember, that many master recordings were originally meant to be demos, so don't settle for less than you can afford.

The talk of the industry this year was the "Knack" and the fact that they recorded "My Sharona" in an 8-track studio. I don't mind 8-track facilities, but I've learned that the entire project must be completed on the same machine. The use of another 8-track machine would tend to add noise.

For just a little more money, you could work a 16-track studio and thereby greatly enhance your capabilities. This might also eliminate the need for ping-ponging from track-to-track and consequently it would reduce studio costs. I avoid the use of Dolby or dbx noise reduction machines and other outboard equipment. A lot of producers use them as a matter of course. I prefer to think of them as tools, to be used sparingly. I'd much rather record a good performance cleanly, than to doctor an inept performance with an audio trick. I mix my important projects in a sophisticated room, equipped with a flexible console. If, at that point, the situation calls for a harmonizer, limiters or dbx, I have them at my disposal. Most studios charge extra for the use of outboard equipment.

Many recording studios have both 16- and 24-track capability. The cost of 16-track averages between $25.00 - $135.00 an hour. The rate for 24-track ranges from $40.00 up to $250.00 an hour. This price gap can be attributed to a number of factors, but especially a studio's chart success, sophisticated equipment and location. You don't need country club ambience to record strong rhythm tracks and there are so many studios today, that their prices have to be competitive. The majority of moderately priced rooms feature an excellent array of microphones and good consoles. These rooms aren't necessarily state-of-the-art, but they are genuinely good facilities. I love working the $175.00 - $200.00 an hour studios, but it isn't warranted in every situation.

Policy regarding engineering costs vary from location to location. Some, like Excalibur Studios, include the services of an engineer in their hourly rate. Most L.A. studios charge between $7.50 - $10.00 an hour for their 'in-house' engineers to work a 16-track date.

The use of used tape is another way of cutting expenses. There are places in every major city that sell last year's tape series or used tape that may have one or two splices where the masters have been removed. The location of these splices should be checked and noted for future reference. This tape should be erased either by a bulk eraser or by running it through the tape machine in the record mode, at 30 ips.

Arrangements

A good producer approaches his project with care. He makes a rough analysis of the material he's selected and formulates a game plan. The arrangement of a song is a major consideration and one of the key components in an exciting recording. With some groups, an arranger isn't necessary, but the layout of the tune, particularly with regard to the hook, and the verse-chorus relationship, is very important. A lot of musicians get so turned on by their solos that they lose sight of the fact that they're trying to make a commercially consumable recording. I'm amazed at the number of singers and musicians who are unwilling to take the time to listen to the radio in order to understand the elements that go into the making of a 'big record.'

AUDICON MARKETING GROUP

Proudly Announces Exclusive U.S. and Canadian Sales and Marketing For:

Barth Signal Processing Equipment

U311 DYNASET-COMPRESSOR/LIMITER/EXPANDER

A unique dual threshold VCA level control device which features tracking threshold levels which are individually adjustable for compression or expansion ratios of 40:1 to 1:2, gain reduction signal gating to eliminate noise increase when input signal drops below a preset level, and LED metering of gain reduction or expansion. Available as a dual rack mount unit or DIN module for mounting in our powered rack mount which holds 10 units.

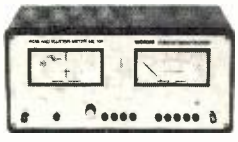
MUSICODER-MUSIC OPTIMIZED VOCODER

A ten band special effects device used to impose the envelope characteristics of one signal on the spectral characteristics of another. Unlike other units which have been optimized for speech synthesis, the MUSICODER is optimized for musical special effects.

Woelke Recorder Test Equipment

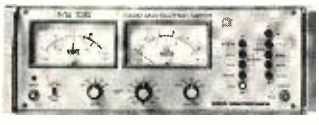
ME110 WOW AND FLUTTER METER

The basic flutter meter. Reads DIN flutter, wow, and drift of turntables, cassette recorders, and reel to reel using a Woelke test record or cassette, or external oscillator. Verifies speed accuracy of turntables and cassete machines. ME110E also reads NAB standard flutter and has oscilloscope output of flutter components.



ME108 WOW AND FLUTTER METER

The standard flutter meter for professional studio use. Separate meters for flutter and drift, internal oscillator, four ranges, internal or external weighting filters. ME108E reads NAB as well as DIN measurements.



ME105E WOW AND FLUTTER METER

The ultimate laboratory flutter meter for audio, video, and instrumentation recorder use. Quartz reference oscillator, two internal filters or external filter, reads DIN, IEC, ANSI, NAB, or JIS standard measurements.

ME401 AUTOMATIC DISTORTION METER

This unique test instrument verifies bias optimization by displaying third order distortion measurements while automatically maintaining calibration despite changes in input level. With the ME401 any recorder can be optimized for any tape and exact tape bias requirements can be verified eliminating guesswork and reliance on tape manufacturer's recommendations.

see us at the Los Angeles AES
Booth 104-105, Demo Room 474

AUDICON MARKETING GROUP

1200 Beechwood Avenue • Nashville, Tn. 37212
615·256·6900 • Telex 554494

for additional information circle no. 108

"RULES"
for playing the
INDEPENDENT PRODUCTION GAME

The circumstances surrounding these kinds of sessions vary greatly. Normally, I bring an arranger into the picture after I've laid my rhythm tracks. Some producers work very closely with their arrangers and prefer the security of having their counsel throughout the project. There are groups who sing, write, and play well, but who aren't imaginative with their charts. When this is the case, I'll have an arranger make a sketch for the rhythm date and any other sweetening (additional percussion or voicing after the rhythm session), I may require.

Arrangers used to be paid for writing an entire arrangement, the cost ranged from $300.00 - $350.00 per chart. Today, most arrangers want to be paid separate fees for the rhythm, background, brass, and string sections. Producers are faced with four or five separate expenses of perhaps $300.00 each. Also, the arranger will probably want to conduct the sessions and for this receive leader's fees for each date.

On a limited budget, there are certain critical points in the process of recording. *The basic tracks are very important.* They are the foundation upon which you build, so use the best room you can afford. You'll have to live with the rhythm tracks through the duration of your venture. I try to find a warm room that is small enough to get a good sound; one where the musicians don't have to exclusively rely on their headphones. For the rest of the sessions, aside from strings and the final mix, you can use a less expensive studio for vocals, background vocals, and sweetening. Lead vocal is obviously important. For most voices I like the sound of a Neuman U47 microphone. When you're recording strings, do it in a room with a high ceiling.

Musician Costs

A legitimate demo session requires a license with the AFM, with a payroll scale of $35.00 for the first hour, and $15.00 for each ½-hour after that. Since the first hour is usually consumed with the engineer working on the drum sound, I find the demo scale a hardship.

For publishers' demos, I prefer paying musicians $25.00 a tune. The musicians I hire know I'm not going to take advantage of them by taking five or six hours with a single tune. I also pay singers, both lead and background, $25.00 per song. Singers work faster than instrumentalists, and this seems to be the going rate. If I'm working on a recording project with a group, I don't think I should pay them a demo fee. However, if you want to avoid feeling obligated, pay them demo scale for each tune. According to AFM guidelines, as long as each member of the group receives a royalty and is paid scale for each tune, you can use the musicians as long as they're needed for sweetening and overdubbing. Also, groups are plagued by personnel problems. You'll invariably find that after you've completed your sessions, someone has left the group, so by playing it legitimately, you'll be protecting yourself from union trouble.

Groups sound pretty good in a club when you have a drink in your hand. You may find in the studio that one or more of the players is weak. Unless his playing is deficient enough to affect the tempo or feel of the recording, you can hire a studio player and save the tape.

When a record company is excited with a tape, they'll always ask to see the group live. They'll also want to know the extent of the input of studio players and singers and whether or not there have been any personnel changes since the recording of the tape. Lead singers are usually pretty good, but a lot of groups are weak in their background vocals. If the problem is severe enough, as with weak players, I'll record the performance and replace them with studio singers. These situations can be difficult personally, but I try not to be affected. I don't enjoy raining on anyone's parade, but as a professional, I take my work seriously. I believe that the final product should be my primary consideration.

Selection of Material

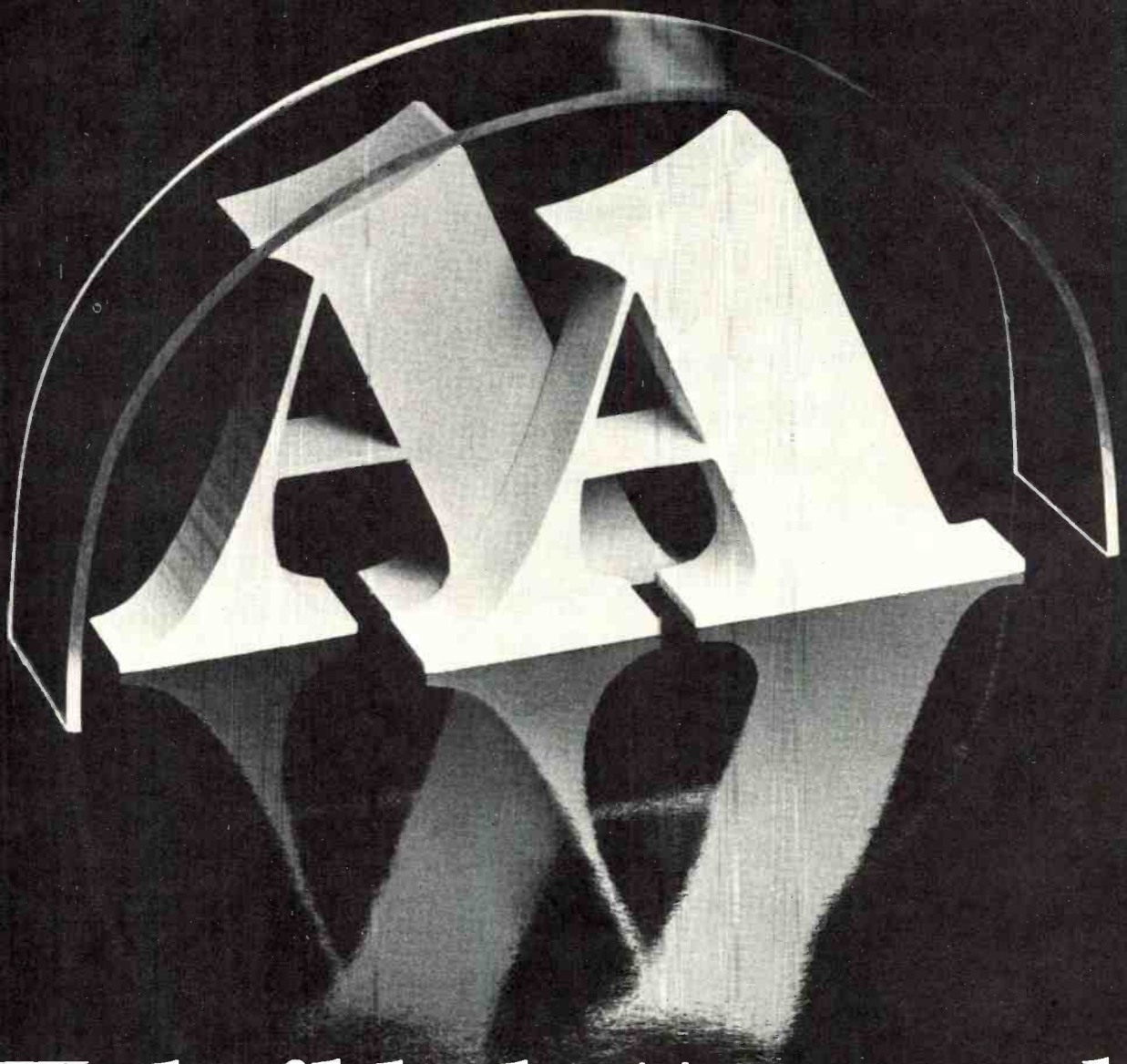
This may well be the producer's most important decision. A producer should be up-to-date on the record charts and be able to reel off the top ten at the snap of a finger. In the record production classes I teach at various colleges, we review the charts and discuss the elements that made these records successful. A lot of producers are knowledgeable about audio and music, but not many are really into songs. Having been A&R director for a number of major firms, I cannot emphasize strongly enough how intense the search is for strong material. Songs build stars and maintain careers. If you feel deficient in this area, you'd better do some homework; it's important!

Every group has a direction, whether it be rock, fusion, rhythm and blues, or country. Compare the tunes you're about to record against the chart records in your category. If they don't stand up favorably, either have your group write new material, or go to an outside source. Remember that you want the publishing on the tunes you record, so go to a songwriter, not a publisher.

There is no purpose for recording without strong material. Record companies listen to material first and the group second. Again, it is very important that you receive the publishing rights to the group in the letter of agreement between you and your artists. If a song is particularly exciting, at very least, you'll have a shot at placing it with another artist or group.

Dionne Warwick is an artist of great integrity, but record-wise her career was cold until recently. Listen to Richard Kerr and Will Jenning's powerful song, "I'll Never Love This Way Again." Look how her career has benefited by her having decided

Listen.



We build a better sound.

From the ground up. Or by state of the art renovation. Precisely tailored to meet your acoustic and aesthetic tastes. Let our staff of experts give your studio the sound it deserves.

A complete pro audio dealer, we service what we sell. At our place or yours. Anytime. And if current equipment doesn't meet your specific needs, we custom design and manufacture systems that will.

Audio Architects
INC.

112 Space Park Drive, Nashville, TN 37211 615/331-3247 FORMERLY CREATIVE AUDIO

for additional information circle no. 110

to record that single song.

Letter of Agreement

Colleagues and students question me more on this subject then any other. A producer needs something in writing in order to secure the rights necessary to represent his artists and their product. I'm not a lawyer, therefore I use a limited but binding agreement that doesn't seem to scare new talent. Can you imagine a fledgling artist's apprehension at the sight of a 30-page production contract? When and if a record company desires your artist's services, a lengthier and more specific document can be drawn. A letter of agreement should cover these basic points:

1 - Artist shall be available to perform at sessions under the direction of the producer or company, for a period of time agreed upon by all parties.

2 - Company or producer shall select the compositions to be recorded, subject to the approval of Artist, which approval shall not be unreasonably withheld.

3 - Company or producer shall advance all costs necessary to record and mix "master recordings," (as that term is customarily used in the entertainment industry). It is understood that should musician's services or studio time be provided "on spec" (that is, payment to be made out of advances received upon the execution of a recording agreement with a record company) such payments shall be made out of first monies received by Company.

4 - Company agrees to use its best efforts to obtain a production agreement with a record label concerning the "masters" to be recorded hereunder, and this agreement shall remain in force and effect for a period of 270 days from the completion of the production, with said date to be established by a registered letter from the producer or company to the artist.

5 - In the event that the efforts of Company or producer result in an offer from a label to artist to record Artist's performances, which offer is acceptable or which results in the consummation of a recording contract, which label does not desire Company or producer to produce Artist, then Artist shall assign to Company twenty (20%) per cent of the Artist Royalties.

6 - Any composition that is written by Artist and is recorded either as a demo or commercial release pursuant to this Agreement shall be published by Company or producers firm. If there is a split publishing agreement, Company or producers firm will administrate said publishing company for a twenty (20%) per cent administration fee for the first five (5) years only, at that time there will be no administration fee.

7- If and when Agreement is reached with record label, Company will have the right to a management fee of twenty-five (25%) per cent and will have the right to assign a sub-management firm to handle day-to-day situations.

8 - It is anticipated that a more formal Agreement shall be prepared and executed in the event of a production and/or recording agreement resulting from the efforts of Company or producer, and as stated above, the parties hereto shall negotiate in good faith with respect thereto.

Following is a glossary of terms, definitions, percentages, and contract guidelines which you may find helpful as a reference.

Storage

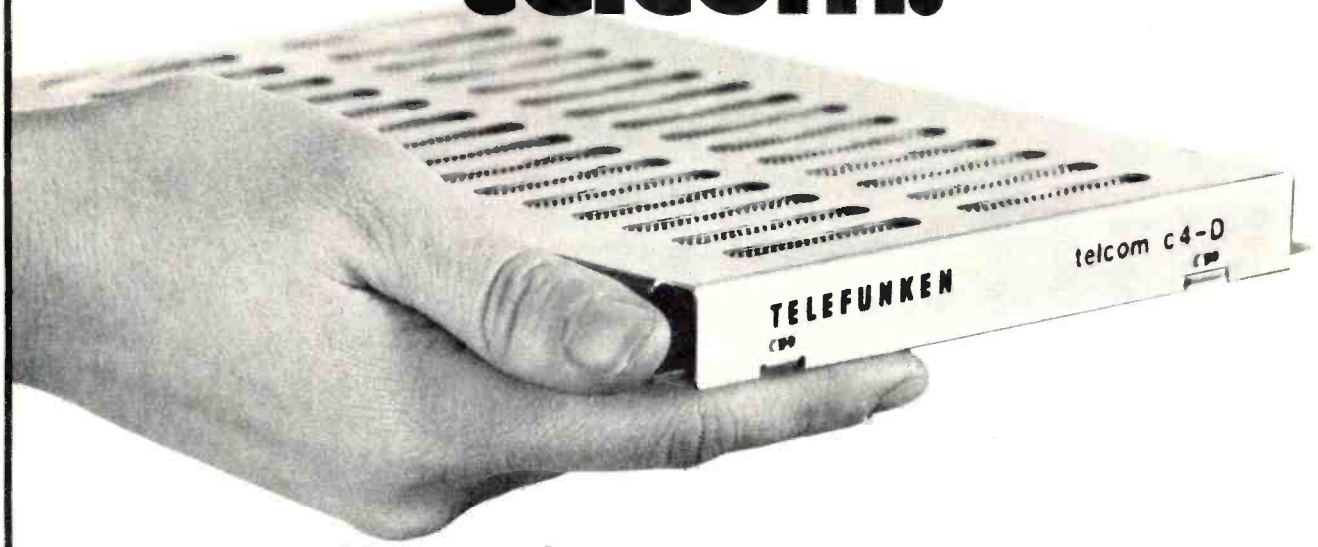
A big problem for independent producers and publishers is tape storage. When I quit working as an employee of a record company and went into independent production, I had to find a place to store my product. A 2-inch reel of Scotch #250 has room for 15-minutes of music, at 30 ips. It takes 4 to 6 reels to complete an album and they are both heavy and cumbersome. I not only do 8 to 10 albums a year for record companies, I have my own productions and have to produce the demos for my publishing company. Add to this, the fact that I've been in this business awhile, then you can see the enormity of the problem.

A producer might work closely with a single studio and store his tapes in their library. I won't do this because I work different studios to meet different needs. Wherever you store them, make sure that the room is not subject to direct sunlight or drafts, and that the room is dry and maintains a temperature of between 60 and 75 degrees.

Tape

In the event a project isn't marketable, all is not lost, you still have the reel of tape. Ampex 406 was replaced by their new series, 456. While 456 is a superior tape technically, for demos there is no significant difference. Just make sure that your engineer knows the model number so he can align his machine to your tape.

Gotham proudly presents telcom.



It gives you a lot less for your money.

A lot less hiss. A lot fewer problems.

Quite simply, the telcom® c4 is the most effective noise reduction system, with the features discriminating customers like ours want:

- 30 dB of dynamic range expansion without pre-emphasis or the need for aligning expander to compressor.
- Control channel processed in 4 separate bands.
- Plugs directly into both 24- and 2-channel GOTHAM TTM racks, as well as Ray's* 360/361 units.
- Unique applicability to tape recording, satellite, microwave and broadcast long-lines.

telcom® also happens to be the most expensive system and we're sorry about that. But there was no other way to give a demanding professional like yourself the most exciting noise reduction breakthrough in more than ten years.

So, don't settle for more, when you can get less.

Write today for more information. Or better yet, let us arrange for you to hear less for yourself.

TELEFUNKEN

GOTHAM AUDIO CORPORATION

741 Washington Street, New York, NY 10014 • (212) 741-7411
West Coast Office: (213) 874-4444

*Ray is the registered first name of Dr. Dolby.

GA-7

"RULES" for playing the INDEPENDENT PRODUCTION GAME

Who?	How Much?	How Long?	Why?
CONTRACTS	**PER CENT**	**LENGTH**	**PURPOSE**
PRODUCER	2, 3, 4	Per project	Producer override is usually based on previous track record. Not to be cross-collaterialized against artist or any previous albums. Each LP should stand on its own.
PRODUCER FINDERS FEE *(For placing artist with label or publisher)*	10	One time only	Should be based on monies offered for new group. If producer has invested monies, that should be paid for separately. Percentage is on total amount.
PERSONAL MANAGEMENT	25	One year plus 4 one year options	To be able to employ sub-manager, plus road manager. Total cost of management not to exceed 25%.
AGENCY	10 Steady Empl. 15 One Nighters	Usually non-exclusive	Personal manager has right to assign agency to handle bookings.
BUSINESS MANAGEMENT	5, 10	Cancellable one month notice	Personal manager should have control of business management firm in event artist achieves level where this would be needed.
RECORDING CONTRACTS	6-7 *New* 8-14 *Established* Between 7 and 10 normal per cent	1 Year plus 4 one year options	Should have acceleration clause to go up each year. Some stay at same level for first two years. Make sure tape and foreign is at least ¾ to full royalty.
AGAC *(Royalty Collection Plan for composers)*	5 Up to $20,000 ½ from 20M up to 100M	At least 1 year from date of signing	Percentage due Society well worth expense since contract is stronger. Their lawyers help collect monies.
ASCAP	0	5 Years	Cancellable with six month clause.
BMI	0	5 Years	Cancellable with six month clause.
MUSICIANS UNION	3, 3½, 4 Work dues	On work performed	Recording checks must be picked up at union.
FINANCING OR BACKING	50	Until paid off	Backers usually require heavy money payback until investment is covered then per cent decreases. Backers are usually personal managers.
PUBLISHING	50 (Writers get 50%)	Usually song reverts back to writer if not published or recorded in 1 year	Publisher obtains copyrights then should assign all payments to writers directly from performance societies and sometimes mechanical royalties on sales of records to go directly to writers.
ADMINISTRATION OF PUBLISHING	15, 20	Should only run for first 2 or 3 years of copyright, then no admin. fees should be paid	Publishers take administration fees on split copyrights or on publishing companies they run for artists, writers, and producers.
STAFF WRITERS FOR PUBLISHING COMPANIES	50	1 Year with options	Staff writers get salary as advance against future royalties. Fees are the same as normal writers share but all material must go to publisher during tenure.
PUBLICIST (P.R.)	None	Month-to-month	PR is always a salaried job.
CO-PRODUCER	?	Project-to-project	Each case is negotiated with % derived from producer's override.
SOUND SYSTEM ENGINEER	None	UNTIL EXHAUSTION	Usually a salaried job.
RECORDING ENGINEER	None	As long as producer grooves with them	In-house engineers get from $7.50 to $10.00 per hour. Heavyweights can go as high as $40, $50 per hour. Negotiable for sure.

As a publisher, I use a lot of cassettes. I must use at least fifty of them a week. Obviously, I'm not about to pay the retail price of $6.00 for a Maxell or Fuji cassette. I've found a dealer in North Hollywood, B&L Sales and Marketing, who supply me with duplicator tape. These are cassettes used for high-speed duplication in mass quantity. A 45-minute cassette purchased in quantities of 50 costs me .68¢ a unit. I can buy a box of 50 AD-TDKs, which is a superb cassette, from B&L for $1.70 each, I'm sure that most major cities have retailers who offer similar deals.

A cassette has become an important part of our industry. Most studios have their cassette machines set up so that you can record the entire session as it's in progress. Since studios sell their cassettes for the retail price, I bring my own and record my sessions for study at home or in my car. Make your cassette during playback, not after the session. This is a considerable saving and a good habit to get into.

I think the label and information on a cassette says something about the publisher or producer who sent it. At B&L, I buy blank labels. Typewritten labels containing contents and data expose my product with professionalism. The vast majority of artists, managers, or record companies will call me if they pass on what I've submitted and ask if I want the cassette returned. I'd feel funny about having them pay postage on my 68-cent cassette, so I tell them to forget it and to buy the next group I have to offer.

Some Final Thoughts

Should your product fail to develop into competitive masters, be prepared to pursue the recordings as a publisher. If your judgement was sound when you selected material, you should have good demos of quality songs. Be objective of yourself and your wares. Get a reaction on your product from colleagues whose judgement you trust before making an important appointment. If your tape is 'hot,' then give it the 'hard sell.' If it is ordinary, take note of the lessons learned and write it off. Don't try to peddle something just because you have money invested in it. The doors of the industry are open to new faces, but if you get a reputation for handling mediocre product, you'll find those doors closed. When a record company has spent a large sum of money on an album that has turned out to be inferior, they simply won't release it. They will not throw good money after bad. The largest expenditure for a record company isn't production, it's promotion and merchandising. Companies usually spend five times the cost of an album in its promotion. If an album costs $50,000 to produce, up to $250,000 will be spent on its promotion. For these reasons, record companies only release product that they feel has a good chance in today's market.

As you become more involved in the record industry you'll meet people, and if you're wise, develop contacts. Follow the trends in contemporary music and keep up-to-date regarding technical advances. Be informed on as many areas of the business as you can. One day you just might produce a superior project, and if you've laid the proper groundwork, someone of importance in the industry will be receptive to you. □□□

For busy studios

Synchronizer and Locator

from the Tape Control Experts at Audio Kinetics

QLOCK 210 Synchronizer

At last there's an easy to use synchronizer—a complete, efficient unit designed by recording engineers *for* recording engineers.

The QLOCK 210 provides full transport control of two separate machines, together with all locate and cycle functions. It lifts the tape during fast winds—eliminating needless wear of expensive heads and protecting signal quality of master tapes.

The 210 has a built-in multi-standard SMPTE time code generator and two readers, 10 locate memories, Auto-Record drop in and out memories, and can be controlled by desk automation.

Best of all is its sensible, workable ease of operation. This and its many other features combine to make the QLOCK 210 the best buy in synchronizers today.

XT 24 INTELOCATOR

Free yourself from manual tape machine operation—or clumsy, inefficient auto-locators.

The Audio Kinetics XT 24 *Intelocator*, with its straightforward, sensible commands and one-button locate, is a time-saving must for busy studios.

The *Intelocator* remembers tape and transport behavior patterns, reducing subsequent locate time. It has two independent counters, master and intelocate, which together with six aim points provide a unique and practical way of working. Cycle and recycle modes allow automatic replay of tape. The unit has lever controls for easy counter setting, and even has a varispeed readout.

The *Intelocator* interfaces with most 24 track machines—to maximize performance, software is especially written for each machine type.

AUDIO KINETICS

For a demonstration or further information, contact Ian or Carole at:

QUINTEK DISTRIBUTION, INC.

4721 Laurel Canyon Blvd., Suite 209, North Hollywood, CA 91607
Phone (213) 980-5717 • Telex: 194781

East Coast distributor:
Empirical Audio / 3A Todd Place, Ossining, NY 10562 / (914) 762-3089

SEE US AT AES —BOOTH 673

— continued from page 34 . . .

STUDIO UPDATE

Midwest

■ **GRANNY PRODUCTIONS** (Hamilton, Ohio) has opened a 1" 8-track facility featuring a 25' x 30' acoustically treated studio with an isolated drum booth; Ampex, MCI, and Scully recorders; Grommes Precision and Langevin mixers; and Altec monitors. Mikes are by Shure, Electro-Voice, RCA, and Sony; and instruments include a Ludwig drum kit and a grand piano. **IMANI FOWLER** is the owner/operator. *2297 Benninghafen, Hamilton, OH 45015. (513) 868-1544.*

■ **TRC STUDIOS** (Indianapolis, Indiana) has just completed major renovations to its Studio "A," including the addition of a Harrison 3232 console, Allison programmer, and ADR noise gates, compressors, equalizers, and autopanner. The 1973 **JERRY MILAM** designed studio was left structurally intact, but underwent minor acoustic adjustments with major redecorating and refurnishing. The Sentry III monitors are now driven by a Crown PSA-2 through White 1/3-octave equalizers, and two optional monitoring systems are provided. MCI 2-track machines have been added to compliment the JH-114 24-track with Dolby noise reduction. AKG echo and a variety of Eventide and UREI signal processing gear is offered as well, and rates have been restructured to offer incentives for daily and weekly bookings. *1330 North Illinois Street, Indianapolis, IN 46202. (317) 638-1491.*

Solid Sounds

■ **SOLID SOUND** (Ann Arbor, Michigan) has completed installation of an MCI JH-636 automated console and a new MCI 24-track recorder. Studio president **ROB MARTENS** also announced the appointment of **DANA GROSS** to the post of business manager of the studio. *Box 7611, Ann Arbor, MI 48107. (313) 662-0667.*

■ **SOUNDTREK STUDIOS** (Kansas City, Missouri) is re-equipping Studios "A" and "B," according to its president **RON UBEL.** New equipment features a Neotek Series III 28 x 24, a Neotek Series I 12 x 4, Scully 2- and full-track machines, Otari 5050Bs, UREI 1176 LN limiters, and Lexicon 224 digital reverb. Microphones are by Sony, AKG, Electro-Voice, and Shure, while the monitoring chores are handled by JBLs and Crown amps. The new gear should be operational by the Spring of the year, and is being installed by **FLANNER'S PRO AUDIO,** of Milwaukee, Wisconsin. *3727 Broadway, Kansas City, MO 64111. (816) 931-8735.*

■ **MADISON STREET SOUND STUDIO** (Waupun, Wisconsin) has added a Delta Lab DL-2 Acousticomputer to its facility along with a new baby grand piano and a re-designed drum booth. *17 North Madison Street, Waupun, WI 53963. (414) 324-3021.*

■ **SOUND RECORDERS** (Kansas City, Missouri) is in the process of completing its new facilities in Kansas City. The studios will feature a 24-track automated room as well as several production and voiceover rooms. **JIM WHEELER** has been named vice president and general manager of Sound Recorders, along with the addition of **TIM STANTON** as staff engineer, **BOB JENKINS** as music producer, and **LINDA MCLOUD** as production assistant. *3947 State Line, Kansas City, MO 64111. (816) 931-8642.*

■ **GOLDEN VOICE RECORDING STUDIO** (Oklahoma City, Oklahoma) owned by **ACKERMAN & MC QUEEN ADVERTISING,** has added to its microphone collection with the purchase of a Neumann KM84 and an Electro-Voice RE-20. A Teletronix LA-2A tube limiter has been added as well to the selection of UREI limiters, and four more parametric channels have been added to the MCI 600 series console, making fourteen parametric and fourteen normal channels. The 24-track studio has also purchased a complete natural wood Yamaha drum kit. *5708 Mosteller Drive, Oklahoma City, OK 73112. (405) 843-9451.*

■ **CABOOSE RECORDERS** (Indianapolis, Indiana) is the new 8-track studio recently opened by **CABOOSE PRODUCTIONS.** The studio was designed by **MICHAEL EBERT,** who has joined the studio as technical director, according to company president **CHARLES DUKE.** The operation features Otari and Sound Workshop equipment along with a full complement of microphones and signal processing equipment supplied by **VALLEY AUDIO** of Nashville. *2204 Duke Street, Indianapolis, IN 46205. (317) 545-5165.*

Mountain

■ **LISTENUP AUDIO SYSTEMS** (Denver, Colorado) announces the completion of their 8-track live broadcast control room in the Rainbow Music Hall facility. Equipment includes a Tascam Model 15 console, Otari 8-track and Tascam 2-track machines, parametric equalizers, noise gates, compressor/limiters, reverberation, and JBL monitors. The control room was designed by **MILAM AUDIO,** according to general manager/senior engineer **NORM SIMMER. THOMAS LANG** is also on staff. *685 South Pearl Street, Denver, CO 80209. (303) 778-0780.*

■ **THE MUSIC PLANT STUDIOS** (Denver, Colorado) has re-designed its control room, with additional gear including an Eventide Clockworks Instant Flanger and custom direct boxes featuring Jensen transformers. Recorders are by MCI and Ampex, and studio manager **DAVE SAWYER** adds that numerous other outboards have also been installed. *4511 East Colfax, Denver, CO 80220. (303) 399-4220.*

Northwest:

■ **AAA/TRIANGLE RECORDING STUDIO** (Seattle, Washington) has merged with **WILLIAM STUBER,** of **IWA RECORDING,** doubling the equipment available, while expanding and remodeling the studio and remote facilities. In the studio are a Scully 8-track, Studer, and Otari 2-tracks, UREI 813 monitors, Crown, and BGW amplifiers, Kepexes, Gain Brains, and an assortment of mikes by AKG, Sennheiser, Beyer, and Electro-Voice. *4230 Leary Way, N.W., Seattle, WA 98017. (206) 783-3869.*

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
P.O. BOX 2449 •HOLLYWOOD, CA 90028

. . . continued overleaf -

Now, More Good News.

Quad-Eight Delivers...on The Front Line for "The Big Show." When you're doing a weekly TV show that requires two sound stages... an ice rink... a swimming pool... a stage big enough for a "cast of thousands," you don't skimp on your equipment. That's why Ed Greene, leading independent recording engineer and consultant, picked an automated Quad-Eight Coronado console for Nick Vanoff's Complete Post Production Center in Hollywood, taping and post-production location of NBC's The Big Show. "I can't think of another stock console that could suit our purpose better," Greene said, in discussing his choice.

Greene is very familiar with Quad-Eight consoles, having used them at Sun-West Studios in Hollywood, The Hollywood Bowl and at the Eastman School of Music where he teaches.

In selecting the console for Complete Post Production Center, Greene wanted the highest reliability possible. Shooting a weekly high budget series of this size on 4 shooting days required a console with zero downtime. In a situation with 18 hour shooting schedules and literally hundreds of people on the set, *any* delay can cost thousands and force costly schedule changes. And the board had to be straight forward so it could be used for other work as well. "I'm not the only guy who's going to be sitting here operating it," Greene said. "This console is so straight ahead that I can bring in someone to use it and they can do it the first day..." he added.

What Ed Greene chose was the *dependable* automated console from the company most experienced in Production and Post Production applications.

The Coronado console delivered to Complete Post Production joins the scores of Quad-Eight boards already in use for broadcast post-production and sweetening around the world. Quad-Eight post production consoles have long been the standard of the film industry... maybe that's why Quad-Eight is the only audio company to be awarded The Academy of Motion Picture Arts and Sciences Award for technical achievement.

Whether your business plans call for a new console update or you're starting from scratch like Complete Post Production Center, one phone call to Dave Hadler at Quad-Eight can get you going... fast! **We told you it was good news.**

Seated: Ed Greene, independent recording engineer. He specified this Quad-Eight Coronado console for Complete Post Production Center in Hollywood. Standing: Dave Hadler, Quad-Eight.

We speak your language.

Quad-Eight Electronics/Quad-Eight International, 11929 Vose Street, North Hollywood, California 91605, (213) 764-1516, Telex: 622-446

STUDIO UPDATE

Northern California

■ **ARMY STREET STUDIOS** (San Francisco) has recently added to its equipment an eight level sequential rhythm computer, according to studio manager **LESTER GASS.** *P. O. Box 31425, San Francisco, CA 94131. (415) 285-0952.*

■ **HEAVENLY RECORDING STUDIOS** (Sacramento, California) has taken delivery of a new Lexicon 224 digital reverb. *1020 35th Avenue, Sacramento, CA 95822. (916) 428-5888.*

■ **DIFFERENT FUR RECORDING** (San Francisco) has opened its fully automated studio with 48-track analog capability and 32-track digital capability. Owner/operators **PATTY** and **PATRICK GLEESON** had their old studio completely re-designed and re-built to achieve this facility. The control booth is now of LEDE and Time Delay Spectrometry™ construction based on a design concept by **JOHN STORYK,** of Sugarloaf View. The previously employed Harrison 4032 console custom modified by **WESTLAKE AUDIO** is used again with MCI analog recorders and/or 3M's new 32-track digital machine from San Francisco's **AUDIO VIDEO RENTS,** when requested. Additional features of the room include AutoLocator III, 26 channels of Dolby A, 28 channels of dbx, Lexicon Prime Time and 224 reverb, ADR Vocal Stressor, Eventide Harmonizer, and Allison Kepexes and Gain Brains. Monitors are 3-way bi-amped Westlakes, JBL 4311s, and 4313s, and Auratones. Microphones are by AKG, Beyer, Shure, Electro-Voice, Sennheiser, and others. **TOM PADDOCK** is the chief technician. *3470 19th Street, San Francisco, CA 94110. (415) 864-1967.*


Different Fur

■ **TEWKSBURY SOUND RECORDERS** (Richmond, California) have added to their collection of classic microphones with the acquisition of a pair of AKG 012As. *6026 Bernhard, Richmond, CA 94805. (415) 232-7933.*

Southern California

■ **HOUSTON RECORDING** (Cucamonga, California) has taken delivery of a new MCI JH-636 automated console. The 32-input board will be installed in the company's remote truck according to **RICH HOUSTON.** *9340 Foothill, #32, Cucamonga, CA 91730. (714) 987-0379.*

■ **ENACTRON STUDIOS** (North Hollywood, California) was forced to relocate after heavy rains and flooding in its Beverly Hills facility. The original truck is still operational, as is a new studio suitable for doing strings. A second room will be added. *5102 Vineland Avenue, North Hollywood, CA 91601.*

■ **MARS STUDIOS** (Los Angeles) unveiled its plans for expansion from what was primarily a rehearsal complex to a full scale recording/rehearsal facility. A Trident TSM 40-track board will be linked with an MCI 24-track machine as well as Studer 2-track recorders. Full dbx will be installed, along with AutoLocator, a Lexicon 224 and two echo plates. A full array of outboards is planned with mikes by Neumann, RCA, Shure, AKG, and Electro-Voice. General manager **STAN GITTELMAN** estimates the total expenditure will be around $650,000. The operation is scheduled to open in late Spring. *665 N. Berendo, Los Angeles, CA 90004. (213) 660-6334.*

■ **CAN-AM RECORDERS** (Tarzana, California) will see the completion of its Studio "B" this Spring. The new room will house a Quad-Eight Coronado 40x40 console with Compu-Mix Three automation linked to MCI recorders with 48-track capability. The facility's Studio "A" features the same panel feeding an MCI 24-track with Audio Kinetics XT-24 Intelocator and Dolby noise reduction. Monitoring is by a Goodman Reference custom designed system supplemented by JBL 4311s and Auratones. Outboards include Lexicon Prime Time, EMT Gold Foil reverb, dbx 165 compressor/limiters, and a phaser, flanger, and exciter all by EXR. Mikes are by Neumann, AKG, Sennheiser, Beyer, and Electro-Voice, and instruments include a Kimball grand piano, a Fender Rhodes 88, and an ARP string ensemble. *18730 Oxnard Street, Tarzana, CA 91356. (213) 342-2626.*

■ **THE HOPE STREET STUDIO** (Los Angeles) announces the formation of **DIGITAL SOUND RECORDING,** a digital recording company. **VAN WEBSTER,** Hope Street's owner, revealed the purchase of a Sony PCM-1600 digital recording editing system featuring the PCM-1600 digital audio processor, two BVU-200A video recorders, and a BVE-500A editing controller. Services to be offered will include studio and world wide remote 24-track digital recording; 24-track mixdowns to 2-track digital masters; editing, assembly, and preparation of digital masters; and digital playback for disk mastering. The system is also available with a technician for use in outside studios. *607 North Avenue 64, Los Angeles, CA 90042. (213) 258-6741 and 258-0048.*

■ **LION'S GATE SOUND** (Los Angeles), a division of **ROBERT ALTMAN'S LION'S GATE FILMS,** is planning construction this year of a second re-recording stage, for use primarily in video projects. The sound service has been in operation for one year, and features a dubbing stage equipped with a 24-input console, and high speed equipment. Facilities can handle multichannel as well as conventional film sound. **SUZANNE HINES** is the facility coordinator. *1861 South Bundy Drive, Los Angeles, CA 90025. (213) 820-7751.*

■ **SCOTT/SUNSTORM RECORDING STUDIOS** (Los Angeles) has finished installation of a new Harrison 3624 console in its Studio "A," bringing the facility to a total of three fully refurbished 24-track studios. Studio "A" was also enlarged by 72 square feet and received a full acoustical modification and upgrading of the control room monitors. The new board was purchased from and installed by **ELECTRO-MEDIA SERVICES,** of Los Angeles, and is programmable automatically by changes in a programming PC card. The announcement was made by managing director **GENE MACKIE.** *9255 Beverly Boulevard, Los Angeles, CA. (213) 658-5990.*

■ **BLACK ORPHEUS RECORDING** (Studio City, California) has completed its expansion to 24-track on its first anniversary, according to president and chief engineer **EDUARDO FAYAD.** The studio is now equipped with a modified Amek 28x24, 4-band parametric console feeding a 3M M-79 recorder with AutoLocator and ATR-100 and AG-440 2-track machines. Monitors are UREI 813 Time Aligned™, JBL 4311s, and Auratones. Among the sideboards are dbx and UREI compressor/limiters, UREI parametrics, an Eventide Harmonizer, Scamp S23 and S24 effects modules, and Orban sibilance control. Noise reduction from dbx is utilized, and mikes are by Beyer, AKG, Shure, and Sennheiser. A Mason-Hamlin concert grand piano is also available. *11702 Ventura Boulevard, Studio City, CA 91604. (213) 762-0605.*

to be represented in the next available issue write:
R-e/p STUDIO UPDATE
P.O. BOX 2449 • HOLLYWOOD, CA 90028

BUY DIGITAL NOW. WHEN YOU CAN LEAST AFFORD IT.

Accountants would scream that an economic slump is no time to be installing Sony Digital equipment in your studio.

However, when was the last time some economic expert cut a record?

The fact is, more and more top recording artists are insisting on state-of-the-art Sony Digital equipment when they cut theirs. Because they care about the perfect sound reproduction only digital audio provides.

And when you attract their business, you stay in business.

For the complete facts on Sony Digital Audio, see us at A.E.S. in Los Angeles. Or call Jim Guthrie in New York at (212) 371-5800; Roger Pryor in San Francisco at (415) 467-4900; or Rick Plushner in Los Angeles at (213) 537-4300.

SONY®
Digital Audio

New Products

SOUND WORKSHOP INTRODUCES SERIES 30 AUTOMATED RECORDING CONSOLE

The Series 30 has been designed to implement most of the features and performance of the Sound Workshop Series 1600 Recording Console, in a smaller size and at a much lower cost. The Series 30 comes equipped with 8, 16, or 24 discrete output channels (determined by the number of inputs ordered) and 8 active mix busses. Mainframe sizes of up to 36 inputs are available, permitting console configurations ranging from 12 x 8 to 36 x 32.

In the tradition of the Series 1600 Console, the Series 30 is available, or may be later fitted, with a variety of options including VCA Input Sub-Grouping (utilizing the Allison EGC-101 Gain Cell) and ARMS Automation (MCI compatible). High-slew electronics and transformerless active balanced microphone preamplifiers are employed. A nominal output level of +4 dBm is standard, however, other interface levels are easily accommodated with no decrease in performance.

The Series 30 is an in-line (input/output) design, thereby allowing full monitor capabilities of any multitrack format, limited only by the number of inputs present. Metering is via LED ladder display with carefully compensated ballistics to duplicate standard VU response. An optional meter bridge housing with standard mechanical VU meters and peak-reading LEDs will be offered in mid-1980. All Series 30 Consoles will allow the retro-fit of the meter bridge.

The Series 30 is available in two console formats. Format "A" is designed for applications demanding sonic excellence without a full array of supplementary functions and frills. It uses Long Throws Carbon Track Faders (100 mm), 3 band/3 frequency EQ sections, and 2 auxiliary send busses. Format "B" is more elaborate, offering Penny & Giles faders, fully wired double normalled patch bay, 3 band sweepable EQ, switchable low cut filter, and 4 auxiliary send busses. Both formats include pedestal base and power supply.

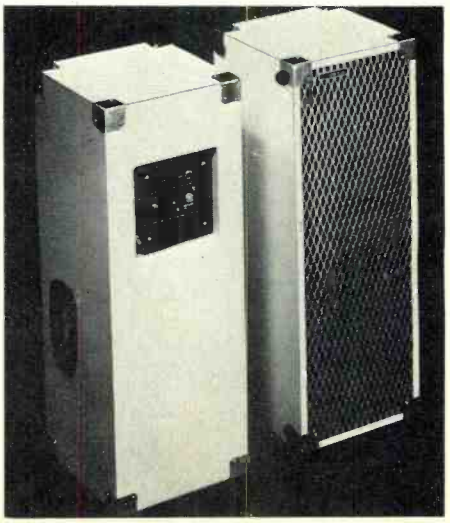
SOUND WORKSHOP
PROFESSIONAL AUDIO PRODUCTS
1324 MOTOR PARKWAY
HAUPPAUGE, NY 11787
(516) 582-6210

for additional information circle no. 117

'THE PERFORMER' FROM SPECTRA SONICS

Introduced as a new concept in sound amplification, this truly portable speaker system is of professional quality — is self-powered — and contains all amplification required for microphone use. Just plug in a microphone and be in operation. Anywhere.

Known as the Model 3100, it consists of a microphone preamplifier, a line level amplifier, a power amplifier, three 8-inch speakers, and rechargeable batteries for powering the complete system. Two separate inputs are provided. One input is for a microphone, and one input is for any line level source, such as tape, phono, tuner, etc. The system may be operated on internal battery power alone, or may be operated on 115 volt AC power (220 V/50 Hz operation available as an option) in a conventional manner. It may be utilized in the vertical or horizontal position, and is provided



Studio quality microphones that don't need a studio to survive.

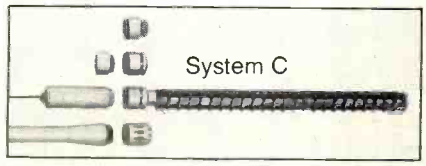
The CS15P condenser cardioid microphone is equally at home in a recording environment or broadcast studio. When hand-held it puts sex appeal in a voice with its bass-boosting proximity effect. With shaped high-frequency response and its ability to handle high sound pressure levels (140 dB with 1% THD at 1kHz), the CS15P is ideal for close-up vocal or solo instrument miking applications.

When boom mounted, the CS15P has better gain-before-feedback and a better signal-to-noise ratio than most shotguns. It's phantom powered and it's rugged.

The CO15P condenser omni extends frequency response to the very limits of audibility, 20 to 20,000 Hz. Unlike other "omni's," the CO15P maintains its omnidirectional polar pattern at the very highest frequencies. Perfect for the distant miking of an entire orchestra as well as up close on individual instruments. And like the CS15P, it's phantom powered and it's rugged.

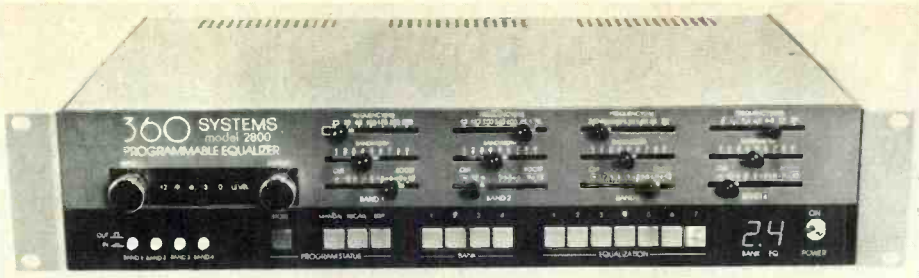
The Electro-Voice warranty
Electro-Voice backs up these two microphones with the only unconditional warranty in the business: for two years we will replace or repair your CS15P or CO15P microphone, when returned to Electro-Voice for service, at no charge – no matter what caused the damage!

We can do this because we build these microphones to meet our standards for performance, ruggedness and durability. We accept nothing less, and if you're a professional, buying a professional quality microphone, you shouldn't either.



Electro-Voice®
a gulton company
600 Cecil Street, Buchanan, Michigan 49107

for additional information circle no. 118



with rubber feet to accept either orientation. All electronics are solid state, designed by Spectra Sonics, to provide "beyond the state-of-the-art" performance and reliability, while the exterior is designed to provide durability. Metal corners and a metal speaker grille, combined with a leather luggage handle, make portable usage easy and practical.

The Spectra Sonics Model 3100 is said to be the ultimate in portable speakers, and will perform professionally wherever sound amplification is required.

SPECTRA SONICS
3750 AIRPORT ROAD
OGDEN, UT 84403
(801) 392-7531

for additional information circle no. 119

360 SYSTEMS PROGRAMMABLE EQUALIZER, MODEL 2800

360 Systems' new Programmable Equalizer stores and recalls 28 sets of EQ curves and level settings from its own internal memory. It is a completely self contained system, using a Z-80 microcomputer to manage the affairs of a 4-band analog parametric equalizer. With the Model 2800 it is said to be possible to pull the plug and take a sound from the studio to the cutting room. Or get repeatable special effects on the road with a stage act. And in non-music applications it provides unusually extensive spectral manipulation, with the advantage of direct comparison between all 28 stored programs.

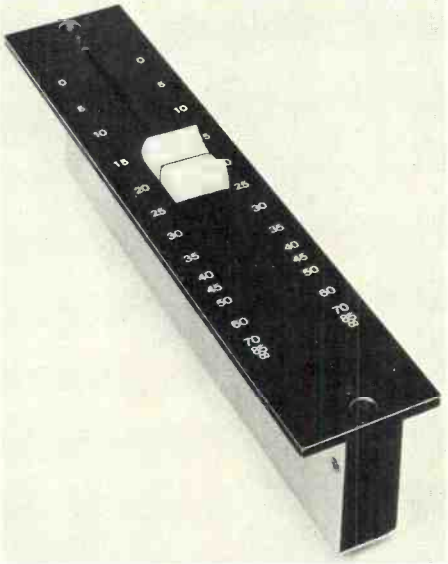
Model 2800 is available in single and dual channel versions, priced at $1,415, and $1,730 respectively. It occupies 3½" of rack space, and can be ordered in 117 or 230 volt versions. Delivery is stock to 15 days.

360 SYSTEMS, INC.
18730 OXNARD ST., #215
TARZANA, CA 91356
(213) 342-3127

for additional information circle no. 120

THE FIRST DIGITAL FADER BY PENNY & GILES

The new digital fader provides a direct 8 bit digital output in non-ambiguous gray code decimal 0 to decimal 255 within a stroke length of 102 mm. The maximum and minimum counts are held constant within the 1 mm overtravel at either end of the linear stroke. A resolution of 0.4 mm is attained which results in an electrical resolution of 1/6 dB per step at 0 dB when the fader output is used to generate the digital equivalent of an analog audio taper law.



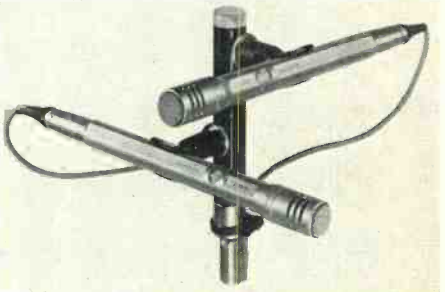
The new digital fader is physically interchangeable with the Penny & Giles 1100 and 1500 series faders and offers the same wide range of top plates and facias. Demand is considerable from those who need to drive digital attenuators or input directly to computer.

PENNY & GILES
1640 FIFTH STREET
SANTA MONICA, CA 90401
(213) 393-0014

for additional information circle no. 121

SHURE ANNOUNCES NEW STEREO MICROPHONE ADAPTER

Permitting two microphones to be mounted on a single stand, thereby providing a convenient method of miking for recording,



broadcasting, and sound reinforcement applications, the A27M permits horizontal coincident (mounted on same axis) or closely spaced mounting of microphones in a wide range of directional angles. The user can select the X-Y, ORTF, or other stereo pickup configurations. The A27M provides for vertical microphone separation of 31.8 mm (1-1/5 in.), 66.7 mm (2-5/8 in.), or 102 mm (4 in.).

The A27M permits miking for improved pickup of stereo ambience in comparison to other methods, such as two or more microphones widely spaced, or individual miking of instruments or instrumental sections.

for additional information circle no. 122

SONEX SOUND CONTROL

SONEX acoustical foam absorbs sound uniformly, with no peaks or valleys. You can control reverb times, eliminate stray reflections and standing waves. SONEX has proven itself as the method for effectively engineering sound in live-end dead-end control rooms.

SONEX is specially sculptured acoustical foam. It's based on new cellular foam technology and the anechoic wedge for optimum sound absorption and dissipation.

SONEX gives you overall cost savings compared with other methods of construction for sound absorption. You can build bass traps in half the space. Replace fiberglass in studio partitions and flats, eliminating airborne glass particles. And it's great for goboes. SONEX is easy to install. Apply adhesive, put SONEX in place; or simply staple to wall studs. You don't need any decorative covering. Its sculptured shape enhances the professional look of a fine-tuned sound room.

SONEX is available in 4′ x 4′ sheets or in 15″ square Audiotiles, conveniently packaged with 28 squares per carton.

When you need to eliminate noise and hear pure sound, go with the best. SONEX, made only by Illbruck.

See SONEX at AES Show at Alpha Audio Suite 571. Get your SONEX trial kit today!

illbruck/usa
techniques with foams
3800 Washington Avenue No., Minneapolis, MN 55412
Phone: (612) 521-3555 Telex: 290466/Cable: ILLUSA

Photo of SONEX in recording studio courtesy of Alpha Audio.

Alpha Audio
A Stocking Distributor
Richmond, Virginia

for additional information circle no. 123

The Shure Model A27M is 168 mm (6-5/8 in.) in length by 25.4 mm (1 in.) in diameter and weighs 392 grams (13.7 oz.).

User net price is $22.05.

SHURE BROTHERS, INC.
222 HARTREY AVENUE
EVANSTON, IL 60204

for additional information circle no. 124

MEYER SOUND UM-1 ULTRA-MONITOR SYSTEM

The new system was recently used by the Jefferson Starship in concert in San Francisco and by the Jefferson Starship and the Grateful Dead for their performance at the benefit concert for the Cambodian Emergency Relief Fund. On February 27, 1980 Filmways/Heider used the UltraMonitor™ for the Grammy Awards Presentation in Los Angeles.

The company noted the UltraMonitor incorporates a newly patented (U.S. Patent #4,152,552) high frequency driver which reduces "horn-distortion" by a factor of 10. The UltraMonitor system includes a control electronics package which includes speaker protection via SpeakerSense™. SpeakerSense is a portion of the controller circuitry which continuously monitors the voltage at the speakers and acts to reduce the drive to the amplifiers when the safe limits for power or excursion are exceeded.

Although designed primarily as an on-stage floor monitor, the UltraMonitor may be combined with one of two Meyer Sound Subwoofer Systems and can be used as a sidefill monitor, a drum monitor or as a small to moderate size sound reinforcement system.

MEYER SOUND LABORATORIES
2194 EDISON AVENUE
SAN LEANDRO, CA 94577
(415) 569-2866

for additional information circle no. 125

EDCOR HEADPHONE AMPLIFIERS

Two new professional headphone amplifiers, the HA 100 eight stereo channel and AP 10 four stereo channel, can be used with any combination of 8 to 2000 ohm headphones.

These units, in addition to having a flat frequency response, have less than 0.1% THD an an A weighted signal-to-noise ratio of -101 dB.

The units can be desktop or rack mounted.

EDCOR
16782 HALE AVENUE
IRVINE, CA 92714
(714) 556-2740

for additional information circle no. 126

THE TE-2 MIC CABLE TESTER

Wireworks announces the TE-2 Mic Cable Tester. The Model TE-2 combines all the features of its predecessor TE-1, plus an additional test mode and direct plugging of a second connector type. The TE-2's additional test mode checks for conductors shorted to the case of XLR-3 type connectors. This feature exposes the ground-to-case shorts often the cause of ground-loop problems. TE-2 also incorporates quarter-inch phone connectors which expand its capabilities to directly plug and test phone-to-phone cables and any combination of XLR-3-to-phone cable arrangements.

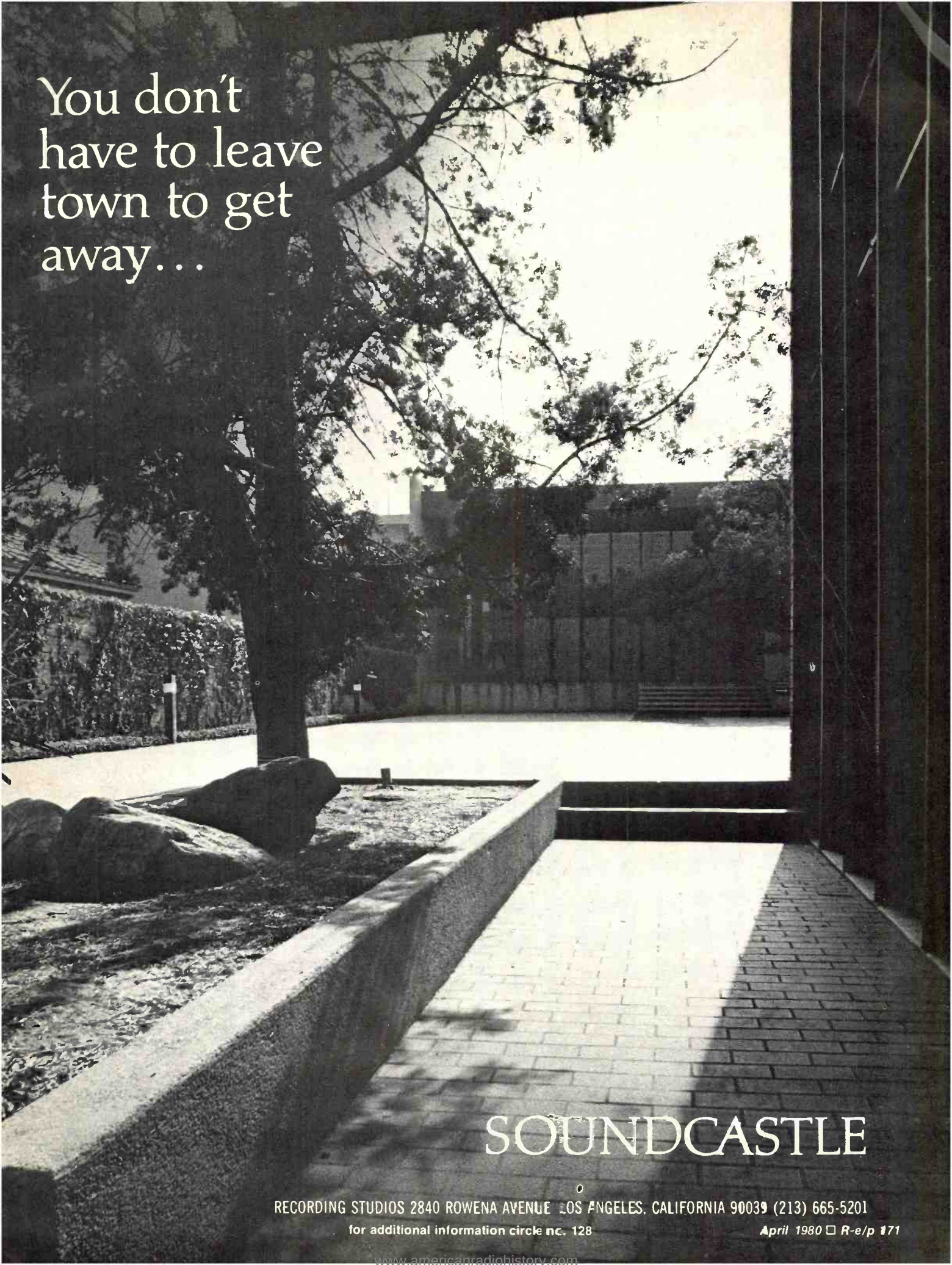
The Model TE-2 features: Immediate display of shorts, open circuits, and out-of-phase wiring, single handed operation, rugged steel enclosure, compact pocket size, reliable PC board construction, positive action switches, black textured finish, simple operation, and long life LED display.

The unit is powered by one nine volt battery (included) with an average test life of over one thousand cables.

WIREWORKS CORPORATION
380 HILLSIDE AVENUE
HILLSIDE, NJ 07205
(201) 686-7400

for additional information circle no. 127

. . . continued overleaf -



for additional information circle no. 128

SPECTRA SOUND PRO FLANGER

Spectra Sound, a wholly owned subsidiary of Spectra Sonics, has introduced a Professional Audio Flanger designated as the Model 4000. The unit was designed to create effects such as positive and negative flanging, double tracking, and speaker rotation simulation. In addition to these effects, chorus, vibrato, and tube echo effects can be achieved. The Model 4000 produces over five octaves of flanging without input aliasing, output equalization noise, or the introduction of any high frequency clock components.

An internal variable sweep oscillator can be employed for modulation of the delay time. Modulation of the time delay can be accomplished also via an external control voltage from conventional foot pedal, joystick, synthesizer, or computer device.

Standard features for the Model 4000 include both balanced and unbalanced inputs and outputs, LED overload indicators, and inputs and outputs for slaving several units.

The Model 4000 Professional Audio Flanger is available for immediate delivery and the price is $695.00, U.S. dollars.

SPECTRA SOUND
3750 AIRPORT ROAD
OGDEN, UT 84403
(801) 392-7531

for additional information circle no. 130

PROFESSIONAL AUDIO-VISUAL PATCH BAY

Featuring sixteen stereo inputs and outputs (256 2-channel crosspoints), with 64 gold-plated RCA phono connectors on the rear panel and 3-conductor Bantam® jacks on the front, the "fully-normalled" design means that no patch cords are necessary for normal system operation. Once set up, there should be no need for access to the rear of any equipment.

Front panel phono connectors enable connection of external equipment anywhere in the system.

The system uses a unique fully-shielded printed circuit design with no discrete wiring or active circuitry, has gold plating on all contact surfaces, and is contained in a 1¾" EIA standard rack package.

The patch bay will introduce no additional noise, crosstalk, or distortion to line-level signals, as all connections are "hard wire."

AUDIO VISUAL SYSTEMS
725 LORRAINE BOULEVARD
LOS ANGELES, CA 90005
(213) 934-3006

for additional information circle no. 131

CETEC VEGA ANNOUNCES ADVANCED HAND-HELD WIRELESS MICROPHONES

Cetec Vega proudly announces two all-new hand-held wireless microphones designed for use by professional performers, or anyone who must have professional sound quality without a mike cable. Vega claims these microphones to be a substantial improvement over all previous hand-held wireless mikes, citing not only top audio performance, but also a revolutionary case/antenna system. Because the antenna is incorporated into the microphone housing, unsightly dangling wires and "rubber duckies" have been eliminated. Vega states their new design assures that the RF output is equal to, or better than, that which could be achieved with an external antenna — no matter how the microphone is held. Light weight and a gracefully contoured shape contribute to the mike's comfortable, well-balanced feel.

The Model 80 is equipped with an Electro-

The SG-200
Dual Signal Gate,™
It's the gate you set and forget!
The SG-200 is as easy
to use on stage as it is in the studio.
The settings are non-critical, no "touchy"
threshold or release settings. The solution is the
SG-200's unique **Program Controlled Attack Logic** which positively prevents gate stuttering, chatter, distortion, or modulation problems.

• Use the SG-200 to gate individual input channels in P.A. or recording, for controlling echo chamber decay time, eliminating effects pedal hum or any other kind of low level interference. • Use the SG-200 live or in the mix—it's the gate you set...and forget!

Check these features of the SG-200 • Fast VCA control—no distortion producing FET's or slow optical attenuators. • Two channels in one sturdy 1¾" rack cabinet. • Independent attack, release, range, and threshold controls. • External control input.

For complete information call or write: **Symetrix** 109 Bell St., Seattle, WA 98121. (206) 682-3076.

for additional information circle no. 129

Voice EV-671 mike capsule, and the Model 81 utilizes a Shure SM-58 capsule. The unit has a transmitted response of ±2 dB from 40 Hz to 15 kHz (±1 dB 100 Hz to 12 kHz). Used with a Vega "Dynex" receiver, overall system dynamic range is said to be better than 90 dB, eliminating the mixer gain control riding the distortion caused by compression and clipping. (The mikes are available without Dynex for compatibility with older Vega receivers or those of different manufacturers.)

Both models use a standard 9 V alkaline battery, offering from 7 to 9 hours continuous use, and a range of up to 1,000 feet. Since operation is in the 150 to 216 MHz VHF range, there is no interference from CB radios or FM broadcast stations in normal use. An audio gain control on the bottom of the case lets the user adjust the mike's sensitivity. Optimum setup can be verified with an adjacent LED indicator that doubles as a battery monitor. The mikes also include a power on/off switch, plus a separate audio on/off switch so you can keep the receiver quiet when you want to temporarily silence the mike.

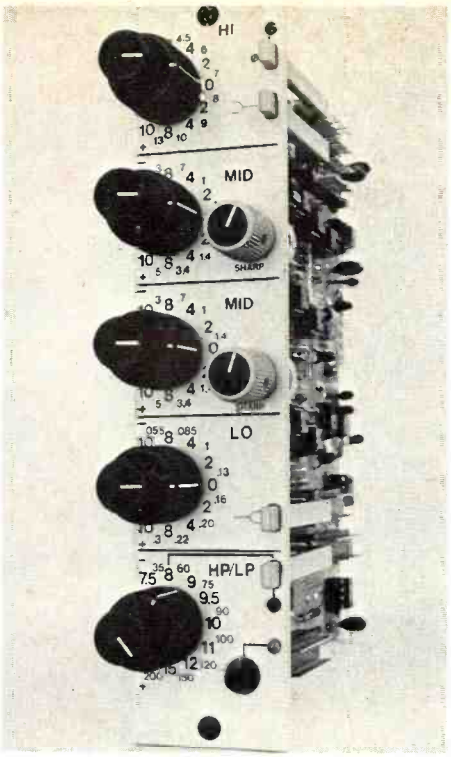
CETEC VEGA
9900 BALDWIN PLACE
EL MONTE, CA 91731
(213) 442-0782

for additional information circle no. 132

SPHERE PARAMETRIC EQ

Sphere Electronics EQ 1014 true parametr is now in production following exhaustive fiel testing. The unit is designed to complemen and is interchangable with the successful ' octave Sphere graphic.

The 1014 is a 4-band equalizer with hi/lo pass filters. It provides the engineer wit unprecedented equalizer versatility an



quality in a compact package.

The equalizer features continuously variable frequency and amplitude for all four EQ sections. Q shape on the two mid-band sections is also continuously variable as is the hi pass/low pass filter section. Shelving switches on the hi and low frequency sections, a phase reverse, and EQ in/out complete the manual controls all with associated LEDs.

Equalizer ranges are: Hi, 15 kHz to 3 kHz; Mid, 7 kHz to 150 Hz (both); Low, 300 Hz to 30 Hz.

Filter ranges are: Hi pass, 20 Hz to 300 Hz; Low pass, 17 kHz to 7.5 kHz.

Q range on the mid bands is from broad to very narrow ("notch").

The 1014 is now offered along with the 910 graphic as standard on all C series consoles from Sphere. It can also be purchased in a separate frame for rack mounting up to eight units.

SPHERE ELECTRONICS, INC.
20201-A PRAIRIE STREET
CHATSWORTH, CA 91311
(213) 349-4747

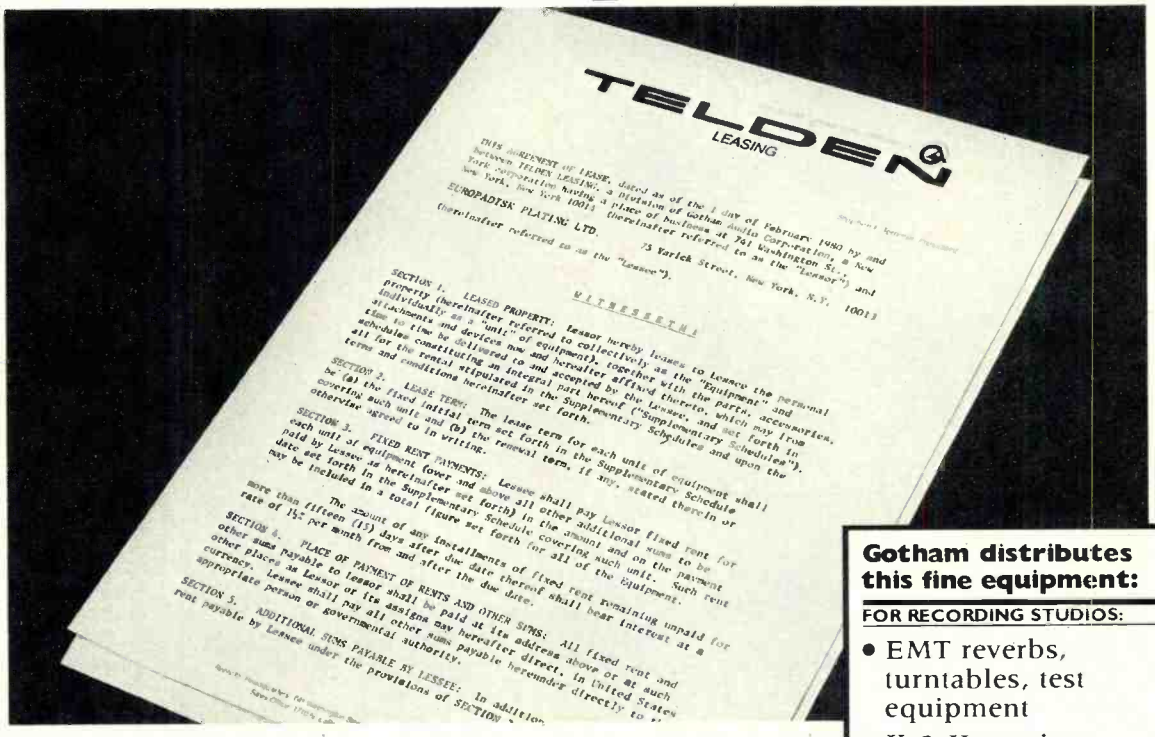
for additional information circle no. 134

VORTEC HIGH DEFINITION LOUDSPEAKER COMPONENT

For use in a wide variety of custom applications, Integrated Sound System's Vortec series is said to represent the state-of-the-art in high definition loudspeaker components. Heavy-duty Vortec transducers provide smooth and consistent response in a wide range of high performance sound reproduction and reinforcement situations. The four heavy duty transducers are described as high efficiency/high output models, and are available ranging from an 18" deep-bass reinforcement driver to a high frequency Supertweeter.

The Model 18160 18" Subwoofer is a deep-bass reinforcement driver especially designed for heavy-duty sound reinforcement from 20 - 500 Hz. It is capable of driving very low frequencies through tight horn loading, with impressive power and clarity.

Every studio should be equipped with this outstanding Gotham product.



Everyone knows Gotham distributes the world's finest audio equipment.

What everyone may not know is that we also have an unusual leasing program.

For more than ten years, Telden Leasing, a division of Gotham Audio Corporation, has helped fledgling studios, disk cutting facilities and plating plants get started and enabled established operations to expand.

Unlike the usual leasing organizations with little understanding for the workings of the recording industry, we're audio professionals. And, unlike outside leasing companies only interested in bank statements, Gotham's Telden Leasing is primarily interested in *you*. Your artistry. Your skill.

We have the expertise to assist you in determining the best leasing terms as well as equipment. Even if it's not in our line. And it isn't unusual for us to start individuals in their own business just on the basis of an interview.

For more information about the numerous advantages which a Telden lease offers, write for our brochure. You'll find out why one of Gotham's finest products is made of paper.

Gotham distributes this fine equipment:

FOR RECORDING STUDIOS:

- EMT reverbs, turntables, test equipment
- K & H monitor speakers
- Neumann condenser microphones
- Telefunken master recorders
- telcom noise reduction system
- TTM universal noise reduction frames.

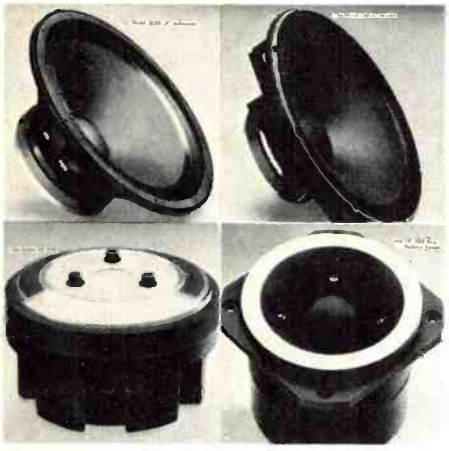
FOR DISK PRODUCTION:

- VMS 80 tape-to-disk mastering system
- Complete record plating plants from Europafilm

GOTHAM
AUDIO CORPORATION
741 Washington Street, New York, NY 10014 • (212)741-7411
West Coast Office: (213)874-4444

GA-3

The Model 1560 15" Woofer is designed for powerful, natural sound reproduction from 40 - 4,500 Hz. Rugged construction lets the 1560 handle up to 240 watts without distortion, and a unique set of innovative features makes it the ideal low frequency loudspeaker for use with studio monitors, musical instruments, and PA systems.



The Vortec MF 2000 was engineered for use in situations demanding wide range precision sound reproduction. With any 1" entry horn of appropriate dimensions, the MF 2000 provides consistent and smooth response from 800 - 14,000 Hz.

For high definition sound reproduction in the high frequency region, Integrated Sound Systems offers the Vortec HF 3000 Ring Radiator Tweeter. The HF 3000 is a fluid-cooled bullet radiator able to reproduce the harmonics and timbre integral to faithful and articulate sound reproduction from 3.5 - 20 kHz.

INTEGRATED SOUND SYSTEMS
29-50 NORTHERN BOULEVARD
LONG ISLAND CITY, NY 11101
(212) 729-8400

for additional information circle no. 135

RUSLANG NEW LOW COST RACK

Ruslang Corporation has developed a low-cost, versatile, studio quality electronic rack cabinet designed to accept tape decks 19" wide by up to 21" in depth.

Called the RL200 Tape Transport Console, the unit is solidy constructed, comes wholly assembled and is available with easy-rolling casters to provide operating flexibility.

The unit is available in lusterous wood grain finishes, as well as a variety of solid colors. It's

built with standard EIA tapped steel rails that facilitate attachment of electronic equipment. Overall height is 31¾" (without casters), with a front operning that measures 19" wide.

RUSLANG CORPORATION
247 ASH STREET
BRIDGEPORT, CT 06605
(203) 384-1266

for additional information circle no. 137

THE EVENTIDE HM80 HARMONIZER

Since the introduction of the first Eventide Harmonizer™ in 1975, it has been a favorite special effects device for many top bands and studios throughout the world. Now, Eventide introduces the HM80 Harmonizer™ — a compact unit with a full range of features. Pitch changing from one octave up to one octave down, delay from 0 to 270 ms, feedback control, mix of effect + dry signal, repeat, and reverse (a new capability which gives a unique effect).

The HM80 has a frequency response of 10 kHz, a dynamic range of 80 dB, accepts line or guitar level input, weighs less than 3 lbs., and costs $775 ($800 for the 230 volt version).

While not intended to replace the H949 and H910 Harmonizers,™ which are designed for recording studio use, the HM80 is ideally suited to live performance. The repeat and pitch change functions have been made remote controllable with this in mind, and a mix control is included so that a console is not required. Its compact size and rugged construction make it easily transportable — on stage, it can be placed on the floor or on top of a keyboard instrument, where its sloping front panel make the controls easily visible. It also has die-cut 'handles' to permit wearing it with a shoulder strap.

EVENTIDE CLOCKWORKS
265 WEST 54TH STREET
NEW YORK, NY 10019
(212) 581-9290

for additional information circle no. 139

please mention . . .
YOU SAW IT IN R-E/P

SENTRY 100 STUDIO MONITOR INTRODUCED BY ELECTRO-VOICE

"The Sentry 100, the result of many man-years of research, testing, and evaluation, is considered the focal point of Electro-Voice's total commitment to fulfilling the monitor requirements of the recording and broadcasting industries," stated E-V sales manager for Professional Products, Greg Silsby.

"The Sentry 100 is a highly efficient speaker,

for additional information circle no. 138

which not only lowers distortion, but allows it to produce the sound pressure levels of comparable units with far less amplifier power. Most of all, the Sentry 100 delivers the sonic accuracy required in critical monitoring," claims Silsby. E-V fully plans to incorporate the Sentry 100's unique innovations in a complete Sentry monitor line in the near future.

An optional hardware kit for rack and wall mounting is also available.

Suggested retail price for the Sentry 100 is $200.

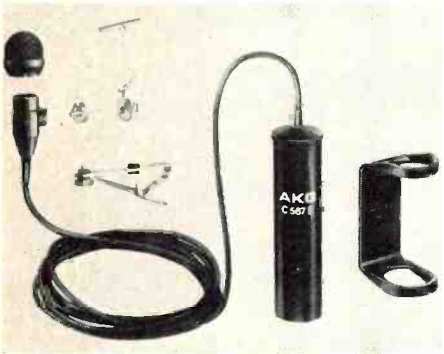
ELECTRO-VOICE, INC.
600 CECIL STREET
BUCHANAN, MI 49107
(616) 695-6831

for additional information circle no. 140

AKG INTRODUCES NEW ELECTRET-CONDENSER LAVALIER

AKG has dubbed its new electret-condenser lavalier, the "almost" invisible microphone. According to AKG, the new C-567 is among the smallest lavaliers obtainable with comparable professional acoustical quality and mechanical durability. The transducer system is field replaceable.

The microphone "head" and output module are all-metal zinc construction providing maximum durability and are chrome-black plated to offer an attractive, yet totally non-reflective and unnoticed appearance.



No battery compartment is provided in the C-567. Instead, the microphone may be phantom powered from the mixer or recorder to which it is connected. It may also be powered by any of the AKG external AC or battery-operated phantom power supplies. Accessories include tie bars for one or two C-567 mikes, a single-mike tie tac, belt clip, and a wire mesh windscreen. The C-567 is omni-directional with a frequency range of 20 - 20,000 Hz.

Currently available in limited quantities, the C-567 Lavalier carries a list price of $195.00, complete with carrying case.

AKG ACOUSTICS
91 MC KEE DRIVE
MAHWAH, NJ 07430
(201) 529-3800

for additional information circle no. 141

DIGITAL KEYBOARDS SYNTHESIZER

Digital Keyboards announces the introduction of the Crumar General Development System. The new GDS is a fully digital, computer controlled synthesizer which provides precision and control of all musical parameters unmatched in previous analog and digital/analog instruments. Accurate generations of waveforms, envelopes, and filters result in an infinite number of distinctive sound capabilities for performing and studio musicians, composers, researchers, and educators.

Unlike most syntheiszers, the new GDS is completely digital, offering singularly accurate control over the entire range of sonic and musical parameters all in real time. This results, it is claimed, in an infinite number of distinct creative possibilities with control that is logical and convenient.

The GDS can be divided into three major structural sectors:

1 - A Z-80 based general purpose computer system with 64 Kbyte of memory.

2 - Performance input devices with a dedicated processor to pre-process input data (keys and pots).

3 - A digital oscillator system that performs the function of 32 completely programmable oscillators and patching network.

The performance input devices include a 61-key velocity detecting keyboard (sensitive to 256 distinct striking velocities) sliders, rotary pots, 2-axis joystick, and multi-function foot controls. The oscillator system offers a 90 dB dynamic range (16 bit D/A) and a frequency resolution as fine as 1/30 of a Hz. Extensive

software is provided for easy and efficient operation of the system. The GDS consists of a general purpose computer, video terminal screen, and keyboard control panel.

The Crumar GDS will be marketed by Digital Keyboards, Inc.

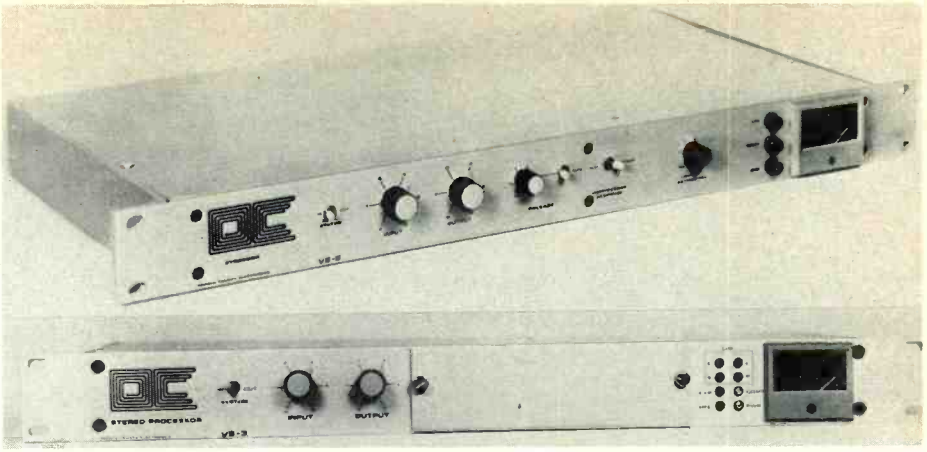
DIGITAL KEYBOARDS, INC.
105 FIFTH AVENUE
GARDEN CITY PARK, NY 11040
(516) 747-7890

for additional information circle no. 143

NEW ORANGE COUNTY VS-2 AM STRESSOR AND VS-3 FM DYNAMIC RANGE PROCESSOR

These processors feature simplified front-panel design with maximum flexibility inside the unit for tailoring the parameters of limiting, compression, and expansion. Both units have input and output controls and a meter showing overall gain reduction on the front panel. Inside the units, however, are mini-dip switches which allow the user to change the compression ratio, threshold, attack and release time, as well as expander threshold, range, and attack and release time.

The VS-2 AM Stressor features the combination of a peak limiter, multi-ratio compressor, and expander along with a loudness contour switch which, the company says, introduces a dynamic equalization network to increase density and intelligibility of modulation, without adding fatiguing side effects. There is also a positive peak assymetry control whch provides optimum modulation. The VS-2 features 30 Hz - 30 kHz frequency response, 97 dB signal-to-noise, and less than 0.1% THD @ 15 dB gain redcution @ 18 dBm output. Introductory price of the VS-2 is $976.00, making it one of the least expensive



AM processors on the market.

The VS-3 Dynamic Range Processor is the FM counterpart to the VS-2. It offers stereo-linked multi-ratio compressors and noise reducing expander. In addition, it includes both soft and hard limiters which allow for more limiting with less distortion. Each of the limiters works on the sum and difference signals and simultaneously maximizes the stereo and mono loudness with no image shift. As with the VS-2, the VS-3 controls are simplified on the front panel, yet an easy-access front plate allows the user to change various parameters of the compressor and expander on mini-dip switches inside. An optional high-frequency limiter with selectable pre-emphasis from 25, 50, and 75 ms. Eight-pole, active low pass filters are available in the VS-3 also. Frequency response, signal-to-noise, and distortion characteristics are the same as the VS-2. Introductory price is $1,148 - $1,298., depending on options. Both units will be covered under Orange County's new three-year parts and labor warranty.

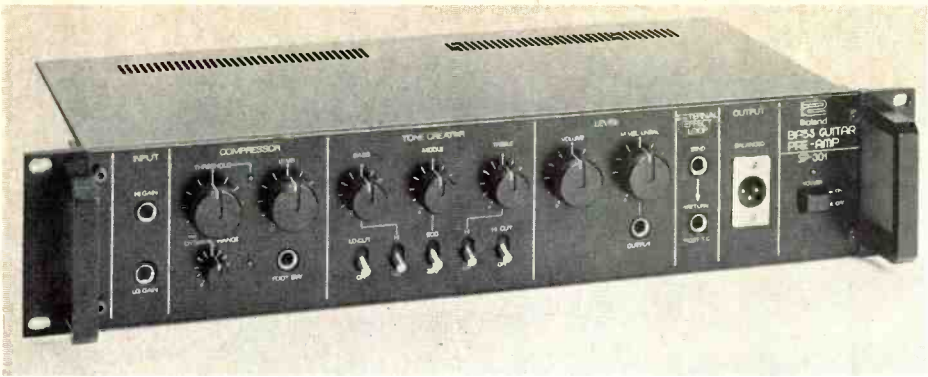
PARASOUND, INC.
680 BEACH ST., SUITE 414
SAN FRANCISCO, CA 94109
(415) 673-4544

for additional information circle no. 145

ROLAND INTRODUCES BASS PRE-AMP

In recent years the bass guitar's role in contemporary music has grown from that of merely "holding down the bottom" to include experimentation with its solo potential. Roland felt because of this new role a system of amplification was needed which would enhance the bass guitar's natural sound as well as offer wide tonal variations and textures. They have introduced the SIP-301 Bass Guitar Pre-Amp. The SIP-301 is a rack mountable

for additional information circle no. 144



bass guitar pre-amp which offers high and low gain inputs, a variable compressor section, and active bass, middle, and treble controls each switchable to operate over two different frequency ranges. The SIP—301 also has low and high cut filters, balanced and unbalanced outputs, and two external effect loops. One effect loop is located on the front panel (pre-tone controls). The compressor section includes dynamic range and threshold controls, and a variable compressor ratio from 1:1 to 1:6.6.

The company feels one of the most important features of the SIP-301 is the built-in variable crossover network (50 - 400 Hz) which provides precise separation of lower and upper frequencies in a bi-amping situation.

The SIP-301 is designed to be compatible with any conventional power amplifier. The list price of the SIP-301 is $395.00.

ROLAND CORPORATION
2401 SAYBROOK AVENUE
LOS ANGELES, CA 90040
(213) 685-5141

for additional information circle no. 146

CON BRIO ADS 100 ADVANCED DIGITAL MUSIC SYNTHESIZER

Said to be one of the most sophisticated and powerful synthesizers in the world today, the ADS 100 incorporates 64 digital oscillators, expandable to 256, that can be independently amplitude and frequency modulated by separate 16 point envelopes. Any number of oscillators can be added together and/or fed into one another to create sounds. Con Brio feels that this oscillator versatility gives the unit sound power no other synthesizer can approach.

The ADS 100 comes equipped with an 8" floppy disc drive that can store any sound the musician creates. Key sounds used on a recording or in a concert can be instantly recalled and reused. Any stored sound or groups of sound can be assigned to either side of either of the ADS 100's two five-octave keyboards. The ADS 100 also includes a video monitor which can present pictures of individual oscillator's frequency and amplitude envelopes which change as the artist changes the sound. The video monitor can also display the contents of any disc.

In playback the tempo can be changed and the musician can even accompany himself. The ensemble control allows the artist to save and recall elaborate keyboard set-ups with the touch of a button. Other controls include key transpose, balance control, and keyboard re-tuning.

The Con Brio ADS 100 retails for $33,000.00.

CON BRIO DIGITAL MUSIC SYNTHESIZERS
975 SAN PASQUAL ST., #313
PASADENA, CA 91106
(213) 795-2192

for additional information circle no. 147

. . . continued overleaf -

SOUNDCRAFT SERIES 400 CONSOLE

The Series 400 is a fully modular 4-buss mixing console for up to 8-track recording and for sophisticated sound reinforcement. It is available in two mainframe sizes, one for up to 18 input channels and the other for up to 26.

All controls are laid out logically and are easy to use. The latest high quality potentiometers are used, each with 41 detented positions except for the EQ lift/cut and pan which have a single center detent. Pushbutton switches are used throughout. Faders are long-travel (100 mm) conductive plastic. Metering is by 16-segment LED bargraph displays (particularly useful in low light) which can be switched individually to VU or peak reading characteristics. According to Soundcraft, the electronics of the console are of the highest standard. The transformerless differential, mike pre-amplifier is said to produce ultra low noise and gives a transient performance better than conventional transformer-coupled pre-amps.

SOUNCRAFT ELECTRONICS, LTD.
P. O. BOX 2023
KALAMAZOO, MI 49003
(616) 382-6300
or
5-8 GT. SUTTON STREET
(4TH FLOOR)
LONDON EC1 VOBX, ENGLAND
TELEPHONE: 01-251 3631/2/3

for additional information circle no. 149

NEW NORTRONICS BULK TAPE ERASER

The new QM-250 is said to be the result of extensive research aimed at design simplicity and economy. Resonating capacitors, fans, motors and other costly components have been eliminated while performance results are equal or better than many other units costing considerably more.

According to the Recorder Care Division of Nortronics, the QM-250 Professional Bulk Tape Eraser completely demagnetizes commonly used professional tapes, including cassette, 1/4", 1/2" and 1" open reel, broadcast 8-track cartridges, and 1/2" VHS/Beta cartridges. It will hold reel sizes up to 10½".

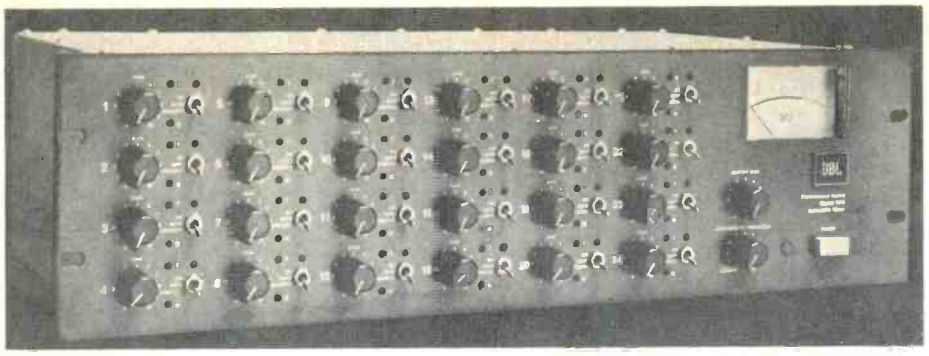
RECORDER CARE DIV.,
NORTRONICS CO., INC.
8101 TENTH AVE. NORTH
MINNEAPOLIS, MN 55427
(612) 545-0401

for additional information circle no. 150

JBL AUTOMATIC MICROPHONE MIXER

The Model 7510 is a state-of-the-art automatic microphone mixer which comes standard as a four-input module and expandable to 24-input capacity. The product combines special digital and analog circuitry, and the 7510 is said to offer significant advantages over conventional mic mixers. Features such as automatic mic turn-On/turn-OFF and output level correction allow considerable gain without feedback. Level sensing circuitry provides extremely fast attack, making the unit well suited for use in gated mixing.

Each individual four-input module is equipped with front panel controls for level,



threshold and release time settings; an additional switch allows each channel to be set for manual, automatic or priority modes. In all three operating modes, a unique digital attenuator automatically reduces output gain by 3 dB for every doubling of activated microphones.

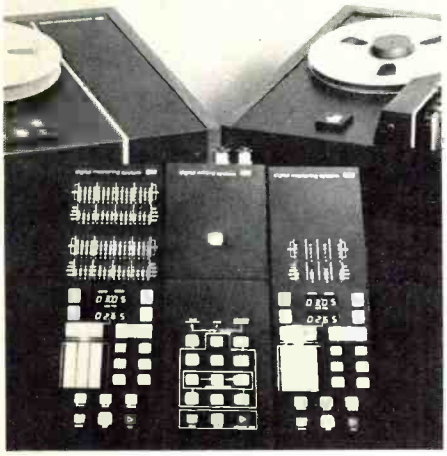
Additional performance capabilities are offered by a built-in 48-volt phantom power supply and direct outputs for each input channel. LEDs light up when each channel is activated, and a large front panel VU meter indicates the mixer's output level.

JAMES B. LANSING SOUND, INC.
8500 BALBOA BOULEVARD
NORTHRIDGE, CA 91329
(213) 893-8411

for additional information circle no. 152

3M ANNOUNCES DIGITAL EDITING SYSTEM

The Digital Editing System consists of a compact console (21½ x 6½ x 5 inches) of microprocessor electronics offering extreme precision, risk-free audition and edit preview capability, unaltered originals and splice-free masters.



Digital's lack of degradation throughout the recording and editing process provides a new vista in creativity, 3M says. The control module, which determines and monitors the tape movement of two 3M recorders, offers a special function button for determining exact editing points. Refinement can be made by as little as one one-thousandth of a second.

There are now a half-dozen of the 3M Digital Editing Systems in studio use with the 3M Digital Mastering System. The final production model was first shown at the February AES in London.

3M COMPANIES
P. O. BOX 33600
ST. PAUL, MN 55133

for additional information circle no. 153

APHEX TO SELL AURAL EXCITER: RENTALS STILL AVAILABLE

Aphex Systems, Ltd., has announced that the company will now sell its model 602B Aphex Aural Exciter sound enhancement unit, according to Marvin Caesar, president. Previously, the unit was only available on a lease/rental basis.

In making the announcement recently, Caesar indicated that recording studios, broadcasters and touring musicians, the predominate users of the Aphex, will still be able to avail themselves of a lease arrangement.

"Our primary marketing philosophy now, however," said Caesar, "is to provide the ownership alternative for two types of customers: they who cannot afford the $30 a minute rental fees on large volumes of usage, and they who wish to increase their volume of Aphex usage on a substantially more cost efficient basis."

Aphex will sell the model 602B for $2,700

. . . *continued overleaf* -

through its 22 worldwide Aphex licensees; additionally, a broadcast model is available for $2,850. Previously, a broadcaster could rent the equipment for a five-year period and buy the unit at the end of the contract for $500.

"The price motivating factor in our decision," said Caesar, "is that the demand level for ownership is exceptionally high. It costs approximately $1,000 to Aphex an album," Caesar estimated, "and for the cost of 2.5 albums, a studio or producer can now buy the unit."

Caesar added that the company waited until now to offer the two units for sale in order to fully incorporate all improvement modifications that have been added since the Aphex was first offered for lease nearly three years ago. "The basic design remains intact," Caesar said, "but the volume of usage of the units in various applications over the past few years has provided us with information that enabled us to make several technical improvements relative to the actual usage of the units."

In a related announcement, Caesar indicated that the company is negotiating with several manufacturers of semi-professional and consumer equipment to include Aphex circuitry in their products. Further, Casear said, the firm will focus some of its marketing thrust in the area of television. "That field is wide open to us," he explained, "because the lower the quality of the playback medium, the greater the results are with Aphex circuitry. Inasmuch as TV receivers are standard equipped with three-inch speakers, the Aphex brings the sound right out of the mud." The company recently completed work on the Linda Carter and Barry Manilow specials for television.

In the area of live entertainment, the new purchase arrangement should result in strong demand from hotel and club owners, Caesar said. The Sahara Reno Hotel has had an Aphex unit installed, as have several others that have been renting the unit for $2,400 a year. Caesar said Trax club owner, Jimmy Pullis, recently installed an Aphex Aural Exciter in his Trax nightclub, the highly popular music industry "watering hole" in Manhattan.

APHEX SYSTEMS, LTD.
7801 MELROSE AVENUE
LOS ANGELES, CA 90046

for additional information circle no. 158

PORTABLE EFFECTS SYSTEM FROM SOUNDER

This recently announced equipment includes a two channel, nine input mixer with a stereo octave equalizer. The system is programmed to produce up to eight special effects, yet it is compact, weighing less than forty pounds. The entire system, including foot control board and cords, fits into two suitcases for quick set-up and easy transportation. The special effects — which are engaged by touching a pushbutton switch on the unit or by tapping a switch on the foot control board — include an octave divider, flanger, distortion,

digital delay, reverberation spring, compressor, a voltage controlled filter, and a wah-wah LEDs on the foot switch board pulsate to indicate which effects are engaged.

The company has designed and built custom equipment for such artists as the Grateful Dead, Jefferson Starship, Joni Mitchell, and members of the Oakland Symphony.

SOUNDER ELECTRONICS
21 MADRONA STREET
MILL VALLEY, CA 94941
(415) 383-5811

for additional information circle no. 159

GIANT RECORDING METER FROM WESTREX

A 3-1/2 foot long light-bar recording meter has been introduced by Westrex for recording studios and motion picture dubbing theaters. The RA-1558-B measusres audio signal with twenty sequentially-lit color bars. The unit operates in three modes: VU, PEAK, or V.I., and may be used vertically as well as horizontally. Input level as low as -20 dBm (600 Ohm line) is sufficient to drive the RA-1558-B. Split second response is assured through RC drive circuitry to the lamps, and a small keep-alive voltage.

Accuracy is plus-or-minus 0.25 dB from top bar to bottom bar (40 dB range). Frequency response: 30 Hz to 20,000 Hz, plus-or-minus 0.25 dB. Individual light bars measure 1¾" x 5½". Unit's overall size: 10½" height, 42" length, 12¼" depth. Other bar marking or colors are available as options.

WESTREX
2629 WEST OLIVE AVE.
BURBANK, CA 91505
(213) 846-3394

for additional information circle no. 160

ZUMA DISK MASTERING COMPUTERS

Zumaudio has announced the installation of the first three Zuma Disk Mastering Computers at disk-cutting facilities in New York and Hollywood.

The microprocessor-based, digital system permits users of Neumann VMS series record mastering lathes to make more efficient use of disk space without requiring mechanical modifications to the lathe.

The three Zuma Computers were installed during the first week of September at Capitol Records and K-Disc, in Hollywood, and Masterdisk, in New York.

In comparison to the lathe's internal pitch-depth system, the Zuma Computers greater efficiency permits an increase in cutting level of up to 2 dB, depending on the program material.

Digital control and improvements in the pitch and depth control algorithms account for the space savings. In operation, the lathe's existing pitch-depth computer is bypassed, and the preview signals from the tape machine are sent to the Zuma computer.

The computer samples and digitizes these signals and constructs, in its memory, a numerical picture of the groove being cut.

Precisely one turntable revolution later, the computer recalls this information and compares it to the numerical picture of the current groove being cut.

If the profiles of these two adjacent grooves permit, the computer nestles them together rather than allowing for the absolute value of the peak excursions, as do conventional systems.

Furthermore, the computer seeks to maintain a constant land value between grooves by keeping track of the space it creates during each revolution.

For example, if additional space if not required to accommodate groove excursions occuring after the computer has made space for a large signal, the computer will stop the lathe's lead screw until this created space has been utilized.

After determining the pitch and depth values digitally, the computer converts these numerical values to analog form to be used by the lathe's existing servo pitch motor and depth control.

. . . continued overleaf -

The computer checks itself with an integral diagnostic routine and alerts the operator of possible malfunctions on any of the four plug-in cards that comprise the system.

Since no mechanical modifications are made to the lathe, the lathe's original system can be restored to operation at any time by means of a jumper plug. Additionally, one Zuma computer can electronically lock two lathes in tandem for the cutting of multiple lacquer sets.

Current price of the unit, including installation, is $7,000.00.

ZUMAUDIO, INC.
4150 W. GELDING
PHOENIX, AZ 85023

for additional information circle no. 161

NEW LOW COST NADY WIRELESS MICROPHONE

According to the manufacturer, Nady Systems, professional wireless microphone use has been opened to the mass market with the recent introduction of a low cost professional wireless mic transmitter. This innovative unit, the Nasty Cordless Black Microphone Transmitter, retails for a suggested price of $400.

Like the prominent Nasty Cordless Blue Transmitter the new Black unit is tunable, operating on clear channels in the FM band, 88-108 mHz. This assures clear channel accessibility and interference-free operation in any locale. The microphone is said to have a 250 foot range, with a frequency response of 20-20kHz, plus-or-minus 3 dB.

The Black Cordless hand held microphone transmitter can be used with any microphone. Nady Systems, it is claimed by them, is the only wireless company to produce such a transmitter - allowing the consumer to pick the unique sound of his own favorite performing microphone. Hooking up or changing microphones with this unit is an easy operation which can be performed in a few minutes. The Nasty Cordless Black Microphone can be used with the inexpensive Toshiba ST-335 receiver (recommended and available through Nady Systems at a retail price of $160.00) or with any FM receiver.

NADY SYSTEMS
1145 65th STREET
OAKLAND, CA 94608
(415) 652-2411

for additional information circle no. 162

— *book report* —

BASIC DISK MASTERING
by Larry Boden

The author established the need for this excellent new book he has produced during the more than 13 years of his work in Disk Mastering and Record Pressing/Production. As Larry Boden says: "During the years many of the same questions have been asked over and over again by clients in discussing work being done for them. Also, it has become more and more apparent that people now coming into the recording industry seemingly know less about disk mastering than those who started out a few years ago."

Bowden, who is a frequent lecturer on disk mastering at various educational institutions, is currently director of disk mastering for MCA, at their Whitney Studios in Burabank, California. A graduate of The University of Cincinnati, he started his career at Rit Records, a mastering and pressing facility before moving to Nashville Record Productions.

Among the 21 major divisions (52 pages between perfect bound soft covers) are numbers of rare Electron Scanning Microscope photos that originated in the research laboratories of Stanton Magnetics. Many more conventional high power microscope pictures abound illustrating virtually every problem that can be visually detected on the surface of a record. There are a total of 70 such pictures and specially prepared drawings in the volume.

The book logically progresses from basics in the first chapters, How Grooves Work, etc., through every link in the chain. The Cutting Lathe, Mastering Console, Cutter Head, Cutting Stylus are all specifically addressed. There is a brief history of the lacquer disk followed by a description of contemporary lacquer manufacturing processes.

Common cutting procedures are then examined, including low frequency crossover avoidance, oscilliscope reading interpretation, use of the microscope, record levels, diameter loss, among other practical considerations. There is a section dealing with the common mathematics of mastering as well as a complete description of the RIAA record reproduction curve, and disk dimensions.

A number of the less well known aspects of mastering are also discussed with the inclusion of a complete description of the Buchman-Meyer light patterns. Half-speed mastering is

also covered.

The mechanical aspects of record production are viewed in the divisions addressed to the plating process as well as the many problems that can occur in the lacquer-to-stamper sequence of events. Vinyl formulae are covered as are the actual cycles as the disk is being pressed in the moulding operation.

The book is brought to a close with practical cause-and-effect descriptions of many common record defects. After each problem is defined, the causes of the defect are identified for the reader. A glossary of terms as well as a listing of many of the major mastering and pressing facilities located in the United States close the work.

This book accomplishes its purpose, that of giving an accurate, popularized overview of many of the complicated concepts inherent in the disk mastering process, along with a bit of record making history as well. It is likely that it will become a primary reference course for recording engineers, producers and, perhaps, knowledgeable musicians. It is likely that many mastering professionals will want to have copies available to illustrate specific problems to anxious clients.

BASIC DISK MASTERING is available from **R-e/p** on receipt of $12.50 (post paid) in check or money order.

BASIC DISK MASTERING
by Larry Boden

52 pages	Soft Cover
Perfect bound	$12.50(US)pp

'SPARS' — SOCIETY OF PROFESSIONAL AUDIO RECORDING STUDIOS ANNOUNCES NATIONAL CONVENTION MAY 3-7, 1980 IN LOS ANGELES

'SPARS'has announced plans for its second national convention to start Saturday, May 3, and continue through Wednesday, May 7. All activities are scheduled at the Biltmore Hotel, Los Angeles, except for a *private showing* at the Hilton Hotel in connection with the Audio Engineering Society (AES) Interface Evening with manufacturers.

President of SPARS, Joseph Tarsia (Sigma Sound Studios) points out that "we have produced a long trail of accomplishments in a very short period of time. As a matter of fact," he continued, "people tend to forget we haven't even celebrated our first anniversary. To many observers, it appears as if we've always been here; a fine compliment to our hard work and deeds. In a very few months," he added, "we have gone from a zero base to an exciting, vibrant organization which has drawn up and adopted by-laws, installed permanent officers and a board of directors, appointed working committees, conducted almost monthly regional meetings in New York and Los Angeles and produced our initial national convention at the Waldorf Astoria in New York in November."

In a closing perspective, Tarsia stated that, "SPARS, long overdue, emerged at the most oportune time. The complex challenge of the 80's is upon us: technological explosions, sagging record sales, home and organized piracy, rising costs of recording equipment, shortage of qualified technical personnel to cope with ultra-sophisticated equipment, critical tax, legal and financial questions . . . all of these and more make the never-ending

. . . *continued overleaf* -

pursuit of recording perfection increasingly difficult to attain. But SPARS is committed to meeting these challenges and problems in its quest for excellence through innovation, communication and education."

The SPARS convention will kick off with a board of directors meeting on Saturday, May 3, followed by an all-day general meeting on Sunday, May 4. However, the highlight of the SPARS convention will be its Audio Recording Conference, Monday, May 5 and Tuesday, May 6 (half-day). In addition to SPARS members, students, educators and other interested non-members are welcome to avail themselves of an in-depth program featuring some of the world's leading studio owners, management and financial professionals, audio/visual experts and studio acousticians. Registrants will have ample opportunity to ask questions of these leading personalities.

Registration fee for non-SPARS members is $100; $50 for students and educators; door registration is $10 additional. Registration includes all seminars, lunch (Monday, May 5) and a guided recording studio tour including transportation on Tuesday, May 6.

Audio Recording Conference Seminars
Monday, May 5

Concept to Gold: Studio owners with engineering roots relate their philosophies and methods in building a successful audio recording business. Moderator: Joseph Tarsia. Panelists: Murray Allen, Mack Emerman, Walter Heider, Robert Liftin, Phil Ramone.

Tape To Disc . . . The Problems: Disk mastering experts describe the perplexities of transferring master tapes to disk. Discussion of what mastering studios expect from audio recording studios. Moderator: Kent Duncan. Panelists: Mack Evans, Steven Guy, Ken Perry, Tom Steele.

Basic Business of Recording Studios: Encompasses legal, accounting, financial, insurance aspects plus management and client relations. Moderator: Malcolm Pierce Rosenberg, Esq. Panelists: Sol B. Schwartz, C.P.A., William Rogers, Thomas Dowd, Michael Dilbeck.

Video And Its Impact On The Recording Industry: What changes are coming? What preparations must be made for their successful accomodation? Moderator: Chris Stone. Panalists: Paul Flattery, Robert Liftin, Richard Massey, Rush Hickman.

Economy: The economic outlook and its impact upon the entertainment industry, and in particular the audio recording business. Moderator: David Teig. Panelist: John McDevitt.

Recording Studio Design and Acoustics: Leading international studio acousticians relate their particular philosophies and considerations of room design. Moderator: John Woram. Panalists: George L. Augspurger, Jeffrey Cooper, Thomas Hidley, John Storyk.

Tuesday, May 6

Guided Tour: A half-day guided tour of three leading Los Angeles recording studios: Motown . Hitsville USA: Filmways/Heider; Record Plant.

Additonally, a private SPARS reception for members, prospective members and manufacturers is planned for Monday evening, May 5, at the home of Chris Stone (Record Plant), western regional vice president of SPARS.

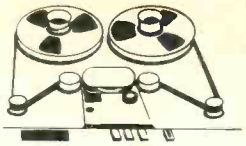
Finally, on the evening of Wednesday, May 7, an all-consuming objective of SPARS since its inception will come to fruition with first "private showing" at the AES Interface Evening with manufacturers. Tarsia explained that "this is a major and a very significant development in the SPARS quest for ever increasing dialogue and understanding between recording studio owners and manufacturers, and we take extreme pride in being the sole motivating force behind the birth of this event."

□□□

RECORDING *engineer/producer* 1979 INDEX OF FEATURE EDITORIAL ARTICLES

TITLE	AUTHOR	ISSUE	DATE
INTERVIEWS			
Todd Rundgren on the Audio/Video Fusion, among various subjects	Tom Lubin	10-6	December 1979
Sigma Sound's Joe Tarsia	Tom Lubin	10-5	October 1979
Roy Thomas Baker, producer of The Cars, Queen, and Journey	Howard Cummings	10-4	August 1979
Academy Award Winner (Sound): Richard Portman	Tom Lubin	10-3	June 1979
Horizon Records' Tommy LiPuma: from promotion, to production, to label president	Tom Lubin	10-2	April 1979
George Martin, Revisited	Tom Lubin	10-1	February 1979
STUDIOS: DESIGN/ACOUSTICS/OPERATION			
The Acoustic Effects of Space and Materials	Martin Clifford	10-6	December 1979
Sound Power vs. Sound Pressure	Michael Rettinger	10-6	December 1979
Studio Testing for Reverberation, Echo, Transparency, Rattle, & Noise	Michael Rettinger	10-4	August 1979
Optimizing Control Room Reverberation Time	Alan Fierstein	10-4	August 1979
The Rudi Breuer Approach	Rudi Breuer and Jim Riordan	10-2	April 1979
Sound Insulation Requirements For Recording Studios	Michael Rettinger	10-2	April 1979
Studio Design Requirements For the Next Decade	Kent Duncan	10-2	April 1979

Increased Height, Active Trapping, Improve Remote Van Control Room Acoustics	Rich Houston and Jeff Brown	1-2	April 1979
(LEDE) Live End-Dead End Control Room Acoustics — (TDS™) Time Delay Spectrometry — (PZM™) Pressure Zome Microphones	Chips Davis and Don Davis	10-1	February 1979
RECORDING TECHNIQUES			
A Fuss About Pluss, Preservation of Audio Signal Polarity in The Recording Chain	Peter Butt	10-6	December 1979
Improved Instrument Timbre Through Microphone Placement	Wieslaw V.R. Woszczyk	10-5	October 1979
Keeping Them Out of Your Hair — Acoustic Comb Filter Effects	F. Alton Everest	10-2	August 1979
Microphone Applications for Classical Recording	Carson Taylor	10-2	April 1979
STANDARDS, SPECIFICATIONS, TESTS, AND EQUIPMENT			
The Use of Ferrofluid as a Loudspeaker Component	Louis Melillo	10-6	December 1979
New Product Review: The Calrec Soundfield Microphone	Carson Taylor	10-6	December 1979
New Product Review: A Digital Snake — JHD's Mainline	Peter Butt	10-5	October 1979
Multitrack Recorders: A Cooperative Tabulation of Pre-Owned Equipment	Winn Schwartau	10-3	June 1979
VCA's Round II: Responses to the VCA Controversy	David Baskind, Paul Buff, Harvey Rubens, Marvin Caesar, Edward Bannon, and Michael Sanders	10-2	April 1979
New Product Review: Ecoplate VCAs — The Promise of Electronic Gain Control	Larry Rubhun, Harvey Rubens, Dave Baskind and Marvin Caesar	10-1	February 1979
TROUBLE SHOOTING, ALIGNMENT AND MAINTENANCE			
Now You Hear It! Now You Don't! Perceiving Audio Noise & Distortion	Paul Buff	10-3	June 1979
Impulse Alignment of Loudspeakers and Microphones — Part II	Gary Leo and Don Pearson	10-1	February 1979
CONCERT SOUND REINFORCEMENT			
Stage Monitoring: The Captain & Tennile Show	Patrick Maloney	10-5	October 1979
Live Performance Sound Reinforcement: Beatlemania	Patrick Maloney	10-2	April 1979
RECORD PRESSING/MASTERING			
Mobile Fidelity + JVC = Original Masters — Doing Something About the Record Pressing Problem	Tom Lubin	10-4	August 1979
FILM SOUND			
Film Sound Mixing: The New Generation of Automated Consoles	Levi Storm	10-6	December 1979
Generating the Low Frequencies for "Apocalypse Now"	John Meyer and Terry Tomaselli	10-5	October 1979
Film Sound for the Studio Engineer: Recording With the Nagra	John Lord	10-3	June 1979
PROJECTS			
Answering the Drummer's Need for More Cue Level: An Earphone Amplifier/Metronome Project	Ethan Winer	10-5	October 1979
Sold State Switching Circuits: Turn-Ons for the Audio Engineer	Ben W. Harris	10-5	October 1979
Construction of a Live Echo Chamber	Scott Putnam and Tom Lubin	10-4	August 1979
A Stereo Synthesizer Construction Project	Ethan Winer	10-3	June 1979
A High Performance, Low-Cost Transformerless Microphone Preamp Project	Dave Baskind and Jon Sanserino	10-1	February 1979
SIGNAL PROCESSING			
Reverberation — An Overview	James Cunningham	10-4	August 1979
Programmable Digital Reverberation	David Griesinger	10-4	August 1979
MISCELLANEOUS			
The Second Engineer	James Riordan and Tom Lubin	10-6	December 1979
Disco Audio System Design	Kenneth Fause	10-5	October 1979
dBs Can Be Hazardous To Your Health	Martin Polon	10-5	October 1979
The Weakest Link in the Audio Chain: The Stylus to Preamplifier	William Isenberg	10-5	October 1979
The Vintage Audio Gear Market: Equipment With a Past	Winn Schwartau	10-3	June 1979
"An American Prayer" — John Haeny's story of the dedicated research, production, and engineering of the Jim Morrison epic.	John Haney, assisted by John Weaver	10-2	April 1979
Recognition 1978: A Tribute to the 1978 Gramming Winning Engineers, Producers, and Studios		10-2	April 1979



Classified

RATES
— $51.00 Per Column Inch —
(2¼" x 1")
One-inch minimum, payable in advance. Four inches maximum. Space over four inches will be charged for at regular display advertising rates.

BOOKS

EDUCATION

LEARN RECORDING ENGINEERING
•One month, full time
• In-studio, Hands-on
Call or Write for Brochure
FULL SAIL RECORDING WORKSHOP
1221 Lee Road • Orlando, FL 32810
(305) 299-1076

The University of Iowa announces a
SEMINAR IN AUDIO RECORDING
Guest Lecturer: Stephen F. Temmer
July 7 - 18, 1980; Fee: $72.00
For further information contact:
Prof. Lowell Cross
School of Music, University of Iowa
Iowa City, IA 52242 • (319) 353-5976

JAZZ/AUDIO INSTITUTE
July 14 - August 15, 1980
Live impro/rehearsal/concerts recorded/critiqued by participants
4 studios. API. In Pacific Northwest.
For information and applications contact Dave Englert,
THE EVERGREEN STATE COLLEGE
Olympia, WA 98505

PROFESSIONAL SERVICES

Consulting in Performance and Presentation Technology

Ewing and Associates
• ARCHITECTURAL ACOUSTICS
• ENTERTAINMENT SOUND SYSTEMS
• TIME DELAY SPECTROMETRY
• AUDIO-VISUAL SYSTEMS
1887 Tipperary Lane • Newbury Park • CA 91320 • (805) 498-4006

EQUIPMENT WANTED

WANTED
RECORDING EQUIPMENT OF ALL AGES AND VARIETIES
Dan Alexander • 6026 Bernhard
Richmond, CA 94805 U.S.A.
(415) 232-7933 or (415) 232-7818

NEED API 560 EQUALIZERS
Will buy or trade 550 or 554 equalizers. Call **Michael, (212) 581-6505.**

EQUIPMENT FOR SALE

FREE CATALOG & AUDIO APPLICATIONS

CONSOLES
KITS & WIRED
AMPLIFIERS
MIC., EQ, ACN, LINE, TAPE, DISC, POWER
OSCILLATORS
AUDIO, TAPE BIAS
POWER SUPPLIES

OPAMP LABS INC.
1033 N. SYCAMORE AVE.
LOS ANGELES, CA. 90038
(213) 934-3566

for additional information circle no. 169

FOR SALE
MCI 16/24 PLAYBACK MACHINE
Plays back 16 or 24 at the flip of a switch.
Call Michael
(212) 581-6505

FOR SALE
If you are looking for well-maintained recording equipment try calling ***Criteria Recording Studios, (305) 947-5611.*** *We are always up-dating our studios and can offer consoles, tape machines, and many other items at a good price.*

FOR SALE
Stephens 811D-103 1" eight-track recorder/reproducer. Complete with VSO, remote control and spare amplifier modules. 2½ years old. New cost over $14,500.00. $7,500.00.
ASi — (512) 824-8781

FOR SALE
INTERFACE 16x4 RECORDING/MIXING CONSOLE, excellent condition. NEUMANN NK-48A phantom power supply (will supply up to 150 mics). For details call *Bill Castner, We Three Productions.*
(313) 767-7426

When you subscribe to *R-e/p* . . .
you'll be starting a useful reference library pertaining to the recording industry.

We will be delighted to enter your subscription to *R-e/p* upon receipt of your order and payment (check or money order must be included with your order — we cannot bill for subscriptions). Your subscription will begin with the next published issue. (Sorry! We cannot start with back issues.)

Foreign subscriptions are payable in U.S. funds only and must be by bank check or money order.

Please provide the information below and mail with your payment to: ***Recording Engineer/Producer, P.O. Box 2449, Hollywood, California 90028.*** Since *R-e/p* is published six times per year, please allow ample time to receive your first issue.

ONE YEAR (SIX ISSUES)

United States (surface mail)	**$10.00**
United States (air mail)	**$17.00**
All Other Countries	**$19.00**

I have enclosed $ _____

Name	Title
Station/Company	☐ New ☐ Renewal
Address	☐ Home ☐ Office
City	State/Province/Country Zip

We've got it.

The Belden 42 Strand Cable. Ends multiple wiring problems in the studio and on stage. Available in bulk or with custom plug configurations.

whirlwind

Whirlwind Music Inc.
P.O. Box 1075
Rochester, New York 14603
(716) 663-8820

for additional information circle no. 170

DIRECT BOXES
* * *
CABLES
* * *
SNAKES
* * *
HEADPHONE DISTRIBUTION BOXES
* * *
CABLE TESTER
* * *
YAMAHA CONSOLE MODIFICATION

Orders processed same day.
COD's accepted.
Write for free catalog and price list.

Windt Audio Inc.
1207 No. Western Ave.
Los Angeles, CA 90029
(213) 466-1271

for additional information circle no. 171

See Us At Room 562 L.A. A.E.S. or your studio! Southern California Rentals, Demos, & Sales

Jim Cunningham's ECOPLATE™

$2,500 Spacesaver
$5,000 The Original
$600 Full Remote Control

SCHOEPS Microphones
L.A. AES Rm. 562
with Jerry Bruck

active
M/S BOXES
active

AKG
Stereo Mikes and Matched Pairs In Stock

RTS Systems
Pro Phono Preamps
Booster Amps, DAs,
Intercoms, used
on The Grammy Show

KEF
101, 104aB, 105 II
Reference Series
and
Raw Frame Drivers

REVOX SERVICE & MODIFICATION TO PROFESSIONAL STANDARDS
VariSpeed, Speed Changes, Head Changes

1029 N. ALLEN AVENUE
PASADENA, CA 91104
(213) 798-9127
AUDIO ENGINEERING ASSOCIATES
Ask for Wes Dooley!

for additional information circle no. 172

EQUIPMENT FOR SALE

continued

PARAMOUNT SOUND FOR SALE
MCI JH-538 Automated Console; MCI 2, 4, 8, 16 and 24 Track Tape Machines with JH-45 Syncronizers. All less than 150 hours use.
PARAMOUNT SOUND
(213) 956-3222

FOR SALE: *Pro-designed and built Mid-Western 24-track studio with 10 year lease, MCI recorder and console, and all trimmings. 75K.*
(417) 926-3763

FOR SALE

MCI JH-10 16 trk w/noise gates	$12,500
MCI JH-416 16 x 16	$13,500
3M (56) 2 track	$ 2,500

Kirk Kaufman
Box 10 • Otho, IA 50569
(515) 972-4475 — (515) 972-4264

MIDAS CONSOLES
FOR RENT, LEASE — 40x8x2
20x4x2 — PR 03, 4, 5; 24x8+2
Monitor (PR 04) — Well maintained
Phone (305) 940-9414

FOR SALE
Auditronics 501 26-input console. Superb condition. Producer's desk, tape remotes, radio speakers, many extras. $22,900.00.
(313) 662-9532 or (317) 638-1491

PIEZO SUPER TWEETERS
Good quantities in stock. Specifications sent if requested. $4.91 - $9.90 depending on quantity.
MUSIMATIC, INC.
4187 Glenwood Road
Decatur, GA 30032 (404) 289-5159

AMPEX, OTARI, SCULLY
In stock; all major professional lines; top dollar trade-ins; 15 minutes George Washington Bridge.
PROFESSIONAL AUDIO VIDEO CORPORATION
384 Grand Street • Paterson, NJ 07505
(201) 523-3333

BEYER MICROPHONES - up to 40% off list on wide range of Beyer models including M500, M160, M200, M100, etc. New and remanufactured models available. Write or phone for prices and availability. ESSI, Beyer Microphone Offer. P.O. Box 176, Jericho, NY 11753 (516) 921-2249.

CUSTOM RECORDING CONSOLE
20 x 20 four bus; Gotham Audio faders; Langevin 6 band selectable EQ; 572 point patch bay; UREI limiters; complete meter bridge.
SACRIFICE $4,500
(314) 962-7635 or (314) 968-0619

FOR SALE
SOUND RECORDING STUDIO
Including all equipment and instruments. $225,000. O.W.C. with 30% down.
(415) 824-6330
Box 12357 • San Francisco, CA 94112

FOR SALE: *16 Track Tascam mixer, Model 10 B-104/105/116, with 6444 cue mixer. Used 40 hours. $3,000.00.*
Don MacLeod
(503) 222-2981

UREI 970 Vidigraf Bar Graph Display Generator with 9700 Control, 9702 Spectrum, and 9703 VU Boards for video monitoring applications. New, never used. $1,350, or trade for new A3440, 80-8, ReVox B77.
(419) 433-3411

FOR SALE — MCI Model JH-416 24-track recording console. $17,500.
Call Ben at (215) 735-5122, Philadelphia, Pennsylvania

FOR SALE
MCI 2001 op amps, used — prime replacements — all pre-tested and guaranteed — $5.00 each, or $4.50 each with order of 10 or more.
DENNIS DODD
(901) 726-1900

COMMISSIONS PAID
for leads to used recording equipment. We pay 10% of net upon sale. Earn money part time as one of our field reps, looking for console, tape machines, outboard gear, and microphones. Send leads to
SYE MITCHELL SOUND COMPANY
22301 Cass Avenue • Woodland Hills, CA 91364
(213) 348-4977 or (213) 657-4487

FOR SALE — DOLBY M24
Used 15 hours, mint condition, completely wired for North Electric Plugs. In custom walnut roll-around cabinet. Call Bruce.
(213) 469-1173

FOR SALE
MCI 428B CONSOLE, 16 I/O modulkes, Mainframe 28-in, 24-out. Perfect condition. $19,000. Also, AKG BX-20E REVERB, $2,000.
Westwood Recording Studios
(602) 622-8012

FOR SALE
Two Yamaha PM-1000-16 consoles in individual Anvil cases. Excellent condition — very little use. $4,200 each, freight collect.
PERFORMANCE AUDIO
(801) 355-8890

SONY PCM-1
Turn any video recorder into a Digital audio recorder
$3,500.00 / Offer
Contact: Robert Millard
(213) 724-5840 or (213) 792-3237

TEAC/Tascam, Sound Workshop, dbx, Technics Pro, Otari, MXR, Eventide, E-V, Shure, Maxell, Ampex, UREI, Stax, Orban, Sennheiser, Spectro Acoustics, NAD, Ivie, DeltaLab, BGW, Studiomaster and Audio-Technica mikes!
ZIMET PRO AUDIO — Dept. R-e/p
1038 Northern Boulevard
Roslyn, NY 11576

FOR SALE
ALL IN EXCELLENT CONDITION
3M-M64 2-Track Recorders in console
UREI Model 813 Speaker Systems
Ampex 351-2 with Inovonics Electronics
Ampex 300-2 in console
Ampex 300-4SS in console
Set of 8-Track Heads for 3M-M79
OP-AMP Labs Model SM 100 50W/Channel
Eventide 1745A DDL
Eventide 1745M DDL
Contact: FRANK TARSIA
(215) 561-3660

***FOR SALE** — Orange County's largest studio, 5,000 sq. ft. complex. Main studio 40x60x20. Iso booth. Control Room: Westlake design. Custom console. Used by Hendrix, Stones, etc. Complete kitchen facilities — game room.*
(714) 532-6801

AMEK #M2000, Six months old, 28-in, 24-out, patch bay-wired, producer's desk and racks, phantom power, 4 band EQ, 4 sends, 6 returns, oscillator slate T/B, P&G faders. Trading up to automated Amek #M2000A. Call for appointment.
Brian or Tim
EVERYTHING AUDIO
(213) 995-4175

WE PAY YOU COMMISSIONS
upon sale, for leads to used recording equipment. Your own or someone else's. Just tell us where it is — we do the rest. Consoles, tape machines, outboard gear, microphones. Recent or obsolete. Nationwide. Call (213) 348-4977 or (213) 657-4487.
SYE MITCHELL SOUND COMPANY
22301 Cass Avenue • Woodland Hills, CA 91364

FOR SALE
Mobile recording trailer and diesel tractor. Length 36', width 8', and is expandable to 15' at location. The control room area is 15' x 22', isso booth 8' x 12'. Trailor includes: Air ride, lead lining, panels and wire troughs. Designed for audio/video/film or combo. $72,500 or best offer.
Call Ike — (213) 851-4111 or
(213) 985-1550

CONSOLE FOR SALE
The VILLAGE RECORDER wishes to sell a Harrison 4032 console. Three years old. Very good condition. Includes Allison 65K Programmer. Asking $65,000. Call **Ken Klinger** at **(213) 478-8227.**

24-TRACK STUDIO PACKAGE
24-Track 3M M-79 recorder, 2-track 3M M-79 recorder, choose from 4 - 24-track consoles, 3 - 1176 UREI limiters, 2 - LA-3A limiters, Dolbys (24-track), EMT reverb stereo 140, 2 - U87, 3 - KM84, 1 - U47 (tube), 2 - AKG-414, Hammond B3 Organ, 2 - Crown DC300A amps, choice of 2 JBL speakers, Eventide digital delay, UREI 1/3 octave EQ. $105,000.00. Like new condition.

Also
3M 16-TRACK PACKAGE
with console, limiters, reverb, speakers, mikes, etc. Over 300 mikes to choose from, like new condition. Reasonable. Also, demo studio package. Immaculate condition.
CALL PAUL AT (312) 225-2110,
or Nights at (312) 467-9250.
MIDWEST AUDIO EXCHANGE

FOR SALE
2 - Eventide H910 Harmonizers
1 - Eventide Polyphonic Keyboard
1 - AKG C-422 Stereo Mike
1 - Ivie IE-30A
1 - dbx 160 Limiter
1 - UREI 527-A EQ
1 - UREI LA-4 Limiter
1 - Pandora Time Line
1 - Orban 516EC Sibilance Controller
1 - ADR Vocal Stressor
AUDIO TRAK RECORDING STUDIO
1025 W. State St. • Rockford, IL 61102
(815) 968-2902

THREE CONSOLES / RECORDERS
All consoles with table system: patch bay, digital stopwatch, 4 remotes, producer's desk. **Yamaha PM-1000** 16 x 4 with shiping case, $4,500. **Optronics 3030** 16 x 8 + 2, $6,500 and 12 x 4 + 2, $5,500. 3030s: 4 stage EQ + solo + 2 cues + pan per channel. Program sub-grouping, remix, VU meters. *Recorders:* Dokorder 1140-4 track, Sony TC-388-4. **Cassettes:** 2 Technics M-85s, Fisher CR-5120.
SPECTRUM STUDIOS, INC.
(503) 248-0248

FOR SALE** — 1 Crown RTA11, Brand new w/warranty including 7" Anvil Rack Case w/lids front & back & Anvil Suitcase type case foam lined w/wheels for air transport $1700 firm. Also, 1 UREI 100-A Soni Pulse complete w/case and warranty (Demo Unit) $800 firm.* ***(215) 589-2546.

EQUIPMENT BROKERAGE SALE
Still more tube Macs. Custom consoles great for parts, including Melcor AE-20 EQ/Pre-Amps, HW600 faders, patch bays, gobs more. dbx 187, $900; MXR DDL, $650; Ampex mono and two tracks; all varieties, call for prices and availability. Ampex 440-C-2. Several mint pieces still around. 1½ years old. $3,769 each. Scully 280-4 in cabs. $2,500 and up. Neve 16-track console, available in late June. 2 - MCI JH-100-16 with AL-II. Good condition. Dolby M-16 used, $9,000; B&W VTR and camera for remotes, $775; and, of course, the incredible Stereo Compressor/Limiter by Trident. Only $750 new. More equipment in and out every day.
EMPIRICAL AUDIO
3A Todd Place • Ossining, NY 10562
(914) 762-3089

EMPLOYMENT

EMPLOYMENT OPPORTUNITY
VALLEY PEOPLE, INC., is looking for a highly qualified field service technician. Applicant must have at least 4 - 5 years experience and be thoroughly familiar with console repair, multitrack tape machine repair and maintenance, systems troubleshooting, etc. Salary negotiable for the right person. Please send resume and salary requirements to Bob Wortsman at Valley People, Inc., P. O. Box 40306, Nashville, TN 37204.

SALES: Experienced musical salesperson to sell pro-electronics and effects line for top Eastern manufacturer. Solid company position with medical/dental benefits. Position requires 50% travel with all expenses paid. Successful applicant will be relocated to home office. Northeastern & Western territories currently open. Send resume and income requirements to:
P. O. Box 23 — Rochester, NY 14601

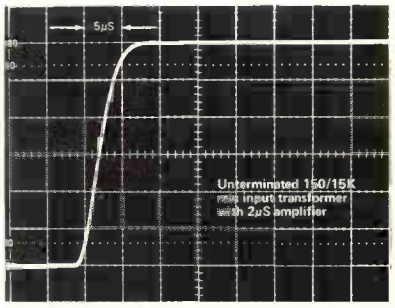
FOR SALE

Sphere Eclipse C 40 x 40 automated console, 24 super graphics, 16 three knob EQs, all with high pass filters. Allison EGC 101 VCAs. Trans-Amp mike pre's, all 40 inputs, 12 returns, 44 light beams with VU overbridge, complete spare parts inventory including extra modules. One year old, $125,000.00.

Call (615) 244-4861
Ask for Ben

jensen transformers
By REICHENBACH ENGINEERING

Wide Bandwidth
Minimum Transient Distortion
Low Noise



Years of transformer manufacturing and design experience, combined with computer assisted technology, have enabled us to make a *significantly audible improvement* in the performance of audio transformers.

Write or call for information
10735 BURBANK BOULEVARD
N. HOLLYWOOD, CA 91601
(213) 876-0059
(Visitors by appointment only.)

for additional information circle no. 173

News

AMPEX ATR-124 DELIVERIES BEGIN

Ampex Corporation has begun deliveries of its new ATR-124 multitrack audio recorder, according to Lee Cochran, general manager of the Audio-Video Systems Division's audio products group.

The first delivery was made to Filmways/Heider Recording, of Hollywood, "one of 23 units that have been ordered by customers in the U.S. since the ATR-124's introduction in November," Cochran said.

"Customers have responded enthusiastically to this new advance in multitrack recording," he added. "Audio professionals recognize that the new technology incorporated in the ATR-124 is required to satisfy requirements."

Filmways/Heider will install the recorder in its newly renovated Studio 4, according to Joe Collins, spokesman for the organization in Hollywood.

ALLISON RESEARCH, VALLEY AUDIO, VALLEY PEOPLE COMBINE

In an announcement by the boards of directors of the respective companies, on May 4, 1980 the consolidated companies will operate under the name of VALLEY PEOPLE, INC.

Named as president of the group of companies is former vice president and general manager of Allison Research, NORMAN BAKER.

Founder of Allison Research, and its immediate past president, PAUL C. BUFF, is named a vice president, as well as president of a satellite corporation dedicated specifically to New Product Development, named PAUL C. BUFF, INC.

BOB TODRANK, founder and past president of Valley Audio, is named executive vice president, and will be primarily in charge of marketing operations and studio consultation.

GARY CARRELLI will retain his title as vice president of Valley People, and will coordinate systems engineering, installations, and repair/maintenance services.

VALLEY PEOPLE, INC., will continue to offer, under a unified format, all of the services previously rendered by the three individual companies. These services include: Product Design and Manufacturing, Specialization in Supplying OEM Peripheral Products, Sales, Installation and Servicing of Equipment of other manufacturers, Equipment Rental, Acoustical Engineering and Consultation, and Circuit and System Consultation.

The reasons for the consolidation, as well as the goals of the new corporation were explained in a joint statement:

"Music production techniques and equipment have undergone tremendous advancements in recent years. Technologies have increased to the point where communications between manufacturer, dealer, and customer are more difficult than in the past. Oftentimes, the customer is faced with an enormously perplexing job of trying to piece together 'the system' from the myriad of complex equipment available. Once he has made his choices, the customer is often faced with circuit structures, and interface mechanisms which are unfamiliar to him, or to his technicians.

"We feel that the time has come for increasing the level of coherency in the industry. Organizations which, by their very nature, can help to put things into clearer perspective, through a combination of concentrated expertise in all areas which must be dealt with, together with a sincere desire to help the customer unravel the puzzles which confront him. In short, we feel that plain and simple integrity, both in a technological sense, as well as at a financial level, is worth its weight in gold.

"We further feel, that in an industry which changes almost daily, the best way to maintain technological integrity is to be fully involved in all aspects of that industry, on a daily basis.

"To this end, we combined our individual talents and facilities, which are time honored, and range from high technology circuit design, through manufacturing, to the sales, installation, service and engineering of percision total systems. These factors, coupled with the proven experience in room design and acoustics which exists within the ranks of the Valley People, give us cause to believe that our merger will be of great benefit to our industry."

The general and executive offices will be centrally located at:

2817 ERICA PLACE
NASHVILLE, TN 37204
(615) 385-1760; 255-4766

AUDIO & DESIGN RECORDING ACQUIRES U.S. REGISTERED TRADEMARK

Audio & Design Recording, of 84 Oxford Road, Reading, Berkshire, England, and of P. O. Box 786, Bremerton, Washington, U.S.A., has acquired the U.S. registered trademark,

Audio Designs™, from Audio Designs Manufacturing, of Roseville, Michigan. Audio Designs Manufacturing will cease their use of the mark "Audio Designs," and have changed their corporate name to ADM Technology, Inc. It is hoped this change will avoid any further confusion between the two companies and their respective products.

VON KARAJAN, POLYGRAM EMPLOY 3M SYSTEM FOR 'TEST' DIGITAL RECORDING OF 'PARSIFAL'

The first digital multitrack recording of an opera was made during December and early January by Herbert von Karajan, for Polygram, utilizing 3M's 32-track digital mastering system.

The recording of Richard Wagner's four-and-a-half hour opera 'Parsifal' utilized the Berlin Philharmonic Orchestra and the chorus of the Berlin Opera. Analog tapes were also made of the sessions.

Final decision to release the opera from digital tapes will be made this Summer, following editing and mixdown of both the digital and analog versions. The digital tapes will be edited digitally with 3M's electronic editing system.

The recording used 16 tracks of one 32-track recorder, while a second recorder was used to provide tape overlap for longer recording segments. According to 3M, recorders were in use approximately six hours a day for 15 days. Recording took place in the Berlin Philharmonic Hall.

"Parsifal" is the first Wagner opera recorded under Herbert von Karajan for the "Deutsche Grammophon" label since the noted 'Ring' cycle completed in 1970, and released in connection with the conductor's Salzburg Easter Festival, founded in 1967.

The recording is anticipated for release in the Spring of 1981. The cast includes Peter Hofmann (Parsifal), Dunja Vejzovic (Kundry), Kurt Moll (Gurnemanz), and Jose Van Dam (Amfortas).

NINE RECORDING STUDIOS INSTALL B&B VCA 500A

Nine recording studios have technologically updated their MCI series 500 consoles by retrofitting them with the B&B VCAs manufactured and marketed by Aphex Systems, Ltd.

The following studios have installed the Model VCA 500A units:

Criteria Studios, Florida; Basin Street Studios, London; Compass Point Recording Studios, the Bahamas; Manta Sound, Toronto; Sunshine Studios, Florida; and Pasha Music, One Step Up, Rudi Records and Fidelity Recorders, all in Los Angeles.

ASHLY COMPLETES MOVE TO A NEW AND EXPANDED LOCATION

Ashly Audio, of Rochester, New York, has just completed a move to a new manufacturing facility. The new plant is an 11,000 square foot single story layout with a totally open production area.

According to Bill Thompson, president of Ashly Audio, "Our old factory was broken up into a number of separate areas but the new one lets us set up a much more logical assembly flow. It's better lit, has better heat and electricity, and is just a better place to work. We actually moved most of the facility over the holidays, working through the long weekends, and we're well settled in now with production at an all time high. At the same time, we've managed to maintain our engineering and research, upgrading our product documentation, and developing a few very interesting circuits for a new product to be introduced at AES. All-in-all, 1979 was an excellent year and 1980 looks even better."

Ashly Audio's new address is: 100 Fernwood Avenue, Rochester, NY 14621.

The new telephone number is (716) 544-5191, and for customers outside New York State, Ashly also maintains a toll free number (800) 828-6308.

For further information please contact:

ASHLY AUDIO, INC.
CUSTOMER SERVICE
100 FERNWOOD AVENUE
ROCHESTER, NY 14621

NASHVILLE'S CREATIVE AUDIO TO BECOME AUDIO ARCHITECTS

In announcing incorporation under the new name, Audio Architects, Allen Rumbaugh, president, said the growth of the business, teamed with its greatly expanded services, brought about the incorporation and name change.

"We feel the name Audio Architects better reflects the nature of our business," Rumbaugh said. "We began operations primarily as a professional audio equipment dealer, but have since expanded our services to include turnkey studio installations, the design and installation of permanent sound reinforcement systems, as well as equipment modification and repair."

Under its umbrella of services, Audio Architects, Inc., also manufactures in-house its own line of studio equipment including control room monitors, cue systems, and

cabling and interface systems.

"We are currently serving clients from Texas to New York," Rumbaugh said, "and anticipate great future growth. We are dedicated to successfully uniting musical expression with progressive studio technology."

Headquartered at 112 Space Park Drive, in Nashville, Audio Architects carries over 50 lines of professional audio equipment including JBL, Tangent, Sound Workshop, AKG, TEAC/Tascam, Otari, Stephens, Audio Design & Recording, Community Light & Sound, and SAE Pro.

RECORDING FOR THE BLIND ASKS AGAIN: CAN YOU SPARE TWO HOURS RECORDING A WEEK?

Can you imagine trying to get through college without being able to read? Well, that's the problem that blind college students face, and the only solution is to have someone read to them.

But it isn't practical for every blind student to have a reader, so nowadays it's done on tape. Recording For The Blind is an organization that provides blind students with spoken textbooks to help them in their studies. But here is another problem: someone has to record these tapes — someone who understands the advanced scientific and technical material being read. This requires a team of people — a Reader and a Supervisor/Monitor who operates the tape recorder. Training is given.

You can help if your field is math, electronics, chemistry, medicine, engineering, computer programming, law, foreign language, or other technical subjects. If you have been promising yourself to "get involved" but have wanted a project that was special, here is your opportunity. You will meet fascinating people; you will learn a great deal; and you will feel marvelous.

RFB is looking for dedicated people who can be relied upon to spend a minimum of two hours each week on a regular basis. To make an appointment, please call Recording For The Blind, Inc., (213) 664-5525, or (213) 660-1391, days or evenings.

Will you help?

IEC RELEASES INTERNATIONAL STANDARD FOR PROFESSIONAL AND DOMESTIC RECORDING EQUIPMENT

International trade in magnetic tape recording equipment was made that much easier recently following the announcement by the IEC that its much-awaited international standard on mechanical and electrical measuring methods for both professional and domestic recording equipment had just been released. Its availability will be welcomed not only by the consumer, but also by manufacturers and test houses world-wide.

The standard, IEC Publication 94-3, is the latest in a series of nine being developed by the international body for magnetic tape recording and sound reproducing equipment. Its object is to list and define parameters affecting the performance of recording and reproducing equipment for sound on magnetic tape, and to establish conditions and internationally-agreed methods of measurement of these parameters.

Standard Methods of Measuring Performance (SMMP) are a primary step in any standardization activity and those set in this particular standard will fulfill a long felt need within the magnetic recording field. Not only are methods of measurement of both mechanical and electrical parameters of tape equipment provided but also a special section indicating precautions to be taken during measurements.

IEC has pointed out that when the standard was being prepared by its sub-committee 60a (sound recording) of technical committe no. 60 (recording), delegates found that it was difficult, and hence unwise, to draw a dividing line between standards for professional equipment and those for domestic use. As a result, Publication 94-3 was developed to be suitable for all applications.

A few items in the standard are mandatory, for example information to be shown on manufacturers' equipment, but, in the main, it has been left to the discretion of the manufacturer to decide which other items are important enough to be included in the specification of their equipment.

In terms of implementation, Publication 94-3 should quickly replace or complete national standards which already incorporate some of the measurements described. Overall, its value for laboratory product assessment and aid in eliminating technical trade barriers cannot be overstated.

Finally, the IEC points out that this standard has already been used as the basis of a soon-to-be published international standard also for this sector establishing minimum performance requirements for high fidelity magnetic recording and playback equipment. This standard will be designated Publication 581-4.

The IEC, the International Electrotechnical Commission, is the world's chief authority for international standards governing the production, transmission, and utilization of electrical energy. A world-wide body based in Geneva, the IEC is composed of National Committees in 43 countries formed to represent all their national interests in standards discussions at the international level. The IEC standardization programs are developed by some 200 Technical Committees and Sub-Committees whose subjects collectively span electrotechnology. A principal aim of producing international standards is to facilitate global trade through eliminating differences in national standards.

ABBA AWARDED AMPEX GOLDEN REEL AWARD

Swedish recording group ABBA continues to ride the wave of international success with their album "Voulez-Vous" which, in addition to topping the five million mark in copies sold, has earned them the coveted Ampex Golden Reel Award.

The artists, whose first-name initials form the word ABBA, are from left to right: Benny Andersson, Anni-Frid Lyngstad, Agneta Faeltskog, and Bjoern Ulvaeus.

To celebrate each award, Ampex makes a $1,000 donation to a non-profit charity selected by the performing artists. The money for ABBA's Golden Reel was given to UNICEF, Sweden.

Ampex Golden Reels are awarded only in honor of albums and singles achieving "gold record" status and which have been completely recorded and mastered on Ampex professional tape.

Golden Reels are unique in that they honor all of the talent behind a hit recording — the performing artists, recording studio, engineers, and record producer.

Andersson Lyngstad Faeltskog Ulvaeus

The February 6th presentation to ABBA for "Voulez-Vous" was held at Polar Music Studio, Stockholm. All tracks were mastered on Ampex Grand Master™ tape by Michael Tretow, Polar's chief recording engineer.

AN OTARI KEEPS ON TICKING, TOO!

Late last Fall a speeding car careened across Hyperion Boulevard, in the eastern part of Hollywood, California, and through the front wall of Music Lab Recording Studios. Unfortunately, behind that wall sat an Otari 5050 tape recorder in a wood roll-about cabinet.

According to Chaba Mehes, the owner of Music Lab, the placed looked like a war zone. When the clean-up crew started to dig out the hundreds of pounds of stucco, plaster, and other debris, they found the 5050 across the room . . . 10 feet from its original location. Naturally, the wood cabinet was in splinters, but the only visible damage to the 5050 was a bent frame and dented screen.

Mehes had his shop dump as much debris

out of the 5050 as possible; they then used compressed air to clean out the rest of the plaster dust. To everyone's amazement, the 5050 operated perfectly when it was plugged in. After straightening the frame and screen, the 5050 was put back to work in Music Lab's studio and dub-down room. No other work was done on the machine.

As a postscript, a week after the first accident, another car careened across Hyperion demolishing a parked car . . . which fortunately kept Music Lab from losing another front wall and . . .

ALTEC — IVIE IN PATENT LITIGATION

Altec Corporation, manufacturer of Altec Lansing and University sound products, has announced that it has filed a patent infringement action in the Utah Federal District Court against Ivie Electronics, Inc., of Orem, Utah. Altec's complaint alleges that Ivie copied certain patented features of Altec's Incremental Power Amplifier System, and seeks relief from the court in the form of a preliminary and a permanent injunction against further infringement. The complaint also asks for damages, costs, and attorneys' fees according to proof. "Altec sought to resolve this matter without litigation but was unable to do so," explained William L. Fowler, president, "so we were forced to file this action to protect our rights under the patent laws." Altec Corporation which develops, manufacturers, and sells industrial, professional, commercial, and consumer sound products, is an American Stock Exchange listed company headquartered in Anaheim, California.

Ivie Electronics, Incorporated, manufacturer of electronic test equipment and professional audio products, meanwhile announced that it has filed several counterclaims against Altec Corporation, of Anaheim, California, in a suit pending in Federal District Court in Utah. Ivie's counterclaims allege that Altec Corporation is involved in the predatory practices of unfair competition, harassment, and restraint of trade. Ivie is seeking damages, costs, and attorneys' fees according to proof.

Ivie engineers and patent counsel have carefully reviewed the Altec patents which are the subject of Altec's claims in the same suit, and the Altec claims do not appear to be meritorious, according to the Ivie spokesman. It was further stated that it does not appear that Ivie is infringing any Altec patents. "Ivie is confident that these matters will soon be favorably resolved."

NEVE APPOINTS HOLLYWOOD & NASHVILLE SALES MANAGERS

Rupert Neve, Inc., of Bethel, Connecticut, a world leader in professional audio mixing consoles for music recording and broadcast, has announced the appointment of **Peter V. Horsman** and **Glen McCandless** to the positions of regional sales managers in Hollywood, California and Nashville, Tennessee, respectively.

The Neve Nashville office opened on March 3rd, and Mr. McCandless may be reached at (615) 385-2090.

Mr. Horsman joins Neve with 17 years of sales, engineering and management experience within the professional sound industry. From 1972 until recently, Mr. Horsman was manager, professional division, of James B. Lansing Sound, Inc.

Mr. McCandless joins Neve with four years of sales and management experience in the high end of consumer audio from Anderson Audio, Nashville. He graduated with a Bachelor of Science degree in 1974 from the University of Tennessee, Knoxville. He is a member of Phi Kappa Phi National Honor Society.

— *continued from page 21* . . .

What The AUDIO/VIDEO fusion Can Mean To The RECORDING STUDIO INDUSTRY

major labels. The result was they received recording contracts. A group called Zuyder Zee received a recording contract with Columbia via those video tapes, and group called Larry Rassberry and the High Steppers used the tapes in setting up their own label." He adds that the tapes themselves were not the major factor in the signing, but that they served the purpose of putting "some people on a plane to come out and see them, and that's always quite a commitment."

It appears, then, that the video demo is an extremely useful tool to the unsigned recording artists, and hence to the recording studio willing to offer video recording as an additional service. In light of this, adds Bill Seal, "One thing I don't understand is that bands are willing to spend maybe a thousand or fifteen-hundred dollars on an audio demo tape, when for that same money they could have a video tape encoded in stereo from a 24-track machine, or whatever, just like an audio demo. They can mix it down just like any other multitrack machine."

Seal's company offers simple video demos of band performances by using two color cameras in a studio situation. The cost is roughly $200, depending on how much the company is interested in the act. Although offering demos is a part of Aberdeen Video's service, they are more interested in experimenting with video music, trying to interest up-and-coming bands in the art, and get in on the ground floor of what they believe is the home entertainment wave of the 1980s.

Seal realizes the limitations of his equipment, but is of a mind that it is how you use what you've got and the band's performance that is more significant than slick lighting and editing. Their cameras are lightweight Hitachis of the types used by television news crews. "They suit our style, because we tend to go out and shoot a band in its natural environment, in the clubs, on the street, wherever they happen to be."

These cameras feed ¾" U-Matic VTR machines, which are Aberdeen's primary transport, though 1" high band has been used when the situation calls for broadcast quality.

In a club situation, Seal goes with the available light on stage rather than bringing more in. It is a budgetary concern, but it also achieves the effect he wants. "On New Year's Eve, we shot at the Roxy where Diane Diamond and Nick Gilder were performing. We used existing lighting in that situation.

"Sometimes it's black, but then sometimes it's black in the room. We did not alter the lighting at all. The audio feed was taken off the mixing panel that they use for their PA system, so we recorded in stereo."

Although Aberdeen Video's system is essentially the same as that described in package Number 2 in the last issue, the company offers a good example of how a recording studio interested in video may take its first step. If a market can be confirmed as an area for video demo work, an audio studio could conceivably invest in the smaller of the three packages, and by using demos to support the equipment, explore the possibilities of video music, and if the video field is right for their operation.

When compared to the state-of-the-art equipment of Compact Video Systems, Todd Rundgren's Bearsville Studios, or the facilities at the three major television networks, this set up may seem tiny indeed, but it has been said that every long journey begins with but one small step. Even a journey where a single step may later run $150,000.

In the next issue, we will be discussing with various studios exactly where they see themselves in this merging of the media and the planning and hardware they are employing to meet their goals. □□□

—*continued from page 54*—

GRAMMY WINNER

LARRY BUTLER

with engineer
Billy Sherrill

Nashville due to the high temperature and humidity encountered at various times of the year?

Billy: Most of the guys, especially guitar players, will get there a little early and open their cases so the instrument can get used to the temperature and humidity in the studio, and will stay in tune. Also, we have dehumidifiers in the studio, and that solves most of the problem.

R-e/p: How much does the humidity seem to change the performance of microphones?

Billy: A lot of times when a U87 is used on vocals if it is very humid and the singer is very breathy it might cut off momentarily. As soon as it dries out it comes back to life.

Larry: If the control room gets a little warm I can tell a difference in the playback. It starts to sound a little mushy.

R-e/p: Do the echo chambers' characteristics change with the seasons?

Billy: They're kept pretty cool all the time since

. . . *continued overleaf* -

Sexless.

Whether you realize it or not, every cosmetic feature ... in fact every feature on an amp costs you money. Sometimes, these features cost you performance and reliability, because the manufacturer is trying to be price competitive. Lately there's a trend to make every amplifier a little "sexier" than the competitions.

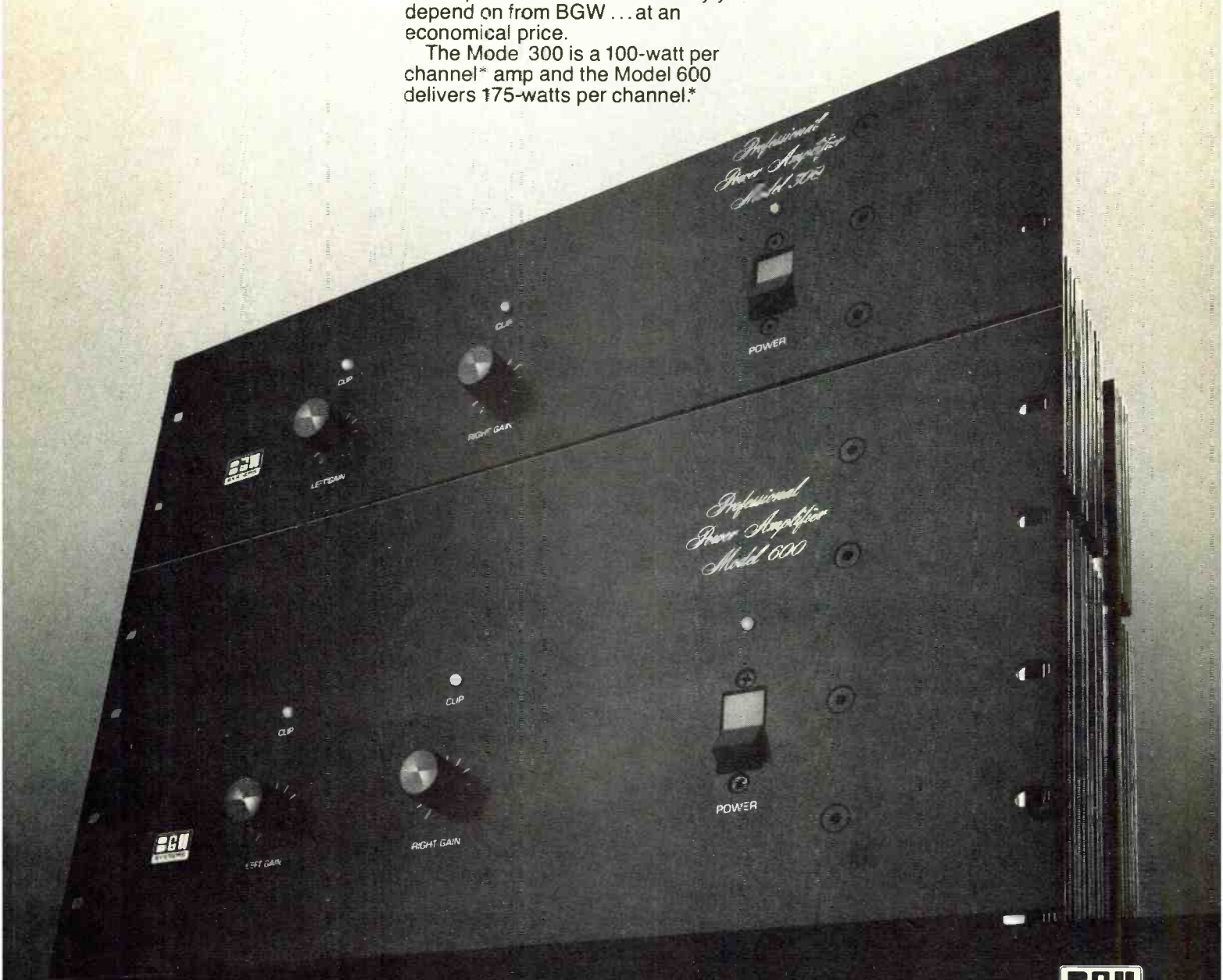
At BGW we know there are applications where all you want and need is performance and reliability. No bells and whistles. That's why we developed the BGW Models 300 and 600. These are true "basic" amplifiers, but they are packed with all the performance and reliability you depend on from BGW ... at an economical price.

The Mode 300 is a 100-watt per channel* amp and the Model 600 delivers 175-watts per channel.*

Both feature full complementary output stages ... modular construction ... a high-speed 15-MHz op-amp front-end ... individual front panel gain controls ... stereo/mono switch ... sophisticated loss-of-feedback clipping indicators ... separate signal and chassis grounds ... and rugged all steel construction. Both are also available with built-in 70/25 volt autotransformers.

Check out the BGW 300 and 600 today.

*Minimum average continuous power output at 8 ohms over the full 20 Hz-20kHz band. 4 ohm rating significantly higher.



Depend On Us. BGW SYSTEMS

BGW Systems, Inc., 13130 S. Yukon Ave., Hawthorne, CA 90250 (213) 973-8090 In Canada: Omnimedia Corp., 9653 Cote de Liesse, Dorval, Quebec H9P 1A3

for additional information circle no. 184

they're down in a cellar.

Larry: The control room is kept very cold. It keeps you alert.

R-e/p: Is there a problem working with musicians that have been doing so many sessions? Do they tend to get stale?
Larry: I'll tell you what happens. Let's say I call a musician and he's got four sessions on Monday, four sessions Tuesday, and I want him for 6 to 10 on Wednesday, and he's got a 10 to 2 on Wednesday morning. He and I will discuss if it would be better for me to have someone else work it and then he'll leave it up to me. But nine times out of ten they'll come in there and shake off that numbness and play their ass off!

Billy: Almost all of them use cartage companies so their things are set up when they get there and someone else tears them down after they leave.

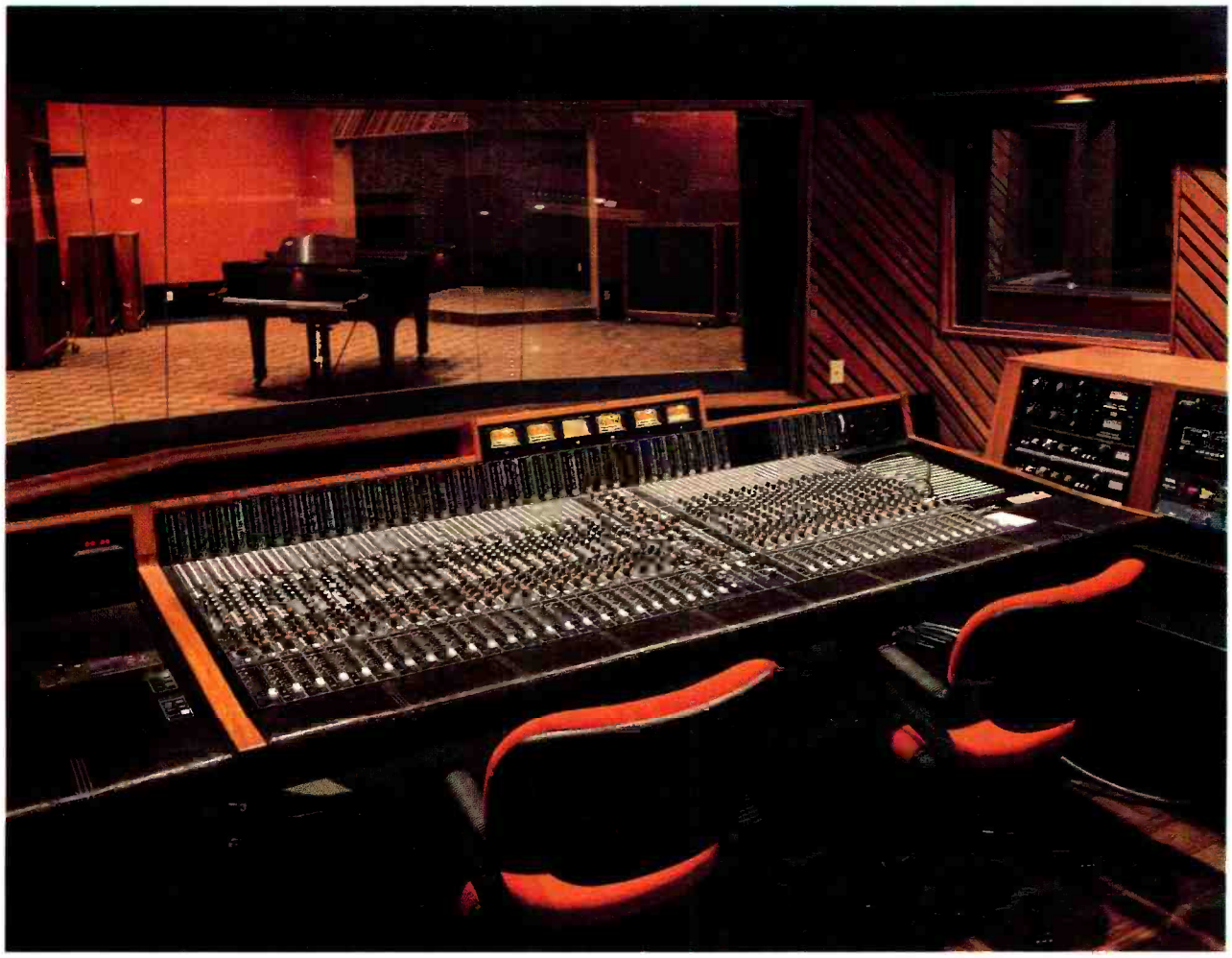
R-e/p: The drummers tune their own drums?
Billy: Yes.

R-e/p: Is there a preferred head or drum type?
Billy: Different drummers use different kinds of heads. They use ambassador heads; some skin heads. I know Kenny Malone uses double-headed drums. He's about the only one in town that has two heads on his drums and they sound marvelous. There is a bunch of good drummers down here. When you push up the faders on those guys the drums sound great.

Larry: And when they hear the playback and it doesn't sound right to them, they'll tell you about it. There have been many situations where I'll say, "Okay guys, that's it! Next song!", and they will ask to hear it one more time. One of the guitar players will say, "You know, it just didn't feel quite right going into the verse," and the bass player might want to do a simpler line. Well, they'll talk me into doing another cut after I've decided we have a take. They work very hard to cut good records.

R-e/p: Do you have any closing comments?
Larry: I would like to emphasize that Nashville is not just the country music recording center. It is a recording center. Anything you want to record can be done there. □□□

THIS ISSUE OF *R-e/p* IS SPONSORED BY THE FOLLOWING LIST OF ADVERTISERS



Evergreen Recording Studios, Burbank
Studio B, 4032C Master Recording Console

"...MAKING MUSIC SOUND LIKE MUSIC"

Two worlds exist side by side at Evergreen Recording Studios — the somewhat specialized world of film scoring and the, perhaps, more conventional world of contemporary studio recording. When Artie Butler and Charles Fox planned the Evergreen recording complex, they designed the studios to combine the latest and best efforts of both worlds. As composers, arrangers, and producers, they had a special insight into the needs of a studio. In selecting their two recording consoles, they chose Harrison.

Studio A, 4832C Master Recording Console

"The Harrison console is very 'musical' and very easy to work with." — *Charles Fox*

"It's probably the only console that actually performs as a mechanical device but sounds more like a musical instrument." — *Bill Lazarus, General Manager*

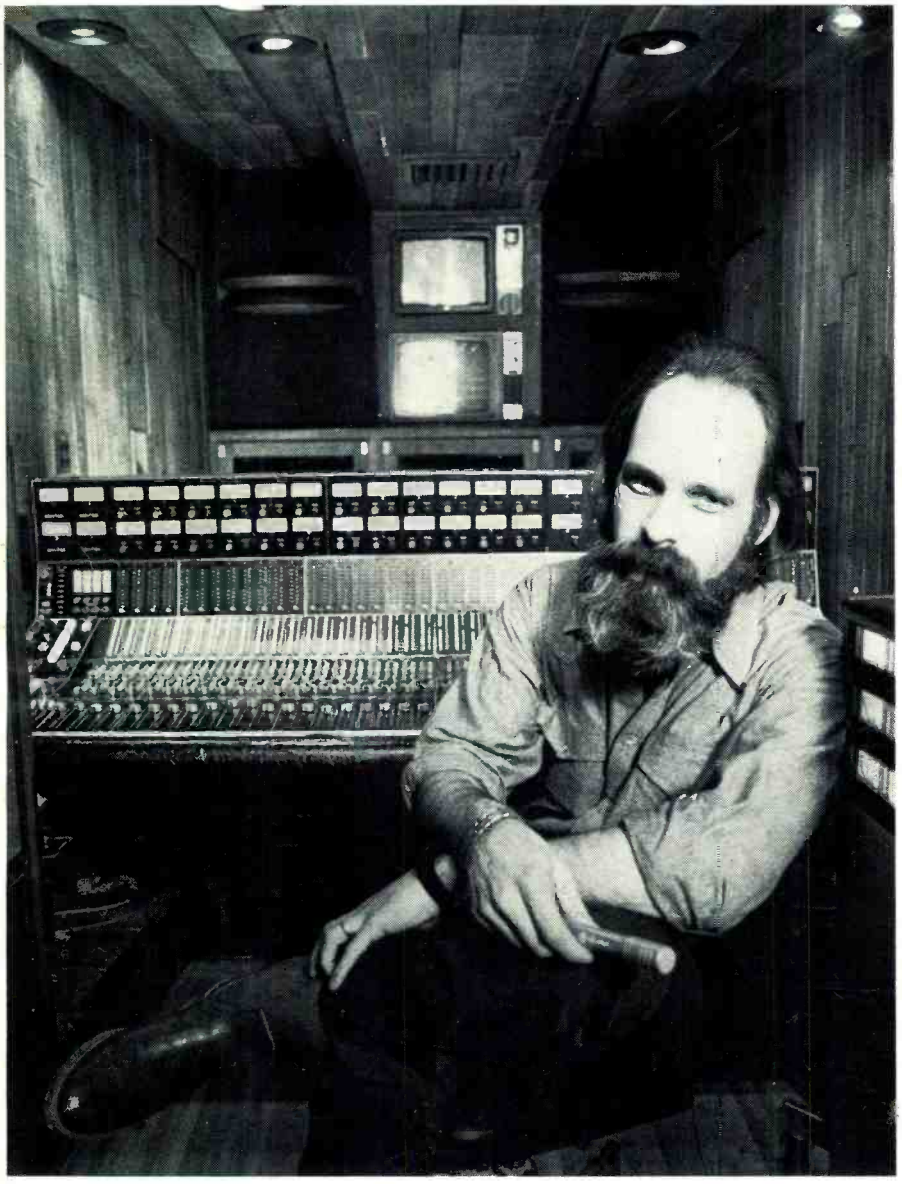
"And that's what this business is all about — making music sound like music." — *Artie Butler*

still NO COMPROMISE

Harrison

HARRISON SYSTEMS, INC.
P.O. Box 22964, Nashville, Tennessee 37202 · (615) 834-1184, Telex 555133

fact: "I never thought such a rugged microphone could sound this great"!



Record Plant Studios, N.Y.C.

David Hewitt
Director of Remote Recording

"When we record a live concert, we have just *one* chance to get every bit of music on tape... perfectly. That's why it's essential that every piece of equipment give *outstanding* performance, even in unpredictable situations that result in equipment being called upon to serve above and beyond the call of duty.

"Our mobile units follow a string of one-nighters from New York to California, with set-up and take-downs every step of the way. There isn't a microphone in the world that's too rugged for that kind of assignment. The Shure SM81 has proven itself time and time again as an incredibly reliable condenser microphone. In fact, we once accidentally dragged an SM81 over 400 feet on a wire catwalk... and it still performed perfectly!

"But, what really blew me away was the SM81's superb sound. Its exceptionally flat frequency response makes it our first choice for uncompromising acoustical guitar applications; and, the wide dynamic range and ultra-low distortion make it perfect for brass and percussion instruments as well.

"We count on Shure to make certain our remote facilities give dependably high performance. With the kind of custom-designed, state-of-the-art equipment we've got in our vans, we wouldn't settle for less-than-the-best microphone on stage!"

SM81 Cardioid
Condenser Microphone

SM81 Cardioid Condenser Microphone

SHURE

The Sound of the Professionals

Shure Brothers Inc., 222 Hartrey Ave., Evanston, IL 60204 In Canada: A.C. Simmonds & Sons Limited
Outside the U.S. or Canada, write to Shure Brothers Inc., Attn: Dept. J6 for information on your local Shure distributor.
Manufacturers of high fidelity components, microphones, sound systems and related circuitry.

for additional information circle no. 186