

RECORDING

ENGINEER / PRODUCER

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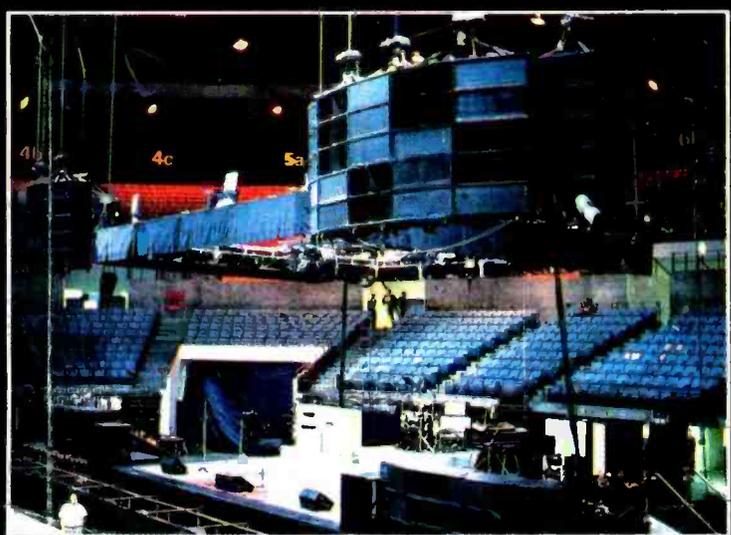
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June 1985
Volume 16 — Number 3

PRODUCING AUDIO FOR • TAPE • RECORDS • FILM • LIVE PERFORMANCE • VIDEO & BROADCAST

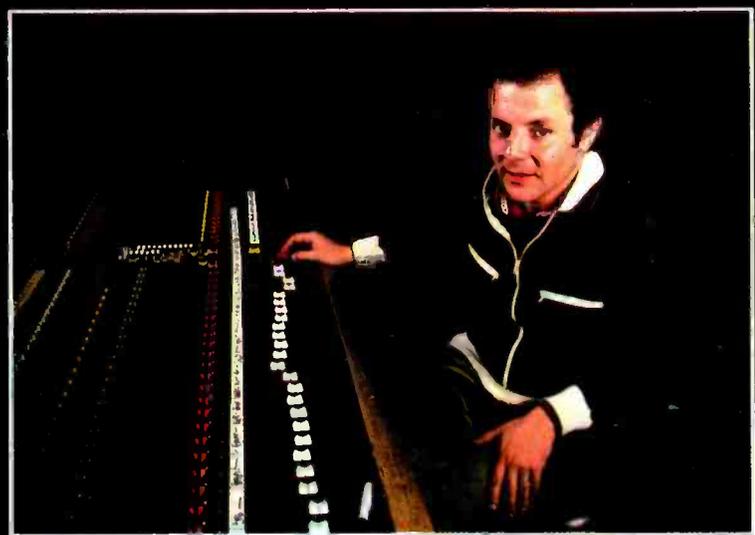


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RECORDING ENGINEER/PRODUCER

— the magazine to exclusively serve the RECORDING STUDIO and CONCERT SOUND industries... those whose work involves the engineering and production of commercially marketable product for:

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"RECORDING Engineer/Producer"
(ISSN 0034-1673)

is published six times a year by GALLAY COMMUNICATIONS, INC., 1850 Whitley Avenue, Hollywood, California 90028, and is sent to qualified recipients in the United States. One year (six issues) subscriptions may be purchased at the following rates:

United States (Surface Mail)	\$24.00
United States (First Class)	\$30.00
Canada	\$24.00
Foreign	\$45.00

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



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News Letters Views

TRADEMARK CLARIFICATION

from: Edward M. Long
E.M. Long Associates
Oakland, CA

I just wanted to express my appreciation to *R-e/p* for its care in making sure that the Time Align[®], which is presently licensed to UREI/JBL, Calibration Standard Instruments, and Modular Sound for use on certain qualified models, is clearly labelled as such.

I am not certain whether UREI/JBL has notified you yet that the trademark Time Align[®] is registered and should be used with the "R" in a circle. Some of their literature still uses the "TM" to indicate the trademark, but they will be changing over.

In some studio information, I have seen the unauthorized use of our trademark and it is possible that they don't realize that they need to meet certain standards to be granted a license for their "custom time aligned" monitors. The only studio which has the right to do this at present is Criteria Studio, of Miami, which has two custom Time Align[®] systems, designed and qualified by us to use the trademark.

Recently, I have seen a number of small monitors which are using our Nearfield Monitor[™] trademark. The only monitors which can legitimately use this trademark at present are the MDM-4 and MDM-TA3, manufactured by Calibration Standard Instruments.

As I have always done with our Time Align[®] trademark, I am continuing to contact companies and studios who use the trademarks without a license. ■■■

MICROPHONE ASSESSMENTS

from: Adrian Weidmann,
Marketing consultant/
recording engineer
Bruel & Kjaer
Copenhagen, Denmark

Let me begin by saying how much we here in the Electro-Acoustic Group enjoy your publication. It provides us with tremendous insights to the people and products in the professional audio industry, and hence are able to gear our research and development of new products and support material accordingly.

As a recording engineer myself, currently working with Bruel & Kjaer in conjunction with the Series 4000 Micro-

phones, I would like to expand upon the article written by Professor Lowell Cross entitled "Performance Assessments of Studio Microphones," which appeared in the February 1985 issue of *R-e/p*.

First let me correct Professor Cross' presumption that "Bruel & Kjaer is committed exclusively to the manufacturing of pressure transducer [omnidirectional] microphones for audio recording." I would like to reassure Professor Cross and your readership that Bruel & Kjaer is committed to the research and development of "B&K quality" products which address the trends and needs of the entire professional audio industry, now and for the future. We here at B&K are well aware of the fact that the pressure transducer (omnidirectional) microphones alone is not the panacea for all the problems encountered during the audio recording process, just a wonderful beginning.

Secondly, due to the tremendously coherent phase response of the B&K Series 4000 microphones, it is in fact possible to get an excellent stereo image, not to mention the extended flat frequency response, utilizing a "closely-spaced" microphone technique. Any type of symphonic, chamber ensemble, choral, organ or recital (the type of format used for Professor Cross' microphone assessment) recording will benefit from a "closely-spaced" (A-B, 20 to 50cm) microphone technique using the B&K Series 4000 Microphones.

A variation on this technique is achieved by the use of the "Jecklin-Disk." Mr. Jecklin and many other European recording engineers have used this disk in conjunction with B&K microphones with tremendous results.

Since the Bruel & Kjaer Series 4000 Microphones have a frequency and phase response well beyond those of other commercially available microphones, the recording engineer is presented with an added dimension of sonic quality which in turn provides a new aural experience, and is many times criticized as being "harsh and lacking a warm feeling." I remember similar remarks were made about the digital recording process, and yet the current and projected future demand for the Compact Disc speaks for itself.

I would like to add that many of our customers, including CBS Records, Denon, Telarc and many other world-class recording studios, have found that by experimenting with non-traditional miking techniques, and changing some traditional recording philosophies, they have been able to fully capture the "ideal" balance between the recorded and actual-acoustic event for truly wonderful recordings. I invite recording

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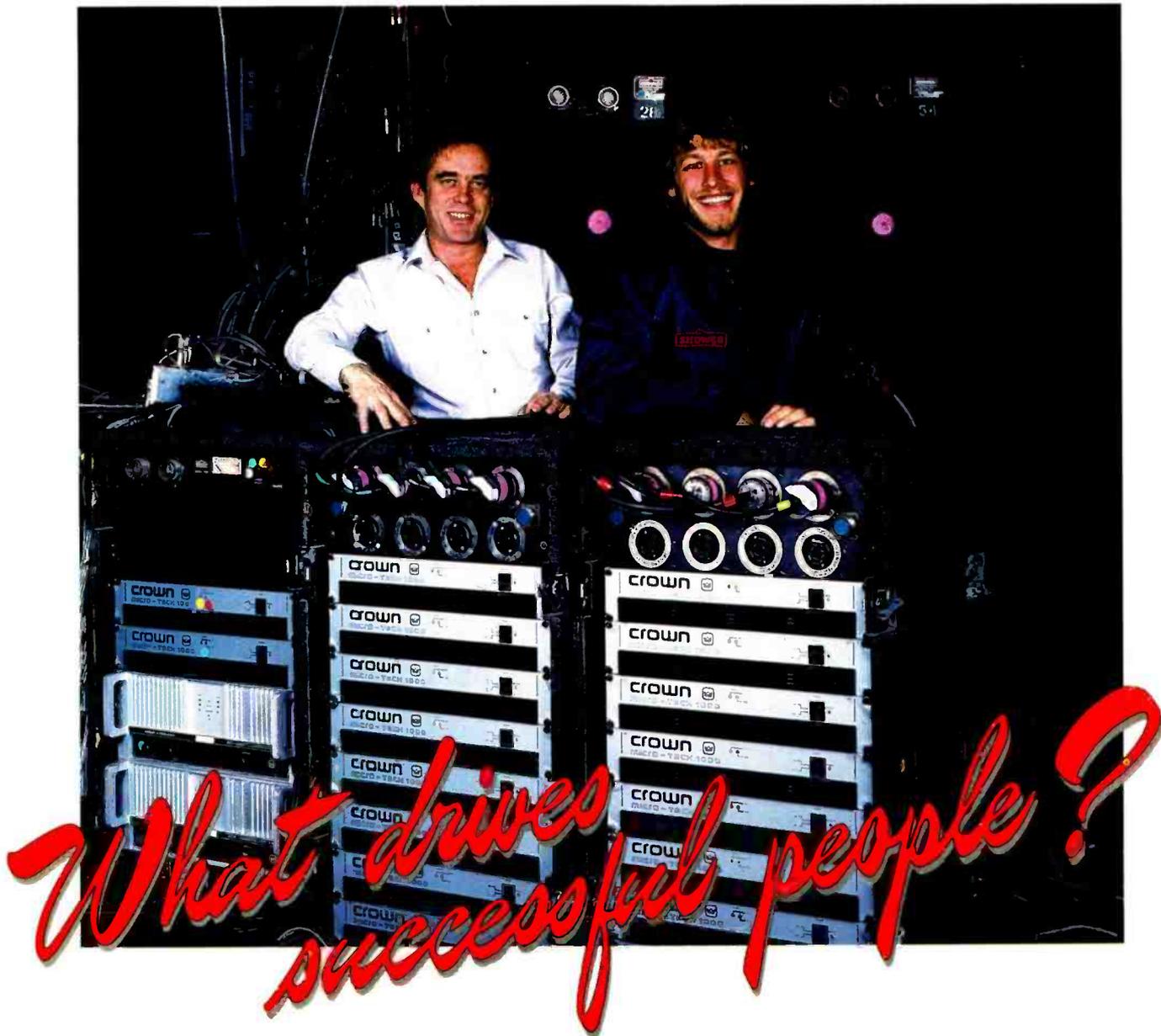
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Music & Electronics . . . Naturally!

Letters

— continued from page 6 . . .

engineers who are dedicated to improving the quality of their audio recordings, be it rock, pop, classical or jazz, to use and experiment with B&K Series 4000 Microphones to truly evaluate and hear for themselves the added dimension in audio quality which these microphones reveal.

Thank you for the opportunity to add to Professor Cross' comments, and I trust that *R-e/p*'s readership has gained further insight into the use of B&K Series 4000 Microphones. □□□

from: Mr. Wuttke
Schalltechnik Dr. —
Ing Schoeps GmbH
KarlsMike 41
West Germany

We read with much interest the articles by Professor Lowell Cross, "Performance Assessments of Studio Microphones," published in the December 1984 and February 1985 issues of *R-e/p*. In the belief that theory and practice may not be separated, and with a deep interest in music, for a long time we have been investigating different recording methods and the use of different microphones.

As Professor Cross has said himself, we acknowledge that there is of course a

presence of subjective factors and, furthermore, things cannot be generalized. Music recording is a profession and cannot be based on one method or microphone type only.

Without contradicting his article, we want to add some comments which may be of interest to Professor Cross:

1. *Colette series.* The Schoeps' Colette series is by far the most extensive modular system: it includes not only 12 different capsules to correspond to all applications, but even allows the use of the same capsules for miniaturized microphones using the active cable. Even elements for stereo and monomics can be exchanged, such as capsules, elastic suspensions, windscreen, and so on.

2. *Same playback level of different recordings.* If comparisons are made, it is of extreme importance that the level is identical; otherwise the judgement of the louder recording will be influenced in a positive way. This seems to be simple and not worth mentioning, but we have the experience that, depending on the music and the mikes used, it can be hard to fulfill this [requirement]. If the spectrum of the music changes, the frequency response of the mike has an important influence on the transmitted sound level.

3. *Mounting of Microphones.* We know about the problems of placing a group of microphones so that they will pick up the same image, but have found that neither this nor the more important

influence of the microphone stands and other reflecting objects is essential. However, we [ensure that] the mikes are not mounted too close together. If microphones are mounted in a way that they touch, there will be an influence on the diffraction around the capsules. This and other effects will in fact change the characteristics of the capsule. If four capsules are taped together, the central ones will be most influenced, of course.

4. *Lowest possible change of parameters.* As Professor Cross explained, it is difficult to separate between microphone quality and stereo quality. If the same capsules (MK 4) were preferred in the ORTF configuration, compared to the XY setup, the method of mounting may have had some influence (see #3 above).

5. *Calrec Soundfield technique.* Professor Cross' positive comments about this system is not surprising. Theoretically, it is the best principle. However, the four-channel playback cannot really be compared to stereo. We have heard other four-channel systems, and the improvement over stereo had always been impressive.

6. *Stereo with omnis.* We agree with most of Professor Cross' ranking for the stereo techniques. For his sessions and many others, this can be considered to be right. However, if the music had contained more deep bass, and precise stereo imaging not be so important (e.g.

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Letters

organ), you would get better results for the omnis.

We would also like to mention in this context the compromise between widely-spaced omnis and the dummy heads using an absorbing screen between two near-coincident omnis. This method (Jecklin) is famous in Europe.

7. *Large-diaphragm capsules.* Concerning their ranking, we are surprised. In general, we try to get a flat and smooth frequency response in both the direct and diffuse soundfield. Our MK 41 hypercardioid capsule is even better concerning this than our cardioid MK 4.

As the user can easily find out, all large-diaphragm capsules have substantial deformations of their frequency response and polar diagram. We are very interested to get more knowledge of which "colorations" are preferred for what application. We do not believe that there is a general requirement.

8. *Another new comparison.* Professor Cross mentioned the paper of Mr. Ceon. Now another paper will appear on the subject of comparison of recording methods and microphones. It has been written by Mr. Wöhr at Bayerischer Rundfunk (Bavarian Broadcasting Corp.), using different music and a 24-channel digital tape recorder. Two

thousand judgements are now [stored] in the computer. A first report [written in German] is given in *Bericht zur 13. Tonmeistertagung 1984*. We hope that one day there will also be an English paper available, for deep-going reflections have been added by IRT (Institut für Rundfunktechnik). □□□

Lowell Cross replies:

I am gratified that such respected manufacturers as B&K and Schoeps have taken an interest in our evaluation process.

At least for the time being, it would appear that Bruel & Kjaer is (present tense) committed exclusively to the *manufacturing* of omnidirectional microphones. In advertising copy and in articles written by the B&K staff, the promotion of omnidirectional microphones is obvious (ads with the headlines "... but why an Omni?" etc). If microphones with other patterns are manufactured by B&K in the future, I am sure that they will receive a great deal of attention.

All of the emphasis on the phase response of individual microphones cannot mitigate a legitimate concern for the problems of phase relationships *between channels* in stereo recording. If omnidirectional microphones with excellent axis characteristics, such as the B&K 4000 Series, are placed 20 to 50cm apart for "stereo" (eight to 20 inches), the most significant differences between

channels will be time or phase differences, and not differences in intensity (from amplitude) or directivity (from patterns).

The Jecklin-Disk technique makes use of an absorptive barrier 30cm in diameter, located between two omnidirectional microphones spaced 17.5cm apart. (See: Martin Dickreiter, *Mikrofon-Aufnahmetechnik*, pp. 102-103.) As in the case of an artificial head, *directional* properties are imparted to the microphones owing to the barrier placed between the pressure-transducer elements. The close proximity of the absorptive disk will alter the carefully designed phase- and frequency-response characteristics of the individual microphones. The Jecklin-Disk technique, as highly regarded as it may be, reintroduces directionality at the expense of time and frequency-response aberrations. Are we not back to Square One?

As mentioned in the December 1984 article, the Schoeps Colette Series offers a comprehensive set of choices, including the only boundary-layer pickup known to the author in a modular "family" of microphones.

Extreme care has been taken in all of our listening sessions to maintain matched, broadband playback levels between the various microphone types. All 24 channels are metered simultaneously with both VU and PPM characteristics. Of course, the comparison of audible differences among microphones in *level versus frequency* has formed the very basis of our evaluations.

If microphones are mounted at the same distance and angle, they will by necessity be placed very close together. However, I appreciate Mr. Wuttke's concurrence in recognizing the problem and in ascribing the preference for the ORTF configuration to the characteristics of that technique, and not to any possible deficiencies in the mounting arrangements of the XY coincident cardioid pairs.

The ranking of the Calrec MkIV Soundfield microphone came only as the result of auditioning its normal stereo output via the 24-channel tape on which it occupied two (2) tracks. As stated in the February 1985 article, its multichannel "ambisonic" capabilities were heard independently from a separate four-channel [B-format] recording made at the same time as the 24-channel evaluation tape.

Our fourth evaluation session was recorded on May 13, 1985, including Schoeps MK 41 hypercardioid capsules, many "vintage" large-diaphragm microphones, and contemporary models from AKG, Coles, Milab, Neumann, and Sanken. Even though I am preparing descriptions and evaluations of these microphones for a future issue of *R-e/p*, I can anticipate that discussion, and wrap up this one, by advancing one more opinion. Absolute accuracy (if attainable at all) is an admirable goal in recording, and its quest should remain our collective point of departure. How-



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Letters

ever, the *ultimate* goal of recording (the means) is to serve music (the end of all such means). If colorations, processing, time- and frequency-response shaping, etc., are appropriate to achieve that end (the serving of music), then so be it.

In conclusion, I must report that I am delighted to learn that such august institutions as Bayerischer Rundfunk and Institut fuer Rundfunktechnik are engaged in similar evaluations of microphones. I trust that these organizations will utilize all of the considerable resources at their disposal during the course of their investigations. ■■■

CONCERT LOUDSPEAKER DESIGN

from: Michael Waldegrave
The Soundman
(Hire Services)

Christchurch, New Zealand

I own and run a small sound hire company in Christchurch, New Zealand, and am writing to inquire about composite box speaker design for concert use.

Presently, I supply six local bands that play in clubs for audiences up to 600 persons. Occasionally we do outdoor concerts using four-way JBL-type systems, including W-bins, 4560 cabinets,

horns and "bullet" tweeters.

These bands like a good low "thump" for kick drum at about 80 Hz. A manageable size for a new box would be no more than five by three by two feet. What results do American firms get when using folded-horn cabinets in this situation? Would a bass-reflex design better suit my needs? Also, should the speaker and horn drivers be in the same vertical plane? □□□

David Scheirman replies:

Since you apparently intend to build your own enclosures to fit a specific need, you will be doing some experimenting. There are several books available regarding the design and construction of loudspeaker enclosures. One of these is *How to Build Speaker Enclosures* (A. Badmaieff & D. Davis, published by Howard W. Sams Co., Indianapolis, Indiana).

Some of these books are dated, however. A good way to stay on top of contemporary speaker system design for live-performance use is through magazine publications. Regarding folded-horn technology, many American concert sound reinforcement firms rely on vented, direct-radiating low-frequency enclosures. A few utilize folded-horns. The folded horn offers relatively high sound-pressure levels with a minimum amount of power amplification, and fewer actual loudspeakers than would be found in an equivalent direct-

radiating system. Folded-horn systems are therefore less expensive to build. Comparing the *sound quality* of the two different types of enclosures is an altogether different subject. (See: "Recent Developments in Concert-Sound System Design and Operation," *R-e/p*, June 1984, page 54.)

Addressing your question regarding vertical alignment of the low- and high-frequency drivers, I would suggest that a basic study of the history of alignment (in time) of the various components in a multi-way speaker system should be undertaken. (See: Pat Maloney's excellent article, "Time Alignment of Sound Reinforcement Equipment," *R-e/p*, December 1980, page 52.)

I hope the above information will be useful to you.

Editor's Note: Photocopies of these two articles are available from the address given on the Contents page; price is \$2.00 each, including postage. ■■■

News

HARRISON AND WESTLAKE RENEW DEALER RELATIONSHIP

Harrison Systems, Inc. and Westlake Audio Professional Sales has announced the re-establishment of the dealer relationship that proved so successful for both companies in the past. According to Claude Hill, VP of marketing at Harrison, "The synergistic nature of the Harrison/Westlake agreement provides both companies with the opportunity to focus the most advanced American technology in studio design and audio console systems for the benefit of Westlake's high-end client base."

Westlake will represent Harrison's full range of 16 application-specific audio console systems from its Hollywood facilities.

As a result of the recent agreement, Westlake Audio's new Studio "D," which is scheduled for completion in June, will be Harrison equipped. The Westlake Studios have also ordered and will receive delivery this Fall of the first of Harrison's Series Ten, totally-automated console systems.

— NEWS NOTES —

• **NBC TELEVISION** has ordered three Solid State Logic SL 6000 E Series Stereo Video Systems as part of its conversion program to full stereo television sound capability. One of the new SSL systems will be installed at the network's Brooklyn stage (production venue for the "Cosby Show"), while two others are scheduled to be installed on Stages 2 and 4 at its Burbank production center. NBC announced recently that it will be starting network satellite distribution of true stereo programming to its affiliates during the first week in July. One SL 6000 E Series system has been in

... *NEWS continued on page 26* —

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“WOW!”

When the boys from the engineering department walked in with their newest creation, we said: “Nice looking box. What is it?”

“This,” they said proudly, “is our new MSP-126 Multi-Tap Stereo Processor. It’s a stereo-tapped digital delay line with a 20kHz bandwidth, eight pre-programmed processing modes, and . . .”

“Hold the engineering jargon,” we said. “Just tell us what this gizmo does.”

“Oh, no problem,” they said. “Basically, the MSP-126 is a signal processor that creates a whole range of interesting effects. To begin with, it produces really great balanced stereo with flat response from any kind of program material. And it also creates other kinds of effects—some of which are subtle, dramatic, or even bizarre. It’s easy to fine-tune the effects you get, too. For each of the eight effects modes, there are 16 delay parameter setups and 16 amplitude variations. Okay?”

We tried to look enthusiastic. “Well, maybe it would help if you could just give us a few *examples* of these effects,” we said.

“Good idea,” they said. “One of the neat things the unit does is produce forward

and backward discrete repetitions. Then there’s a traditional ‘comb filter’ stereo synthesis. And delay-based panning. And binaural image processing for Walkman applications. And delay clusters. And concert hall early reflections.”

“That’s better,” we said. “We’ve probably got enough to do a pretty good ad for you. Before we go, though, you probably ought to run us through a quick demo. That might help if we get stuck for the right word to describe what the effects sound like.”

“Sure,” they said. “Hope you like what you hear.”

So we listened. Then we walked over to the typewriter, rolled in a blank sheet of paper, and typed a headline that seemed to say it all:

“WOW!”

If you’d like to see why we’re so excited about the MSP-126, ask your nearest Ursa Major dealer for a hands-on demonstration. It’s an astonishing experience.

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EXPOSING AUDIO MYTHOLOGY

Laying to Rest Some of the Pro-Audio Industry's More Obvious "Old Wives' Tales"

by John H. Roberts

Before I get into my discussion of specifications, I'd like to pass along a few observations about console automation and VCAs. As recently as 10 years ago, VCAs could be the limiting factor in a recording console's noise/distortion performance. Thankfully, the newer parts are much improved; I give thanks, because VCAs are used extensively in modern equipment.

Not unlike negative feedback, the sonic ills of VCAs are much exaggerated. While the modern VCA is less linear than the proverbial piece of wire, noise and distortion are 70 to 80 dB below the signal level. With the possible exception of fader automation, it is very difficult to audition a VCA by itself. When embedded within a compressor or noise-reduction unit, the sound will be dominated by artifacts of the gain manipulation circuitry.

The paramount difference between moving-fader and VCA-based automation is not sound quality, but the user

interface. Moving-fader designs are elegantly simple to use, while VCA-based systems trade some of that ease for more powerful capabilities. Choices between the two should be based upon ergonomic considerations.

Specifications

While I don't expect performance specifications to be fertile ground for uncovering Audio Myths, there are enough subtleties to the use of even the most common specifications that some discussion is warranted. As space allows, and current events dictate, we will take a look at the more interesting aspects of audio "specmanship."

This month we will start out with the very basic parameters of "Signal-to-Noise Ratio" and "Dynamic Range." As we all know, S/N is simply the ratio between some nominal signal level and a system's inherent noise floor. Dynamic Range, on the other hand, is defined as the ratio between the largest and the

smallest signal levels that a system can handle. Both specifications seem to provide us with almost identical information about a given channel's signal handling capacity. However, just adding a headroom figure to the S/N ratio will not always add up to the Dynamic Range number quoted. To see why, let's look a little closer at both.

S/N Ratio. The basic problem with maintaining consistency of S/N measurements is that we are, essentially, comparing apples to oranges: a simple signal (usually a sinewave) is being compared to a complex waveform (usually wideband noise). When measuring wideband noise, the reading will be affected by the frequency response of the system; the frequency response (bandwidth) of the meter; the meter's ballistic (peak, average, RMS, etc.); and the frequency-weighting curves used (IHF "A," CCIR, etc.).

Dynamic Range has its own wild card in the method you choose to define "minimum acceptable level." In a digital system, the minimum might be defined by a certain amount of quantization-induced distortion. Most measurement systems choose a minimum equal to or above the noise floor, since it is difficult to resolve signal levels below the noise floor. For convenience and some semblance of compatibility... continued overleaf —



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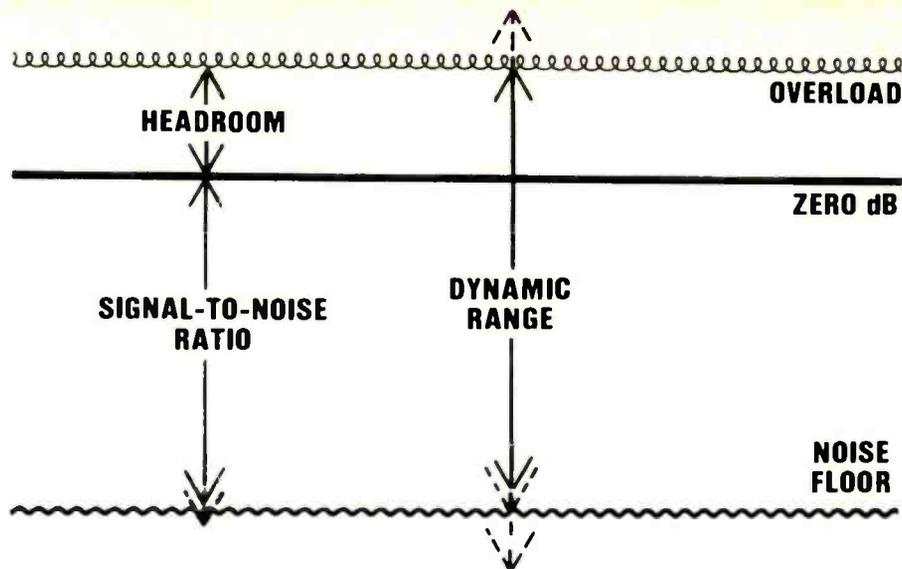


bility, most analog system designers choose a minimum signal level equal to the noise floor.

I have recently become aware of an interesting divergence from the standard practice taking place among some of the anti-digital lobby. At least one writer — and he has been quoted by others — has chosen a minimum acceptable signal level of 16 to 25 dB below the noise floor! You can appreciate that an extra 20 dB makes analog look quite good (on paper) when compared to digital's paltry theoretical dynamic range of 96 dB. While I don't know anyone who prefers digital's noise floor (even dithered) to that of analog, most prefer silence to hiss.

Properly specified Dynamic Range is redundant to a S/N + Headroom specification. If the signal minimum is fixed arbitrarily or ambiguously, then the Dynamic Range specification will be all but useless.

As with the decibel's many variants, I don't really care which parameter you favor, just as long as you avoid confusion by clearly qualifying your numbers. S/N ratios should be accompanied by a bandwidth or weighting curve for the noise measured. It is even useful when making unweighted measurements to name the equipment used, since the meter's bandwidth will affect the results. Likewise, it is useful when specifying a limited bandwidth, such as 20 kHz, to



Relationship Between Signal-to-Noise Ratio and Dynamic Range

note the order of the filter used) — low-order bandpass filters require more bandwidth in the following meter to give results comparable to the steeper laboratory bandpass filter sets.

Now that we've got Dynamic Range and S/N all figured out, here comes another curve ball. How do you specify the performance of a dynamic signal processor? Most (all?) processors that use variable-gain elements have a noise floor that changes with the signal and the gain commanded. Companding noise-reduction systems take advantage of signal masking, and structure

the circuit so that the gain element is noisiest when the signal is loud, and quiet when the signal is quiet. In this way, a compansion system under varying signal conditions can deliver a dynamic range 20 to 30 dB more than for a fixed-signal condition.

In light of this behavior, how do you specify such a product? The marketing department will always push for the larger number, while engineering, sensitive to any appearance of hype, will prefer the more conservative, fixed-signal results. This is one case where I grudgingly agree with the marketing types, although not for the same reasons. When considering the best way to specify a product, look at it from the end-user's perspective: they need to know how well the product does a job. For example, a tape noise-reduction system should specify how much it reduces noise; equally important, the specification should be comparable. When dealing with a non-standard product, disclosure of the test set-up should be sufficient to facilitate comparisons.

To specify a companding noise-reduction system, I favor a total Dynamic Range figure that compares the loudest loud sound to the quietest quiet sound. A companion but secondary specification could be instantaneous or static S/N, which would tell you how much noise is present simultaneous to a signal being present. Such a number will be much less spectacular, but useful when comparing like systems.

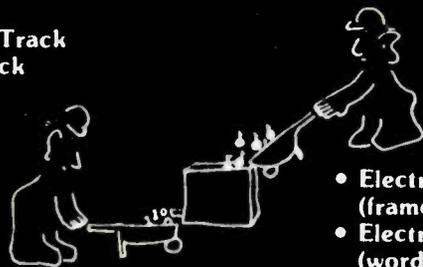
Other processors, such as compressors and gate/expanders, should be specified in a manner that is consistent with how they are used. A compressor could spec a total input dynamic range, while an expander could spec a total output dynamic range; again, a static or instantaneous S/N would be useful in comparisons.

As usual, we invite comments on this topic, as well as suggestions for other specifications that warrant amplification. Incidentally, I have recently relocated my base of operations to Stone Mountain, GA, and can now be reached at (404) 934-9626. ■■■

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The lecturers listed are currently scheduled to attend. Due to unforeseen schedule conflicts, it is possible that there may be a substitution or cancellation.

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June 1985 □ R-e/p 19



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NEW DESIGN.

Conventional in-line consoles suffer from the limitations of one long travel fader and one equaliser being shared by two signal paths. With the engineer fader reversing and moving the equaliser back and forth throughout the recording, overdubbing and mixing process to optimise the situation.

The TS24 eliminates these shortcomings, thanks to its logical design. The long travel fader is in the section called MIX, which is the signal path for both monitoring and mixing. The equaliser moves between the MIX and CHANNEL

signal paths automatically by use of the master status switches. 'Soft' switches may locally move EQ and AUX sends between the two signal paths but are also automatically reset.

When mixing, the Channel sections become available as additional inputs or effects sends without the limitations imposed by more conventional designs.

DROP-IN. BOUNCE.

Drop-ins are made easy by the use of the TAPE and GROUP button (T & G). Tape and Group enables you and the musician to monitor the original track and the overdub simultaneously.

The Bounce button facility enables you to take any combination of channels with their fader and pan settings directly to the routing matrix giving you instant bounce down.

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Soundcraft have developed a unique interface to the disc based MASTER MIX automation system, which enhances its operational flexibility by totally integrating the full extent of the console muting.

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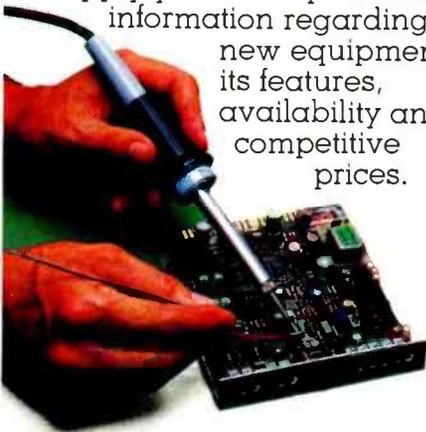
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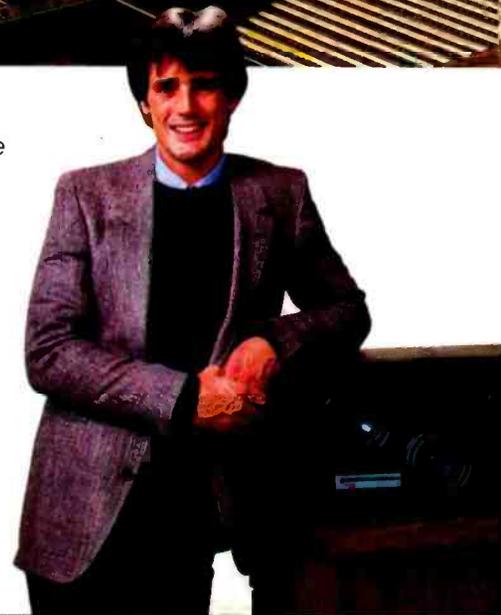


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TRAVELS WITH THE EDITOR

Digital Developments at the West Coast AES Convention, Anaheim

by Mel Lambert

With the digital mastering and multitrack markets apparently set to warm up over the next several months, the recent West Coast Audio Engineering Society Convention, held during early May at the Disneyland Hotel, Anaheim, produced several items of news for the digitally-minded recording and production community. On the hardware front, both Sony and Studer are continuing to actively push their respective DASH-format transports, while Mitsubishi is set to launch new two- and 32-track hardware.

The Mitsubishi Pro-Audio Group — a new company formed by the amalgamation of Digital Entertainment Corporation and Quad-Eight/Westrex — announced that the current X-80 digital two-track will be replaced in the very near future with the new X-86. In addition, existing X-80 transports — of which, at the time of writing, 12 were still available — are to be sold at a “close-out” price of \$16,999 (a drop from \$27,000). Enhanced features of the new

X-86 two-track include serial-interface capability for improved and augmented machine control, and other enhancements which, according to Cary Fischer of Mitsubishi, will “exceed DASH format [two-track] capabilities.” Because of slight differences in track configurations, tapes recorded on an X-80 can be played on the new X-86, but not *vice versa*, Fischer says.

Also launched at the Anaheim Convention was the new X-850 digital 32-track, an upgraded version of the X-800 that offers full razor-blade editing and complete compatibility with existing X-800 tapes. Packaged with a new cosmetic appearance and slim-line cabinet, the X-850 will retain the X-800’s list price of \$170,000. I understand that the first X-850 will be installed at Lion Share Studios, Los Angeles, during mid-June. The facility already operates two X-800 multitracks, plus two X-80 mastering machines.

Sony Corporation announced that well in excess of 100 PCM-3324 DASH-

format digital 24-tracks have now been sold into recording and production facilities around the world, and that the PCM-3202 Twin-DASH 15 ips two-track will be available by the fourth quarter of this year at a pro-user price of \$19,000. In addition, Sony stresses that the company still plans to market the 7.5 ips PCM-3102 DASH-format two-track by the fourth quarter of 1985, at a pro-user price of \$17,500. However, according to Curtis Chan, the company’s senior engineering manager, “prospective customers need to realize that tapes recorded on the -3102 will be incompatible with Twin-DASH material. Presently, we will not be making available a retrofit option to convert the machine to 15-ips operation.” By mid-1986, Chan added, Sony plans to unveil a dual-speed (7.5/15 ips) DASH-format two-track that will offer enhanced electronic editing capabilities.

Studer Revox America announced that production of the new D-820X Twin-DASH 15 ips digital two-track begins next month, and that the unit will be available in the U.S. by early 1986. According to David Walstra, digital audio product line manager at the company’s Swiss manufacturing headquarters, because the D-820X is designed to accommodate 14-inch tape reels, the machine will provide a maximum recording time of two hours and 10 minutes at a 48-kHz sampling frequency, and 142 minutes at 44.1 kHz; scheduled

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Digital Developments

pro-user price will be in the region of \$25,000, dependent on system options.

A 7.5-ips transport will also be made available "if sufficient market demand exists," Walstra explained. So far, the pro-audio industry "has shown a greater interest in the 15-ips version. The same market forces will dictate whether or not Studer develops a twin-speed [7.5/15 ips] DASH-format two-track. We predict that there will *not* be a high demand for a 7.5-ips machine, but we still plan to wait and see if we need to market a switchable transport. To us, a 15-ips tape speed makes sense even without the ability to perform cut-and-splice editing, because of the enhanced robustness against drop-outs and tape damage

offered by the Twin-DASH [matrixed, double-recording] data format."

An electronic editing system for DASH-format transports is currently under development, Walstra added, and will connect to either speed two-track via an AES/EBU digital in/out bus.

Although it had been announced at the recent European AES Convention, held in Hamburg during March, that two more companies had joined the DASH Group, there was still no official release of their names at the Anaheim show. Despite a great deal of industry speculation, the requested anonymity of the two latest members was being honored by representatives from Sony and Studer — currently the only two members of the Group manufacturing DASH-format hardware — and Matsushita, which appears to be concentrat-

ing solely on the development of thin-film recording-head technology rather than transports.

And in response to the rapid acceleration of digital recording, Ampex Corporation recently launched a new digital multitrack mastering tape, Ampex 467, which will be made available in half- and one-inch configurations and from 4,600- to 9,200-foot lengths. According to Ed Engberg, the company's audio tape marketing manager, "467 is designed to match the electrical and mechanical requirements of multitrack stationary-head recording formats, and does not require individual adjustments." Each reel of tape is 100% tested from end to end for drop-out performance, Engberg says, by being recorded and replayed on a stationary-head transport, such as a Mitsubishi X-800 or Sony PCM-3324.

Turning to the lower end of the digital recording market, Electric Valve Communication Corporation provided latest details of pre-production versions of the Editing Co-Processor designed by David Smith for use with digital material recorded with an EIAJ-format 14/16-bit processor, such as the Sony PCM-F1/701/501, Nakamichi DMP-100, or Sansui X-1. (By the way, EVC Corp. is the name of a new company that was set up recently to develop and market Smith's hardware.) Connected to a modified digital processor, the unit is said to be capable of performing frame-accurate edits entirely in the digital domain, and can be controlled with any editing system capable of handling video transports. "All a person needs to do," Smith says, "is to use a conventional frame-accurate video editing system or timecode-based synchronizer to work out and then execute their edit points — the co-processor will then take care of the actual audio edit points necessary to accommodate the 'unconventional' data block per video-frame format of the replayed F1-type material, to produce a drop-out-free edited master." Scheduled for market availability by late June, the Editing Co-Processor is priced at \$1,200.

JVC was showing a production version of the new FX-900 Transfer Processor for converting between 14/16-bit EIAJ-format digital material and the 16-bit VP-900 format. EIAJ-to-VP-900 transfer is effected from composite NTSC video input to 16-bit digital output, while the reverse involves conversion from VP-900 composite video to EIAJ composite video. During transfers, the following functions can be achieved: addition of a copy-inhibit bit to the data stream; pre-emphasis on/off; and left/right channel reverse. Pro-user price of the new FX-9000 is \$2,000. Also to be seen: the new VP-101 14-bit EIAJ digital audio processor that is capable of replaying both 14- and 16-bit material, and which also features a direct external sync input for locking the unit's timebase to any video signal or house sync; price is \$915. ■■■

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— continued from page 14 . . .

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operation at NBC's Burbank Stage 11 for the last nine months.

- **DOLBY LABORATORIES** has announced the sale of the 100th SP-24 multitrack noise-reduction system in the U.S. to Digital Dispatch, the rental group of Soundcastle Recording Studios, Los Angeles. The SP-24 rack features 24 channels of Dolby A-Type noise reduction; currently, 350 such systems are in use at recording and production facilities around the world.

- **ARTISAN SOUND RECORDERS**, the Hollywood music recording and disk-mastering facility of Kendun Recorders-Burbank, was purchased recently by the **LATORRE FAMILY**, of El Paso, Texas. According to Fernando Latorre, spokesman for the family, and himself a recording engineer and musician, "We intend to continue the tradition established by Artisan's founder, Bob MacLeod, and previous owner, Kent Duncan — excellence in engineering, state-of-the-art equipment and the best possible service for our clients." Following the takeover, William Rogers has been named general manager, and Greg Fulginiti as director of mastering for the new company, which will continue to operate under its old name; both individuals were previously employed by the Kendun/Artisan Group in similar capacities.

- **COMPUSONICS CORPORATION** recently completed the first long-distance demonstration of its Telerecording digital music recording and transmission system. The Telerecording process allows music to be transmitted digitally between remote data bases, using special telephone lines. In late April, the company transmitted digital audio data over a 100-mile circuit, utilizing AT&T's Accunet Switched 56 Service, which permits voice, data and video information to be carried at 56 kilobits per second. Telerecording is an optional feature of the company's hard disk-based digital audio recording and replay system. For the recent demonstration, a song by the Glenn Miller Orchestra was digitally recorded onto a 5¼-inch floppy disk using the CompuSonic system, transmitted over the Accunet line, and then re-recorded on a second floppy disk.

- In response to increasing demands from artists and producers to digitally master their material, and supported by a decrease in the costs faced by studios wishing to convert from analog to digital technology, the professional studio industry will be virtually digitized by 1993, predicts Ed Engberg, audio marketing manager at AMPEX CORPORATION's Magnetic Tape Division. "Over the last eight years, a profound change will occur in the professional recording studio," Engberg advises. "Digital will become a fact of every day

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feature, flexibility runs a close second; for not only will the 900 operate with 3/4" VCR's, but with VHS cassettes, too, with total safety and confidence, making it ideal for mastering digital audio discs and the increasingly popular hi-fi video discs. The DAS-900 consists of four principal components.

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Two-channel pulse count mode processor. Several 16-bit micro-processors make it compatible with other professional production equipment such as cutting lathes, synchronizers, and encoders. Dynamic range of more than 90 dB. Frequency response from 10 to 20,000 Hz (± 0.5 dB), and low recording bit rate of 3.087 Mbits/s at 44.1 kHz. Transformer-less analog I/O circuits further improve sound quality, and the analog-to-digital, digital-to-analog converter reduces distortion to less than 0.02 per cent, while an emphasis circuit improves signal-to-noise ratio. Logic circuit uses CMOS LSI chips for high reliability, compactness, light weight (48.6 lbs) and low power consumption.



Audio Editor Control Unit.

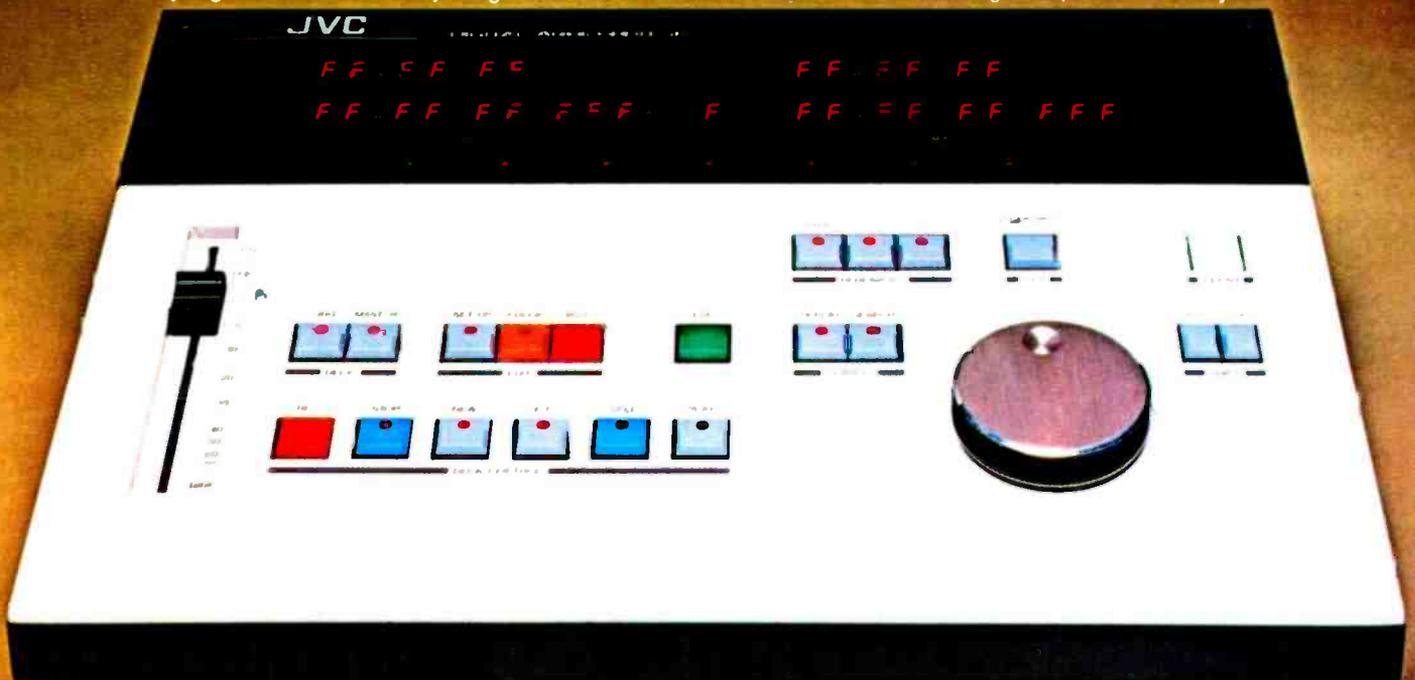
Electronic governor for routing, coordinating, and executing all edit functions, both automatic and manual. All commands, from digital dubbing of original to master for continuous programs, to repetitive point-to-point manual cueing are regulated here.

TC-900V Time Code Unit.

Actually two time code units in one, this unit reads and generates SMPTE standard time code and synchronizes the JVC exclusive BP (bi-parity) time code. Thus, the DAS-900 will operate effectively with both time codes; a necessity when the System is to be synchronized with video equipment.

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For a demonstration of the DAS-900 Digital Audio System, a Spec. Sheet, or JVC's complete catalogue, call toll free:

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life. Less than 5% of professional studios are equipped with digital today; within eight years, 80% will be." At present the digital market is largely centered in New York, London, Los Angeles and Tokyo. A total of 650 digital multitrack and mastering systems — based on both stationary-head and helical-scan/VCR-style recorders — will have been installed by the end of 1985. "By the end of this year, Ampex expects that the total, installed population of analog multitracks will read 4,000," Engberg continues. "However, by 1993 we project

that this base will decrease to 1,000 systems in use. The same projection applies to the two- and four-track analog market. Over 8,000 of these systems will be installed by the end of this year. By the end of 1993, we expect to see [that number] decrease to about 2,000." Engberg predicts that over the same time period, the installed base of digital multitrack systems will grow to around 2,000 units, and the number of two- and four-track digital installations will increase to 5,000. However, the market for quality analog recording equipment will remain a vital one, Engberg emphasizes, in spite of the increased acceptance of digital hardware. "Analog equipment will always be less expensive

to buy and install that digital, and for many applications analog performance will be sufficient."

• **THE SOCIETY OF PROFESSIONAL RECORDING STUDIOS (SPARS)** has received a grant from the **3M COMPANY** to establish a statistical database for the pro-audio industry as an on-line service via the **IMC EMAIL System**. The new database will allow manufacturers and studios to survey equipment brands, room and facility sizes, session rate trends, and general information about the recording studio and production markets. Some 5,000 audio and video facilities will be asked to complete a special questionnaire, of which the responses will comprise the computerized database. The material will be updated on an annual basis. In addition, SPARS has organized a two-day studio business conference, to be held at the 3M Company headquarters, Minneapolis/St. Paul, from September 21 thru 22. During a series of six seminars, the conference will address a variety of topical issues including: the economic outlook for the production-studio market; cost-effective ways to computerize business functions; price/cost comparisons of analog and digital two-track, multichannel, tape, and hard-disk recorders; the effect of recent tax-law rulings; studio insurance; and employee relations.

• **SONY PROFESSIONAL Audio Products Division** has published a studio directory that lists every U.S. facility equipped with a PCM-3324 DASH-format digital 24-track tape machines. Of the 100+ PCM-3324s that have been sold worldwide, over 40 are currently installed in recording and production facilities throughout the United States. According to George Curry, the division's VP and general manager, "Interest in digital audio for record, film and video projects has increased dramatically. The Compact Disc has begun to have a major impact on production activity. Additionally, we are seeing

... NEWS continued of page 156 —

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— The Directory —

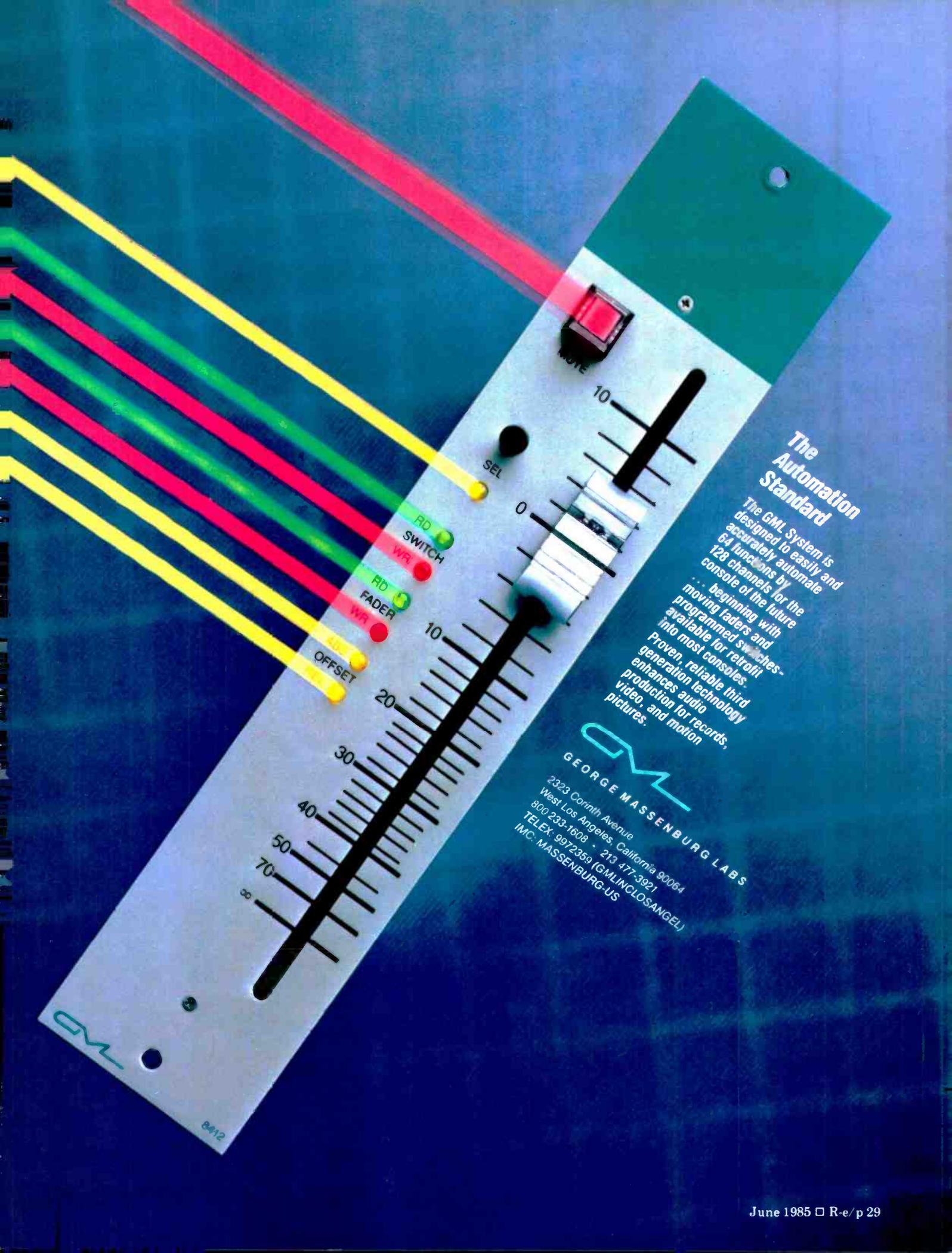
Manufacturers might like to take note that during forthcoming issues *R-e/p* will be providing Directory listings of the following types of recording and production equipment:

AUGUST: Time-Domain Special Effects Processors, including delay lines, flangers, phasers, echo and reverb systems, pitch-shifters, etc.

OCTOBER: Frequency and Dynamics Processors, including graphic and parametric equalizers, compressors, limiters, expanders, noise gates, noise-reduction systems, etc.

DECEMBER: Studio and Live-Performance Microphones, plus Power Amplifiers and Monitor Loudspeakers.

To request a questionnaire for the relevant issue's Directory listing, contact Rob Tuffly at the address given on the Contents page, call (213) 467-1111, or use IMC Email REP-US. ■■■



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DENNIS LAMBERT



All photography by Elizabeth Annis

Producing Crossover Hits
 Interviewed by Mel Lambert and Ralph Jones

R-e/p (Ralph Jones): In the introduction to your book, Producing Hit Records, you recall that your music career began at the age of seven. What were your earliest experiences in music?

Dennis Lambert: As a teen-ager, I worked for about eight years in clubs, hotels, and resorts all through the New York area, performing standards, some popular material, and some ethnic material, because the audiences were predominantly Jewish or Italian. I took it very seriously, and I thought that, in time, it would be my career.

Later I signed with a production company that was owned and operated by a group called the Tokens. They produced the Chiffons, and had a label of their own; at the time I signed with them, they were producing for Capitol in an exclusive arrangement. They found material for me, wrote some themselves, and brought me into the studio. That first experience of being in a recording studio environment excited me.

But I was experiencing a problem emotionally, because I was 13 or 14 years old, close to finishing high school, and all of my contemporaries were into the early pop music. New York was a great launching market at that time. I just found myself a little out of step with the kind of music I was performing: in my heart, I liked what I was hearing on the radio, but I still had a great appreciation for the other kind of music. It was like a great push and pull inside me.

R-e/p (RJ): Nevertheless, that experience must have served as a great background for a song writer, since you were learning the standards?

DL: I think it served me extremely well, because it has enabled me to live in a completely different world. I can relate to, and talk about, the people who come from that era — people like Steve Law-

In his 20 years as a songwriter/producer, music business-veteran Dennis Lambert has forged a career marked by a string of crossover hits, many of which have now become bona fide contemporary standards. A published songwriter while still in high school, Lambert appears to have pursued music with a rare singularity of purpose — first with his own independent production company, then as a staff producer/writer for Mercury Records.

The ensuing years brought a long and fruitful partnership with co-writer Brian Potter, with whom Lambert produced hits for the Four Tops (“Ain’t No Woman Like The One I Got”), (“Are You Man Enough”), Player (“Baby Come Back”), Glen Campbell (“Rhinstone Cowboy”), Tavares (“She’s Gone”), Santana (“One Chain”), Hamilton, Joe Frank and Reynolds (“Don’t Pull Your Love”), and the Righteous Brothers (“Rock and Roll Heaven”). The duo’s writing credits include work for Tony Orlando and Dawn, Sergio Mendes and Brazil ’77, the Fifth Dimension, the Oak Ridge Boys, the Grass Roots, and Survivor. In between songwriting assignments, he also found time to write a “survival guide to the industry” titled *Producing Hit Records*. In addition to numerous television and film composition credits, Lambert’s recent work includes the Dennis Edwards’ hit album *Don’t Look Any Further*, and *Nightshift* by the Commodores. When we caught up with Dennis Lambert at Music Grinder Studios, Hollywood, *Nightshift* had just gone Gold, and the atmospheric, haunting title song was dominating the charts; a second single from the album, “Animal Instincts,” was also moving up the charts. The busy writer-producer was once again in the studio with Dennis Edwards working on a follow-up album to *Don’t Look Any Further*, with regular session engineer Jeremy Smith.



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DENNIS LAMBERT

rence, Eydie Gorme. Unfortunately, they have to live that frustrated experience of: Why can't they record anymore? Why is there no interest? Where is that audience? They know it's out there, or they wouldn't be filling halls, clubs, and theatres-in-the-round night after night. But they *can't* sell records or get played.

On the other hand, I have that special ability to go forward in the contemporary music business, and yet understand musically what I liked so much about the old songs. And I try to infuse the records I make with those musical values.

That was the evolution of my first experiences in recording. There was still a modern kind of "Tin Pan Alley" then; there were companies in New York that were grooming and nurturing young writers — all of the people that came out of what is now Screen Gems Music, which Don Kirschner owned. He and others had these little cubbyholes full of great talent: Carole King, Jerry Goffin, Barry Mann, Cynthia Weil, Jeff Barry, Ellie Greenwich — people who were creating the body of pop-rock music in the early Sixties. I just wanted to live that existence. I couldn't wait to get into one of those rooms and be told, "Don't come out until you have a hit song."

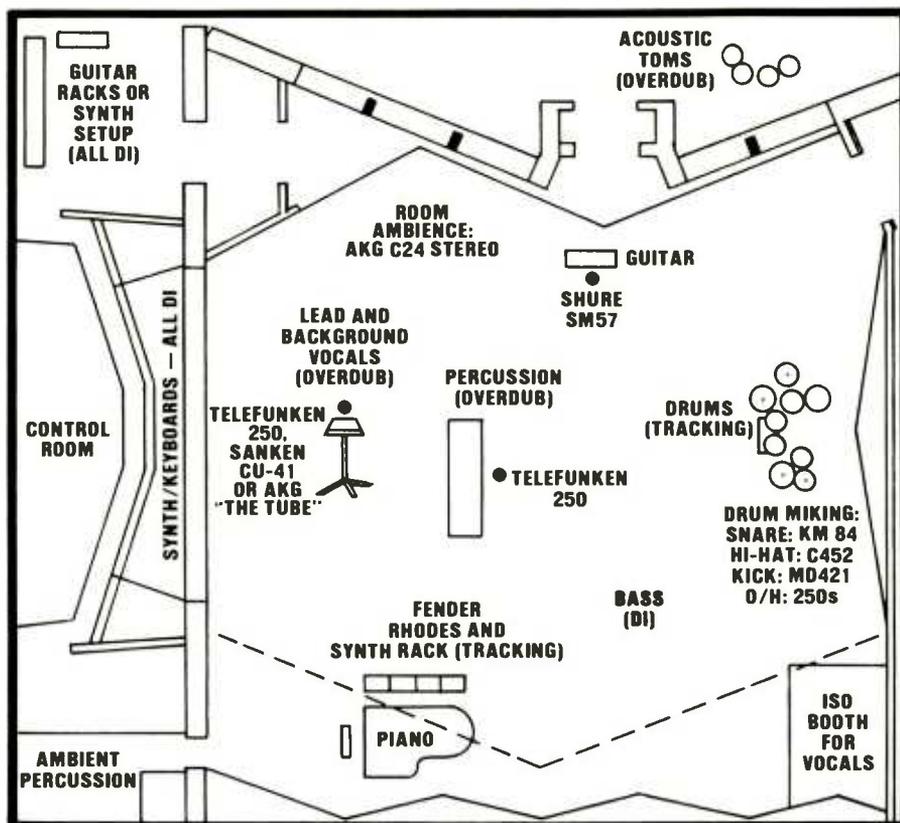
By the time I was 16, I was signed to Mercury Records as a staff A&R man. And given great shots! I mean, I produced Jerry Lee Lewis; talk about an intimidating first experience! But, actually, he was very cooperative. I even wrote a song for him.

I was given opportunities very early on, and was able to convert them quickly. I had a hit song with Freddie and the Dreamers: they were signed to Phillips in Europe, and I saw a clip from a TV show that they did with a silly little dance. So, I wrote "Do The Freddie." I never looked back after that. I thought, "Who wants to go back to those hotels and sing for 50 bucks a show?"

R-e/p (Mel Lambert): Who were the producers working at Mercury back in the mid-Sixties?

DL: Quincy Jones was one of the senior executives in the Mercury A&R department in those early days. It was Quincy and his counterpart, Shelby Singleton, who were my first really strong supporters. They were the ones who gave me all the opportunities. I did some black material — which I felt was in my blood — and then the next thing I knew they were sending me to England, and I was producing the Nashville Teens and writing for Freddie and the Dreamers.

There was a club in Manhattan known for its fantastic jazz-oriented bands, and they had singers booked in on a regular basis. I went to the club, one of the last times I performed in that era, and I did my four songs. I come off the stage, and some English guys walk over



Room and microphone layout for Commodores and Dennis Edwards basic tracks at Soundcastle Studios, Los Angeles. Producer: Dennis Lambert. Engineer: Jeremy Smith. Second engineer: Paul Erickson. The equipment rack in the control room included two AMS RMX-16 digital reverbs, Yamaha REV-1 reverb, AMS DMX 15-80 delay/pitch shifter, Lexicon PCM-60 reverb, Roland SDE-3000 delay, dbx 160, 161 and 165 limiters, GML equalizers, EMT 250 reverb, Drawmer and Valley People Kepex II gates.

to me and they say, "You know, you're very good." And here I am disaffirming that I do this: I didn't want to perform anymore!

As it turned out, they were Don Arden, Peter Grant, and a guy called Mark Wildey. The three of them were partners at the time, managing all of these English acts: the Animals, the Small Faces, and a host of others. The next day, two of them came up to my office and I played them some songs. A few months later, I was over in England producing an act for them. Suddenly, I'm in England, at the thrust of the "Early Invasion." It was an incredible piece of fate.

R-e/p (RJ): So it would be fair to say that you took pretty much the same path as the career plan outlined in your book: moving from A&R to record production. Do you see that same plan holding true today? Would you change your advice to beginning producers starting in the mid-Eighties?

DL: It would be difficult to break into the business the way I did, because that era of A&R/producer has passed. But I think many producers and songwriters evolve today from playing live as musicians. If you play on live dates, you'll learn how to relate to an audience: the importance of song, timing, and all the things that, in a way, also apply to the production of records.

R-e/p (ML): You are quoted as saying, and I'm paraphrasing: "The Song is King." Do you think that if a producer doesn't have a strong song sense, then they don't have what it takes to be a producer these days?

DL: I think that's true. A song sense can be acquired; just through the experience of making records over a period of time, sooner or later you have to become more sensitive to the structure of songs. But I recognize that there are many producers today who are primarily engineer-oriented: their strength is more in sound, and helping to create the sound for the artist. Consider Bob Clearmountain, for example . . . I don't know whether or not he gives Hall and Oates a lot of song input. Or Hugh Padgham; I don't know what he tells Phil Collins about the songs themselves. Perhaps they do have strong instincts about songs, but that isn't where they live, so to speak.

I've worked with engineers who are very musical, like Jeremy Smith. Jeremy has always had the natural instinct to know *why* a song felt great — or why it didn't. He isn't always able to talk about it the way I can, after my years of looking at songs. But he knows what it is about a song that is wrong, or why something's feeling labored.

R-e/p (RJ): In your list of recording and

“It takes a certain dedication and commitment to cross a record over. And it takes dollars to back up that commitment, because you’re going to enter a whole different market. It means merchandising it at the audience; working it at radio; creating a profile; building it.”

production credits, I see two basic categories of artists. One is soul or R&B artists — that’s the predominant one, obviously. And the other is country: the Oak Ridge Boys and Glen Campbell. All your Grammy nominations were for the song “Rhinstone Cowboy.” What, to your mind, is the relationship between the two categories?

DL: Well, I never really thought of myself as being a country-oriented producer or writer in the pure sense. I don’t know, first of all, if I’d be interested in working with many country artists and, secondarily, if I’d be able honestly to know the territory. But Glen Campbell had already been a pop crossover artist, and had emerged as a major star, with country as his roots. While evaluating his past career and what I could do for him, I didn’t feel that country, in a pure sense, was a factor. The records that I thought I could make with him would relate more to his *pop* successes: the Jimmy Webb songs that were standards, though they may have been country-oriented.

I thought, “Well, he’s a great singer who’s somewhat underestimated by people, and he can make emotionally honest records. I can help him do that by finding some great songs.” Since he’s not a writer, I knew that my role would be much more critical.

“Rhinstone Cowboy”, which I produced, just happened to be a perfect vehicle for Glen; ultimately, it’s become his theme song. You dream about that with an artist: that there could be one song so powerful in its marriage to the artist that it’s their signature . . . like “Thanks For The Memories” is for Bob Hope, but in a modern sense.

The relationship between the song and the artist — whether it’s Glen Campbell, Player, or Santana — is essentially the same. It’s just a question of the slight differences in mood, the style of the production, and the edge in the music.

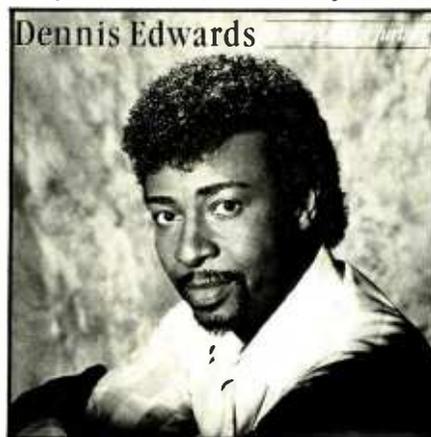
When I record an artist who is “legitimately” black — Dennis Edwards, for example — there’ll still be elements of my pop sensibilities built into the production style. That will be balanced by his ultra-soulfulness: we meet somewhere in the middle. It creates a special blending of everybody’s talent when I get involved with them in that way. They’re black, on this side of the fence, and I’m white, on the other side of the fence. I want very much to do legitimate work with them where they live, and they want to live where I am. Somewhere, we wind up right on the fence. When you do that, you win all around.

Sometimes I kind of chuckle to myself

when people say, “Let’s go after Dennis Lambert because he’s the Crossover Guy.” When I think about it, the black hits I’ve had, especially of late, have been bigger black than pop. I mean, Dennis Edwards’ “Don’t Look Any Further” — you couldn’t have had a bigger black record. But it didn’t cross over: it was primarily a soul record! His album was huge in that market — number one.

The Commodores’ record, “Nightshift,” is a crossover smash, but it’s been number one black for four weeks [mid-May]. So, it isn’t like “We sacrifice something on the black side when he works with us, but he crosses us over onto the pop charts.”

R-e/p (ML): I still don’t really have a



handle on what makes a typical “black” record. Maybe because somebody decides that this is a black record, it will only be played on black stations, and nobody else will hear it. I find that a strange attitude when you come across the Commodores’ album, which I can see just about everybody appreciating.

DL: It’s like . . . in the grocery store, “mainstream” products are in abundance: there’s a lot of milk, but there are not too many smoked oysters, for example. Essentially, that’s what I see in radio. There’s only so much black music that mainstream pop radio will play.

Quincy Jones, in a speech to NARM a few weeks ago, recommended to the record merchandisers and manufacturers that there should be *no* labels anymore. I agree. It’s about time that we went past that, because it is a community of music. Period. The color doesn’t matter if people like the song. I think it would be wonderful if records were judged purely on their own merits — on all kinds of radio.

R-e/p (ML): And not that the label heads and A&R people got together and said,

“Okay, we’ll allocate this amount of money to record this artist, and this will be a black hit,” because they know up front it’s only going to sell to that audience. There appears to be nobody taking a chance and saying, “We know we’ve got our costs covered in one market, let’s try it in other markets. Who knows, it may be a breakout?” You’re leading the way in saying, “Let’s keep all bets open, and see what the market says.”

DL: Yeah, but no sooner does someone say that, than there comes the response: “Wait a second. If we eliminate black music departments within record companies, and we lose jobs, we lose status. We lose a piece of what we’ve worked so hard to get. Let’s not be so quick to eliminate labels: we’ll be right back where we were 20 years ago.”

R-e/p (ML): You were talking earlier about taking Dennis Edwards and moving him over to the Top 40 market by changing his production style. How did you modify the method of recording and production with Dennis?

DL: I don’t know if there was *too* much of a difference in terms of the production: it comes down more to the song. There are certain kinds of songs that you know will work in both markets the moment you hear them. They’re just that strong — they’re irresistible. “Lover Boy,” by Billy Ocean, is a good example. That would have been a smash for Dennis in the same way; it would have crossed him over to pop.

R-e/p (RJ): Can you pick out specific elements of such a song?

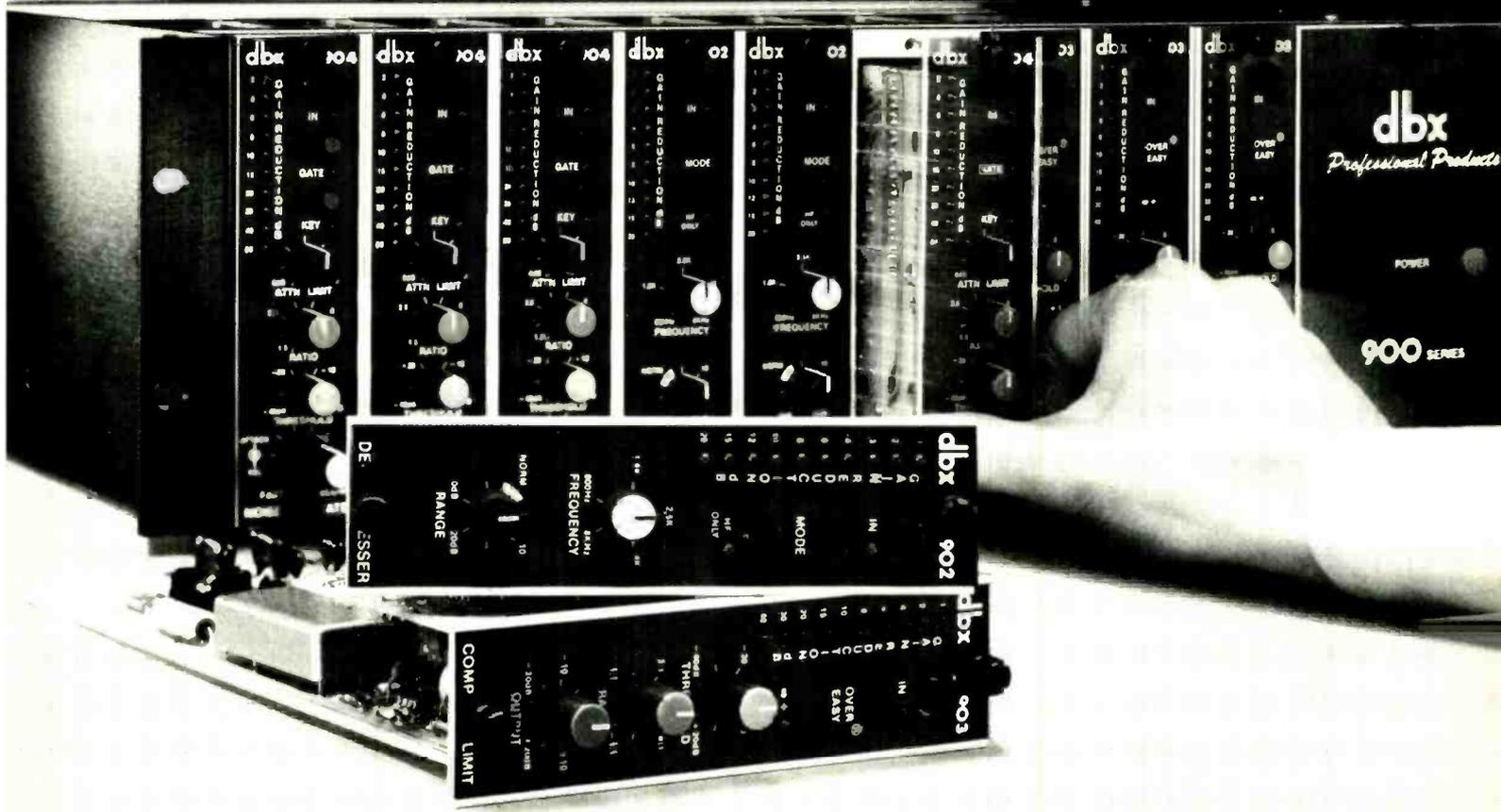
DL: It’s hard to be very specific, because it has to do with the fact that it feels great, and it’s not overly ethnic — not overly R&B. “Lover Boy” has a lot of pop-rock approaches in its production. It’s a fusion of soulful performance — in the case of Billy Ocean’s reading of the song — with a lot of rock qualities and characteristics.

Sometimes, a song can be one that I wouldn’t be so quick to say will cross over. But it will anyway, because it’s just irresistible. There was a record some years ago by Evelyn Champagne King, called “Shame” — it was her first hit, and undeniably a very black, soulful record. But it had that irresistible drive; pop radio played it, and audiences bought it.

Although it didn’t cross over, Dennis’ record, “Don’t Look Any Further,” did get played in major urban markets, where the record was so big on the black charts that Top 40 stations were forced to play it. And where they played it, it

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was a huge hit. Sales were phenomenal — the chart positions in those urban markets were very respectable. In my opinion — and, I think, the record company's too — had they not waited so long to make a thrust into the pop area with that record, it would have crossed and been a major hit. No matter *who* heard that record, it pressed buttons. And that's all the song ever has to do.

It takes a certain dedication and commitment to cross a record over. And it takes dollars to back up that commitment, because you're going to enter a whole different market. It means merchandizing it at the audience; working it at radio; creating a profile; building it — starting smaller. In some cases, they make you do that with black records. It's the easiest excuse: "Where's the base for

the record? What have you done in R&B?"

R-e/p (RJ): Doesn't the cross over potential of a record depend to an extent on the attitude of the tune, as it's embodied in the lyrical content?

DL: I think that factor does have a big bearing. There are many hits that don't cross over — that the record companies perhaps are not even trying to cross over — because there's something in the "essence" of the lyric that just keeps them in the R&B market, where they really, truly belong. Sometimes it's in the musical content, as well. There's always been a "funk" side to R&B, something that I never really got into, because I don't see the real essence of a song in a musical jam. Yet there are some incredible soulful, black-oriented "groove" records: what George Clinton and the Gap Band do and, in some

cases, what Sly Stone did.

R-e/p (RJ): Or James Brown.

DL: Certainly James Brown. But, as time has gone on, groups like Midnight Star have evolved. Primarily, their records are black, dance-oriented records. Usually, they don't have much of a strong song content. But when they come up with "Freakazoid" or "Operator," there's something that's just irresistible in the song — however simple, however tied to an incessant groove and highly electronic production — that makes it work for pop.

R-e/p (RJ): This is a good time for cross over, it seems to me, because a lot of white artists have been co-opting black rhythmic influences, and bringing in a lot of stylistic elements from R&B.

DL: Absolutely. It's more evident today than it's ever been. I think it's at the heart of what was the beginning of rock and roll. Nobody would deny that, in the Fifties, the earliest material that anyone dared call rock and roll was a real blending of black and white. Some of the artists were black, some were white, but the music . . . you wouldn't have known, exactly.

So, it doesn't surprise me that it's happening more now. It's just that there was a period of the two forms moving apart for about 15 years, and then the lines re-intersected.

R-e/p (RJ): Let's talk about production techniques. As a singer yourself, how do you deal with vocalists in the studio? How much direction do you give?

DL: In the case of an artist who isn't as involved in the building of the tracks — who wants that done for him, and doesn't necessarily want, or need, to be there — I'll put down a reference vocal. I do it in the course of building a track. If it's a live track, I may sing it while they're cutting the basics, so the band has a feeling for what the song is all about. It helps the vocalist in the end, because they'll take the track home — both with that vocal, and without it. They'll be able to work with the track on their own, and listen to how I think it should be read; how it should feel.

Most of the artists that I've worked with are particularly confident, strong singers. Dennis Edwards, for example, needs to be held back a little bit. He's an "oversinger;" he has a *very* powerful voice, and tends to kill things. It comes from his years in the Temptations, when they did a lot of that black, protest-oriented material. It was ground-breaking music, but there was a lot of shouting, and not enough singing. Yet from working with him, I know Dennis has a great voice!

I made him analyze a few records, and pointed out how many performances by great artists — artists who you know have the macho stuff and the power — are undersung. You may see them live, kicking ass, but you would never get away with that on record. The key is

... continued on page 41 —

THE CREATIVE STUDIO ENVIRONMENT

Dennis Lambert's Equipment Selection for his Planned Facility

Currently in its final planning stages is a new 24-track studio that Dennis Lambert intends to open later this year. What is his thinking behind the decision, we queried?

"Our basic concept for the studio," he replies, "is this: a large control room equipped with a board that is very clean and simple, with insert points so that you can go right to tape before you go through a whole bunch of group and bus amps, etc. Jeremy Smith and I are looking for a board that sounds musical, and is very quiet. And one or maybe two hot-rodded tape machines.

"We plan to build a control room that's laid out in such a way that it will be obvious that direct recording was thought about during the planning stages — maybe with all the inputs in the rear wall where the synthesizer and drum machine setups are going to be, and everything hard-wired to the patch bay.

"We have bounced the concept of a lot of people. We said: 'What if this room could cost \$70 and hour?' Everybody said, 'Yeah, incredible!' because they find it difficult to justify spending \$120 or \$130 and hour to do overdubs. There's nothing that's priced in the middle: no one has built a studio with that particular role in mind. We think there's a definite need for it. We can probably keep the place busy enough on our own, but we will rent it out to select people that we know.

"It will make the record companies happy, as well, because we'll charge less. If I spend 500 hours on session time for an album, I'm spending 350 of them doing overdubs. If you save \$30 to \$50 an hour during overdubs, it's going to make a significant impact on the budget. People have responded very positively to the concept." ... continued overleaf —

Producer Dennis Lambert (left) with regular session engineer Jeremy Smith at the Trident TSM console in Music Grinder Studio, Hollywood.



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that you just *don't* notice the undersinging on the track, because you're not paying that kind of attention to the performance on a record. What you *are* paying attention to is the fact that the record is feeling great: it's a hit, it works, you dig it . . . and, as a producer, you're jealous. But take a look at it, and you'll see that it's *very* controlled.

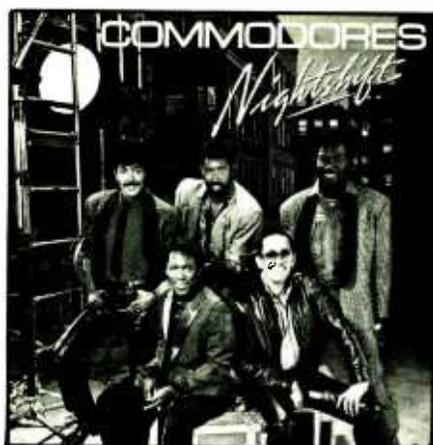
R-e/p (ML): Often it's the case of the person who's listening to the song providing that withheld energy; it gives them a rapport with the song. But, if the energy is all there and you're simply passively absorbing it, it's an uninvolved process.

DL: That's right. You're *not* leaving any room for your audience to feel anything. Dennis saw what I meant: he definitely feels that I've held him back a little, and not let him oversing. I'm making him *sing* more — I'm keeping the keys down, keeping him within his range. I also let him go, of course, because that's part of what he does so well. But I *wait* until the right moments.

R-e/p (RJ): That approach should also help to cross him over?

DL: Exactly. I don't think you can oversell that "heavy soul" to a broad, mainstream audience. Yet they'll take it in small doses.

R-e/p (RJ): In a situation like that,



where you are building a track, do you work with vocal composites?

DL: If an artist is real prepared, and I can sense that they're performance-oriented, I'll let them go onto three or four tracks, top-to-bottom. But I'm not going to get everything I want in every case. They could give me 20 performances, and I could end up feeling that maybe there's one line that I can't find on any one of them.

Dennis Edwards, for example, tends to sing things a little differently every time. When you want to join the 5th line to the 6th line, he's maybe phrased the 5th line a little differently, and it will no longer bounce in. So, I tend to find a performance that I like most of all, and work with that until I'm *really* satisfied with it. That way I know there's not going to be this ridiculous, comping

THE CREATIVE ENVIRONMENT — continued . . .

What are you considering in the way of recording equipment for the new facility?

"We've been looking very closely at the latest Neotek console, the Elite. It's a very good board: very clean, and well built. I think it's been laid out very intelligently; Jeremy was very impressed with it, as well. We've taken modules to the studio we've been working in, and tested them to see how clean they sound, and how they sound next to other consoles. It's a very 'musical' board — the EQ, especially, is like a vintage Trident A-range console, but without all the problems that people have associated with them over the years. And it's like a Neve in the simplicity of the signal flow. Jeremy has never been a great fan of a complicated signal flow. As for automation, he doesn't like VCA-based systems.

"I've never liked VCA systems, either, but the Neotek is available with Massenberg GML [moving-fader] automation; if we buy the board, we'll buy it like that. Jeremy has used the GML system, and he said it was incredible. It's instantly updatable, and every mix you do is merged: you do something, stop the tape, and what you did is now on that mix. So, that's the package we're looking at.

"To handle the acoustic design, we recently met with Ron Baumer and George Augspurger. Baumer is primarily a builder — he's done Soundcastle, and a few other places. Wherever we wind up locating the studio, and several possibilities are still being considered, we would probably use the two of them.

"Regarding a multitrack for the studio — and we're talking about analog for the moment — I think we'll wind up with MCI; overall, they're real good 'work-horse' machines. They sound pretty good, and they can be hot-rodged. We're going to check out the Otari MTR-90 as well.

"We have looked at an analog two-track, which we're still waiting to get to try out. There's a new professional two-track made by Nagra — the T-Audio — which is supposed to be unbelievable. The specs on it are *amazing*, and they have their own Nagra Master Curve, which is very close to digital in terms of the signal-to-noise ratio. The machine is available only with quarter-inch heads, but their specs for 15 ips exceed most 30-ips half-inch machines! And it's also available with 30 ips. It costs almost \$10,000: it's got to be pretty great!

"Jeremy just bought an Eagle amplifier, which we have tried out with our Tannoys. It was unbelievable what we heard on our reference tape. You just never heard anything so *transparent*. That's the kind of hardware we're looking to use in this new studio. □□□

nightmare. It's the easiest, quickest way for me to do it, and it makes me confront decision-making every step of the way. I think you have to make decisions, or the production process becomes never-ending!

If you have 12 or 14 tracks of vocal, it can take two days to make a comp. In the end, the master vocal may not be any better than it would have been if, in three or four hours, the producer, the artist and the engineer said, "Let's get this right now on the track. Let's just go." I don't wind up with more than three or four tracks of vocal, and generally I'll have one master lead vocal. Maybe I've kept a safety if we've done it a few times, in case something goes wrong. If I do have multiple tracks, they're the doubles and the highlight sections — the little two-part harmony things.

R-e/p (RJ): You've said that when you write for one of your artists, you'll set up the bottom of the tune first to get a solid feel, and then build on that. When you bring that song to the studio, do you tend to hold to the feel that you've established while writing? How much input do you take from the artist concerning the feel when you move into the studio?

DL: Any input that they want to give me; anything I think is logical and meaningful. Sometimes, because of my lack of time, my demo is rather barebones and I have to indulge them — and they have to indulge me — in imagining where it was going to go, even though I didn't have time to take it there. That's harder to sell to anybody these days. The artist wants to hear something representative of what the song really is going to be, unless it's a song in the pure sense: what would you have to do to "One More Night" as a demo? Piano and voice: if they don't get it, then it's on to something else. But with songs like "Nightshift," for example, if the demo didn't capture something of what the record would be, it would be hard to expect an artist to react to it.

R-e/p (ML): What was on the song demo for "Nightshift?"

DL: It wasn't actually demo'ed in any complete sense. That song was a real evolution. Walter "Clyde" Orange [Commodores' drummer and vocalist] played me a bunch of songs on different occasions, none of which were really complete: they were ideas, "grooves" . . . little snatches of music. The feeling of "Nightshift" was in one of these tapes — the essence of the groove. It was a demo that Walter had done in his home studio: there was no song yet — just a feel. But I loved it.

At that point, the guys were anxious to get their own tunes developed to the point where I, as their producer, would say, "I love this: let's cut this." I had made a commitment to myself that I would not cave under any pressure from the group, if that came about; I just

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DENNIS LAMBERT

wouldn't give in and do anything I didn't believe in. So, I kept making suggestions about how they could improve these tunes they were playing for me, because I just didn't feel that I would be doing my job if I cut things that didn't knock me out.

When Walter played the "Nightshift" groove for me, I said that I loved the essence of what was on that tape, and I developed it into a full song along with Franne Golde. There's another thing that I would give Walter credit for, besides the essence of the groove: he wanted to do a tribute to Marvin Gaye. I didn't necessarily know if I wanted to do that: it's not automatically "safe."

R-e/p (RJ): A tribute to somebody of his stature could end up being anything from great to embarrassing?

DL: Right! Walter also had one line, which was [sings]: "Marvin, he was a friend of mine." I just loved the way that felt on that little groove, and I loved the fact that it made it so intimate — so personal. So I said, "Well, Jackie Wilson died this year, and he was really a legend in his own right. Why not do a song about both of them?" The band said that would be cool, and that was the last time Clyde saw the song in the form he had given me.

I think I get as much input on the song's direction from the primary arranger as I do from the artist. On "Nightshift," it was Peter Wolf, who is an incredibly talented musician, programmer, and synthesizer player — the whole works in one guy. He had a lot of influence on "Nightshift," in the way that it felt. It was his idea to use a fretless bass for the body of the sound, because of the mood that we wanted.

R-e/p (ML): Given the number of associate producer/arranger credits on your recent albums, it sounds like a fertile process in the studio, with a lot of input being taken by you from various people. But you are obviously the guy at the top of all this, who has to oversee how it's all coming together. How do you pull together the diverse elements?

DL: I find that for every track you have to have a musical leader on the line, so to speak. I can be kind of a general back at headquarters, but you need that line guy; Robbie [Buchanan] and Peter serve that function. So does Paul Jackson Jr., another giant talent.

I love Robbie and Peter for what each of them does. First of all, they're both musicians *par excellence*. They're both fast, in terms of getting a sound that's right, and coming up with a part that's not pre-arranged. In both their cases, we're talking about *very* extensive setups: eight or 10 synthesizers, most of them MIDI'ed. But it's not for their speed that I use them; I use them for their *abilities*. I try to pick the songs that I think each one would have the feel



"In understanding a song, the mood and the content of the lyric, you get a lot of ideas about 'colors' of the sound and the parts."

for, though they honestly can do anything.

I'm a believer in giving credit where it's due, and I feel that, for the effort that they put in, they should get credit for what they contribute to the production. What's the expression... "Success has a thousand fathers, and failure's an orphan." It's easy to claim all the credit yourself, because if you fail, you get the blame. But I know that's *not* the way records are made. When I hear *Nightshift*, I'll never forget the moments when those decisions, some of which were Peter's or Jeremy's, came down.

Many people have said that what gets to them about *Nightshift* is the "sound" of it. Now, do they mean from an engineer's point of view? Or is it the sound of the bass, the air, the mood, the transparency? We could each say, in our own way, that we're responsible for it.

R-e/p (ML): Few producers might be willing to acknowledge that fact — possibly because they forget about it, or maybe because they like to be in the spotlight?

DL: I thoroughly believe that making an album is a collaborative effort. Years ago, when I did records that were predominantly live rhythm sections and overdubbed horns and strings, I never got close enough to any one guy to say that his contribution was so special. But these days, when you work with someone like Peter or Robbie or Paul, there are times when you're building a track from the ground up, and they've played and programmed every single instrument. Maybe you wind up with live percussion, but that's the *only* thing they didn't play. "Nightshift" happens to have a live drummer, and there's percussion and guitar. But every other note, every pad and effect, was Peter. There are tracks on Dennis' new album that are all Peter. Same with Robbie.

R-e/p (RJ): It would be difficult for me to believe that Nightshift was a collaboration among too many people, because the album is so artfully shaped. It's hard to see how you could arrive at that degree of control and taste by committee, so to speak.

DL: That's true. The Commodores had a certain amount of input on *Nightshift* but, candidly, it was less than they might have had on their past albums. They didn't play that much on this last album, and that was by choice. They didn't feel they should, and they weren't prepared: they simply couldn't spend four weeks in a rehearsal studio; it was too much to take on. They opted for going for the best modern players, with me calling the shots. They didn't want to be involved in all of the tracking, because they felt it would hold it back, and I think they were right.

After all, recording in 1985 is not like recording even in 1982. A little bit of the modern technology around today had kind of passed them by while the band was regrouping [after Lionel Richie went solo]. They saw the AMS gear lined up in the outboard rack, and they couldn't believe it. We were sampling drums: we'd have a guy come in, but we wouldn't use him playing — we'd just sample his kit. Then we'd have the track programmed on a Linn, and we'd replace the machine bass drum or snare with sampled sounds.

It took the making of this album for the band to embrace the new technology. They made Goodman's open another store, they bought so much stuff! I'd get a call from Clyde at 2:00 AM: "Uh, Dennis? I got it coming from the trigger out..." He's making a demo while he's figuring out how to work all this synthesizer hardware! But I think that the knowledge he picked up is really going to serve them well as artists and writers.

R-e/p (ML): How is the band going to play all this complex material from Nightshift when they tour?

DL: They're working it up, and it sounds good. They've got three keyboard players, and when you break it down, the material is pretty simple to play live.

R-e/p (RJ): Which is one of the things that really struck me about "Nightshift". By and large, the parts are very simple, but they're done very elegantly. Everything fits in its place very beautifully, particularly on the title track.

DL: Yeah. I wish there was something else on the album that made me feel that good, so we could pull another smash single.

R-e/p (ML): "Animal Instinct" has a good, strong hook: it bounces out at you and, whom, it's off. And there are others... but after "Nightshift," you want to lift the needle and recover!

DL: That's they way I feel, I must... *continued overleaf* —



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DENNIS LAMBERT

admit. "Nightshift" makes me feel really good, and it did from the moment we cut it. I thought: *This* is really going to be a special record. I've been leaning that way more and more; I've been trying to be a little bolder in the productions and the style of the playing. I want to take chances.

R-e/p (ML): Maybe you can now, because you have a proven track record. I guess producers these days have to be aware of what the record labels allow them to do. You have to have a certain amount of clout with the label before you can break new ground.

DL: Yes, I think that's the case. I mean, I get to do what I want: I either hang myself, or I do some good stuff. Now I'm a little older, it's that much more sweet to be successful again when I have had such a long run. But I feel that I owe it to myself and the artists to be a little more risk-oriented.

It was a wonderful thing to be working on *Nightshift*. There were some doubters, you know — little hints of, "It's not that commercial." But I said, "But it feels great! Listen to it!" It paid off, because the public loves it. When I brought the first four tracks in to the Motown offices, Steve Barri — the head of A&R — called me up in the studio about an hour later and said, "'Nightshift' is amazing!" It was *instant*. You dream about that. If it's right, people get the message.

R-e/p (RJ): I think that an important part of why that tune works is that you have so many years of writing under your belt. You have a strong sense of form and content, and of the relation between the two. What do you do in production to strengthen the form of a song, and support the content of the lyric?

DL: Tough question. Every song is different in what it suggests. In understanding a song, the mood and the content of the lyric, you get a lot of ideas about the "colors" of the sound and the parts. With "Nightshift," I wanted to create a track that had a certain eeriness and mood, a certain kind of float. That tune took exactly the shape that I had envisioned for it: maybe it was like a shared vision.

You say to your engineer, "I want this kind of feeling," and sometimes you get exactly that and sometimes you don't. It's not the engineer's fault: it's a question of what the part is, what's playing the part, how it's relating, the key, the song, and so on. So many factors keep you constantly adjusting and compromising. Nowadays, if it's not working, I say, "This isn't right. We've got to start over."

Productions today are so electronic. Practically everything is recorded direct, and the need to create ambience and space is much greater than it used to be.

On "Nightshift," we recorded drums, vocals and percussion live, and nothing else — maybe one guitar part. The rest is all direct. The tendency is to add ambience and, at the same time, add a sense of musicality to what is otherwise artificial-sounding. I don't want to end up with records that are so full of effects that there's not much heart left. That, to me, is a *great* danger.

R-e/p (ML): The effects you use are consistent: there is a consistency in your distant snare sound, for example, and where you place it in the overall sound tapestry.

DL: I want a certain consistency, but I don't want the same snare sound on every track. I use quite a bit of electronic drums, but I try to use real sounds rather than the obvious electronic ones, particularly with percussion. I'll take Paulinho DaCosta over a machine any day!

I think our texturing and layering comes from the way we use echo, and the mix — the blending of individual elements. We love echo.

R-e/p (ML): What album projects are you planning next?

DL: I'm going up to San Francisco to executive-produce the Jefferson Starship's next album, a gig that came about by way of the growing relationship that Jeremy and I have with Peter Wolf, who wrote their last hit single, "No Way Out." At one time Peter was in the band, just for touring, and he played on their last two albums. When the group took note of what we've been doing together, they asked Peter if he would be interested in producing their next album with someone. He talked to me about it, and we agreed that I would oversee it: I'll be concerned primarily with the material and the vocals.

R-e/p (RJ): Your song sense, it seems to me, could be a very good contribution to that band. If there's one criticism I've had about Starship, it's that their material has been somewhat weak on previous projects.

DL: I agree. Hopefully, I'll write some songs with them, and Peter is going to write for them. My job is to see that they cut songs that are going to fit together well. I want to make it a terrific album. If I hear them cutting any material that I think is wrong for them, they're going to hear about it from me. The nice thing is that I can be the heavy: I won't be around that much to catch the flack!

R-e/p (RJ): Do you have an angle on where you're going to lead the band on this new album?

DL: Yes, in a broad sense. You'd have to describe it as "power-pop" material. There's no one act that you could compare it to exactly — maybe Journey, or Foreigner; that kind of energy. I'd like to find a way to showcase Grace [Slick] with the right songs. "Somebody To Love" was a great song, and she was at the heart of it.

R-e/p (RJ): From the way you describe the work that you've already done, would it be correct to say that you prefer the lyric to say something that you can believe in, and that feels right emotionally?

DL: Oh, yeah, I try for that all the time. I'm very proud of "Don't Look Any Further," because the song is believable to people, and is emotionally strong. "Baby Come Back": what stronger and simpler emotion can you express in a song than admitting, as a man, that you were wrong, and telling a woman, "Come back, I can't go on?" I want the experience of a record to mean something more than just another song.

R-e/p (RJ): You've been involved by and large with helping seasoned professionals strike out in a new direction, often resurrecting careers that are on the decline. Do you plan to continue in that role?

DL: It's true that I've been involved with artists who, in many cases, have had their day, and who I just refused to think were over the hill. None of these acts were ever "snob-appeal" acts. Nobody thought, "Isn't it hip to be involved with the Four Tops, Tavares, or Glen Campbell?" It wasn't like saying, "We've got Lone Justice." I knew that I was going to pay a price for choosing to go this way. But that's my vaudeville roots: I'm a *song* guy.

I like the challenge, and I like the underdog. I've always seemed to be able to tell who can make it with the right material. I tried to get Tina Turner a few years ago: she's one artist, among others, that I've always loved. I talked to Roger Davies, and we almost had a deal. But the label where I knew I could make the deal, if anywhere, wasn't interested. They told me, "We don't think she could happen." That was as honest as they could be; they didn't want to know.

I've just never believed that you could hold back great talent, given the right songs and the support of the record company. I still believe that.

R-e/p (RJ): Carving this creative niche for yourself, does it make any sense for you to try working with a new artist?

DL: Yes, I'd like to. I've always known that it's more attractive to me, in certain ways, to work with someone who's established, because it's easier to plug into their image and make changes. But new artists are the future of the business, so I've never looked away from that. I've just never found someone who knocked me out, other than Player when they first came to me.

But I've been contacted by two different British companies to evaluate new artists, and I think I'm going to do one of them. His name is Chris Sutton, and he's quite an amazing songwriter and singer. Maybe I'll finally get some new recognition outside of the United States from the success of *Nightshift*, and find myself being offered more interesting artists with a wider musical style. ■■■

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All photography by David Scheirman



HUEY LEWIS AND THE NEWS

SOUND ON STAGE USING THE POWER PHYSICS FLOWN SPEAKER SYSTEM

by David Scheirman

Many of this country's major sound reinforcement firms broke into serious national concert touring work by having a previously-existing service relationship with a regional act that achieved nationwide commercial success. When a touring act achieves notoriety, and realizes a general market acceptance for its product, consistent sound and lighting systems are one of the first things to be figured into the tour budget. In this manner, regional sound companies may also find themselves catapulted into the national spotlight.

This article takes the form of report on one such relationship between a touring band and the sound company that serves it. 1984 was a breakout year for Huey Lewis and the News, a San Francisco Bay-area based recording act that dominated the pop airwaves with selections from the group's album, *Sports*. Sound On Stage of Brisbane, CA, has provided rental sound system services for Huey and the group since their formative nightclub years.

Sound On Stage has been in exist-

ence as a touring concert-sound system rental and design firm for nearly a decade. Company co-owner Jerry Pfeffer graduated from college with a degree in communications, but live concert sound held a greater interest than did broadcasting.

The steadily growing firm has recently been sending touring systems across the country with such acts as Night Ranger, Luther Vandross, and Huey Lewis and the News. Beginning in mid-1984, Sound On Stage supplied Huey with its newly-designed Power Physics™ speaker system, specifically designed for flying in arena situations. The unique modular loudspeaker enclosures are part of an overall integrated sound system package designed to serve today's contemporary live musical events.

Power Physics Speaker System

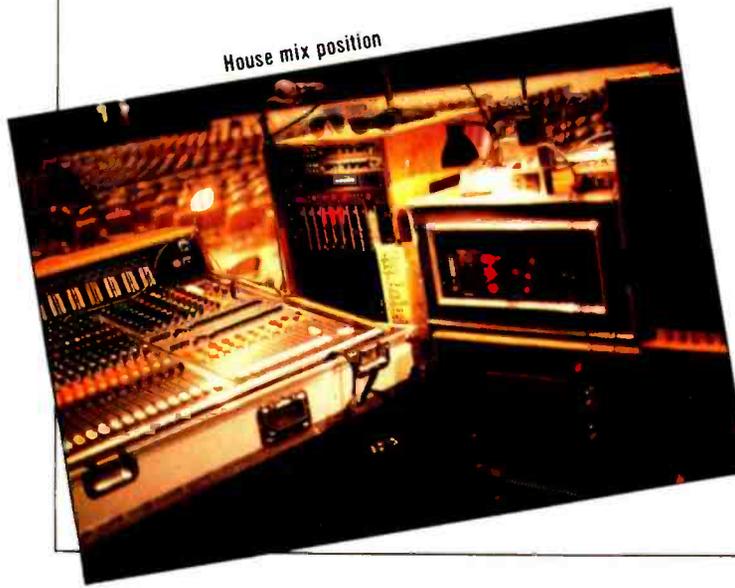
The Power Physics system is constructed of bass, mid-bass and mid/high cabinets. The identically-sized enclosures are trapezoidal in shape, to enable the easy construction of hanging arrays, and more closely ap-

proximate a point-source array with each cluster of cabinets. Each box is 48 inches wide, 18 inches high, and 37 inches deep. A stack of five boxes weighs approximately 800 pounds (two bass, two mid-bass, and a horn box). The system is designed so that the boxes may be stacked into columns in any desired order, depending on the coupling required in a particular frequency band. The bass and mid-bass cabinets are horn-loaded, and three different versions of the horn (mid/high) box exist (Figure 1).

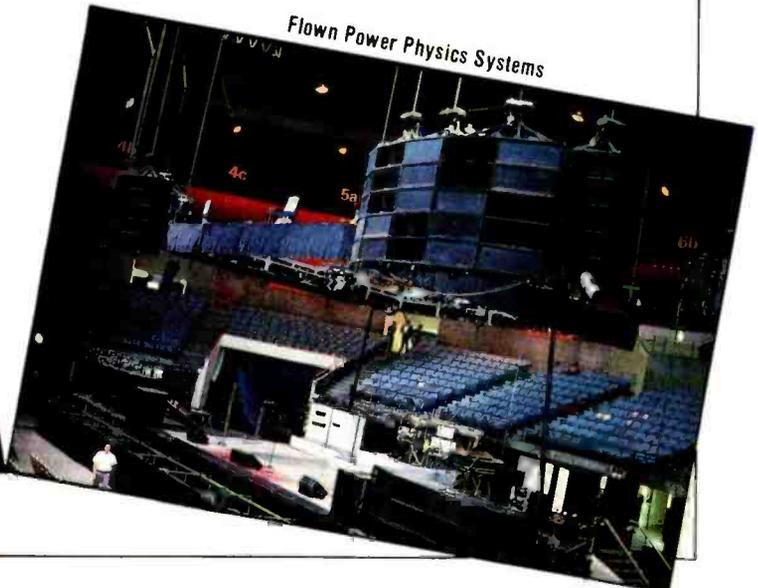
The bass cabinet, known as a CS-15, contains a single Gauss 15-inch Model 5642 loudspeaker. Conceived by Pfeffer and engineer Chris Lovett, the CS-15 design was finalized and developed by audio designer Charles Stevenson.

"When designing any speaker system, there will be a few trade-offs to keep in mind," advises Lovett. "The desired size and shape of the cabinet, the truck pack, the sound quality and sound pressure levels necessary... it all must be taken into account.

"I feel that Charles Stevenson's



House mix position



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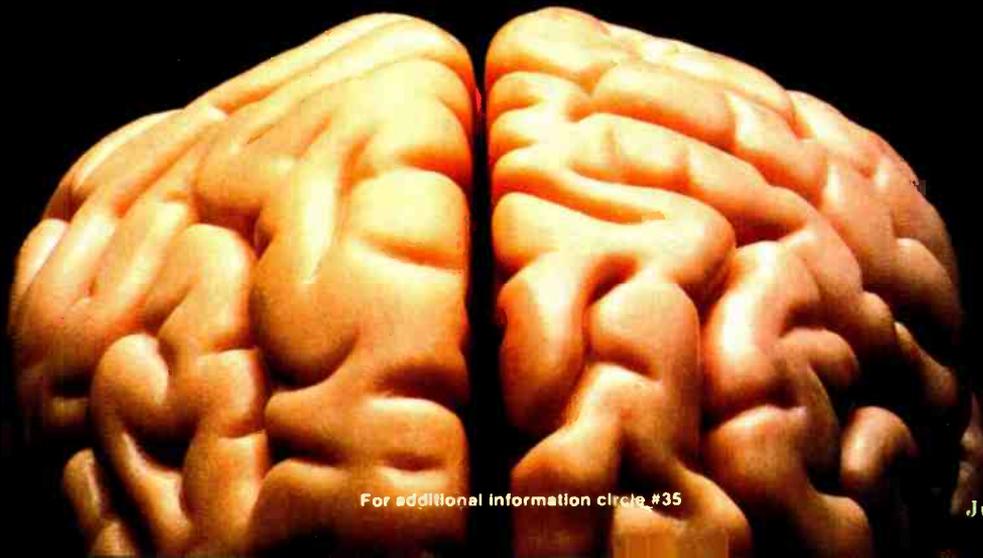


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SOUND ON STAGE WITH HUEY LEWIS

bass box design is brilliant. The efficiency is around 30%. There seems to have been somewhat of a bias to overcome in this industry against horn-loaded bass cabinets — perhaps because of some of the strange bins that have gone before. But this box gives us *exactly* what we wanted.”

The mid-bass cabinet houses a pair of JBL 10-inch K110 loudspeakers, each contained within a deep horn-loaded chamber. A vertical cabinet structural support and phasing wall separates the two chambers.

The three different versions of the mid/high cabinet offer a variety of horn configurations for desired coverage patterns. A box known as the “Twin” holds two Harbinger Model 1208 conical exponential horns with JBL Model 2441 drivers. Four JBL Model 2402 tweeters are also included. The “Shin” cabinet holds two Harbinger Model 1207 radial horns, and is intended for short-throw applications. Again, four JBL Model 2402 tweeters are included.

A long-throw horn box, known as the “Hurler,” is also available. It contains a single large double-driver, long-throw radial horn designed by Mark Wayne, and is driven by a pair of JBL Model 2441 compression drivers.

Assembling the Arrays

The loudspeaker enclosures are trucked to each performance site as pre-assembled stacks of five cabinets. A sturdy metal dolly enables the stack to be moved directly from the truck to the stage area (Figure 2). Additional cabinets are carried separately for smaller stage-level stacks, when necessary. Each individual box is equipped with a pair of wheels and an integral grip handle for ease of transport by one stage hand (Figure 3).

Figure 2: Enclosures are trucked in stacks of five, and secured with straps to sturdy metal dollies.

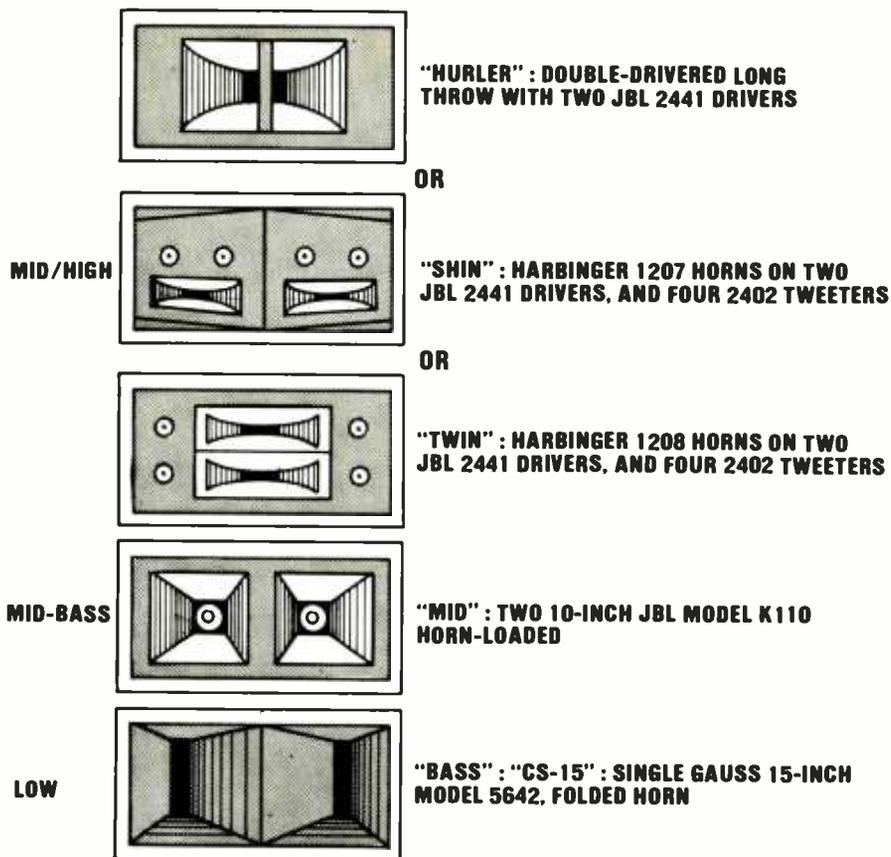


Figure 1: Five basic types of Power Physics loudspeaker enclosures.

Each stack of five cabinets is secured with steel safety cables, the top metal frame and bottom dolly being strapped together with nylon ratchet straps (Figure 4).

As each stack is rolled to the performance area, it is placed in position to become a part of a five-stack array. Half-inch bolts are used to secure the adjacent metal frames together, forming a rigid structure (Figure 5).

“We have been experimenting over the past year, and making some slight modifications in the cabinet stacking

order as we go,” explains John “J.T.” Taylor, audio crew chief for Huey Lewis and the News. “In some arenas, we need more bass coupling. Others require the Hurler cabinets to be directed at a particular seating area. With the modular box concept, we are able to make those adjustments from day to day, and still have the hanging array be a consistent package.”

Once the desired combination of rolling stacks has been aligned on the floor in front of a stage, and bolted

Figure 3: Two permanent wheels and an integral handle offer ease of transport of the trapezoidal boxes by one stage hand.



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together, the sturdy, compact array is ready to be lifted into the air with chain-motor hoists (Figure 6). One five-stack array weighs approximately 4,000 pounds, and is easily picked up with three, one-ton hoists. Straps and shackles that hold the package together are available from Aeroquip. "The thing I've noticed about using Aeroquip gear for cargo control and hanging hardware," Taylor advises, "is that it is readily available in any major city, wherever you go. Many times we can even find replacement parts in truck stops."

Flying the System

In a typical arena situation, a total of 10 hoists are used to suspend the loudspeaker arrays. In addition to the large left and right main arrays, a six-box rearfill cluster and an eight-box main sidefill cluster are flown on each side (Figure 7). For the show that I observed (held in a 15,000-seat sports arena), a total of 102 boxes were used. A dozen cabinets per side comprised the "deck system," stacked three high on the sound wings. Thirty-nine boxes were flown on each side of the performance area, 25 of which made up each main array. A total of 20 bass boxes, 18 mid-bass boxes, and 13 horn boxes were in use per side (Figure 8).

This system configuration gave a total of 40, 15-inch loudspeakers in folded horn boxes, 72 10-inch loudspeakers in horn-loaded chambers, 48 two-inch compression drivers on four different horn types (two per side equipped with large JBL lens units), and 80 super-high tweeters.

Typically, four union stage hands will be assigned to work with "flyman" Carl Ciasulli (pictured left) in assembling and flying the speaker arrays. "Sometimes just the three of us from the sound company set the whole thing up," Ciasulli confides. "Other times, we



may have 20 college kids, all needing directions. We have tried to put this whole package together so that it is quick and easy to work with, either way. Everything is color-coded and labeled. The speaker cable harnesses are pre-assembled and taped together. The system goes up fast, and it comes down fast. The whole sound system is packed up, and the doors of the sound truck closed, usually within no more than an hour and fifteen minutes in an area like this one."

Power Distribution System

Once the chain motors have been operated and the loudspeakers arrays

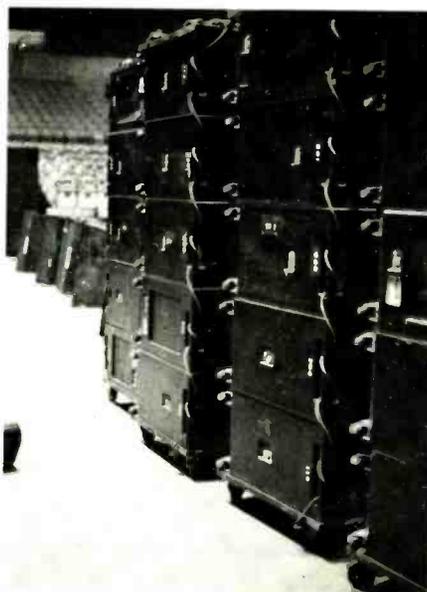


Figure 4: The stacked boxes are secured with steel safety cables. Nylon ratchet straps around the edges hold the five boxes and metal frames together in a cohesive unit.

are in position, the 300-amp three-phase power distribution system is available to power up the audio gear. A master distro panel features VIZ power-line monitor and current-draw meters. Four-pin Hubble twist-lock connectors are used to attach AC feeder cables to five different areas: monitors; main mix position; house left amplifiers; house right amplifiers; and band gear. Each feeder carries 60 amps (two hot legs; 220V) which is then split to 110V on two, 30-amp breakers.

"Each amplifier rack has 220 volts coming to it," explains Ciasulli. "We run one hot leg to a quad box that powers half of the amplifiers in that rack. The other half of the amps go on



Figure 5: Half-inch bolts are used to secure the upper metal frames and truss bars together. (Shown: audio crew chief John "J.T." Taylor.)

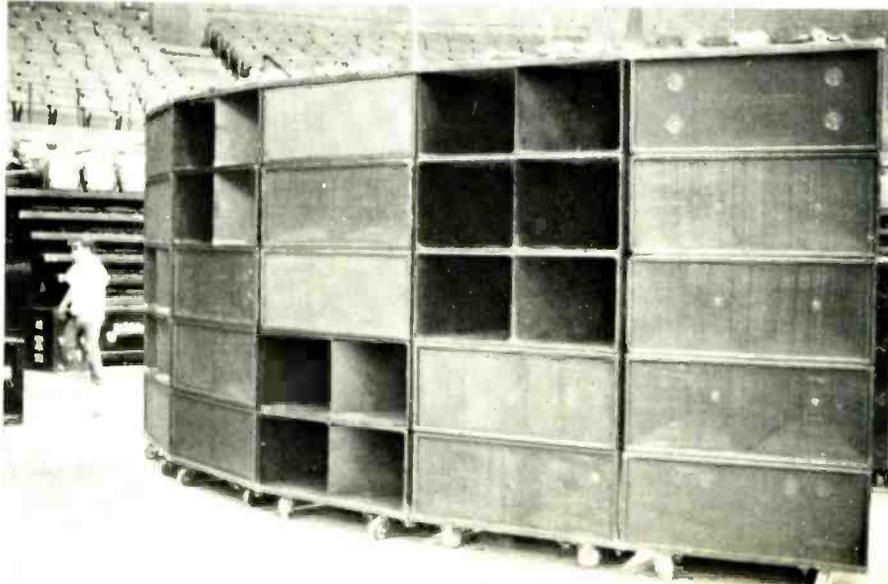
another quad box and hot leg. That gives us a separate 30-amp breaker for half of the amplifiers in a given rack. If we lose a breaker during the show, we don't lose the entire rack of amplifiers."

Converter cables are available, fitted with 110V Edison adaptors. "Sometimes, when three-phase power is not available, it's handy to be able to power up the racks without rewiring them," the engineer notes. "Almost every venue has three-phase power available, but sometimes you'll run into an old school or a nightclub that doesn't. Carrying the adaptors makes it easy!"

Power Amplifiers

Crest amplifiers push the Power

Figure 6: Once bolted together, the five stacks comprise a single rigid array ready to be flown.



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GAIN REDUCTION: Shows gain of the VCA (0 to -25db). Shows the effect of any control but OUTPUT TRIM and DE-ESSER.

INPUT ATTENUATOR: Adjusts drive to compressor/limiter, determining amount of G/R.

ATTACK TIME: Adjusts speed of response to input level increase. Fast: Peak limiter & compressor. Slow: Compressor only.

GATE THRESHOLD: Determines the input level that causes "gating": VCA gain then moves slowly to IDLE GAIN setting.

OUTPUT TRIM: Adjusts VCA gain to control or prevent clipping as required. Effect is seen on VCA LEVEL meter. Not an Output Attenuator (Output Attenuator is located on rear of unit).

DE-ESSER OPERATE/DEFEAT: Activates or defeats de-esser control circuitry.

COUPLED/ INDEPENDENT: Couples A and B gain and gating circuits for accurate stereo tracking.

COMPRESSION RATIO: Adjusts compressor from "looser" (2:1) to "tighter" (∞ :1).

RELEASE SHAPE: Linear: Compressor releases at constant rate. Exponential: Release starts slower, then accelerates.

VCA LEVEL: Shows peak operating level of VCA. Clipping occurs above approximately +2.

IDLE GAIN: Presets VCA gain when in gated condition or anytime unit is DEFEATED. Used for smoothing out transitions and for decreasing audible action of compressor.

OPERATE/DEFEAT: Activates or defeats gain control circuitry. Does not bypass any circuitry.

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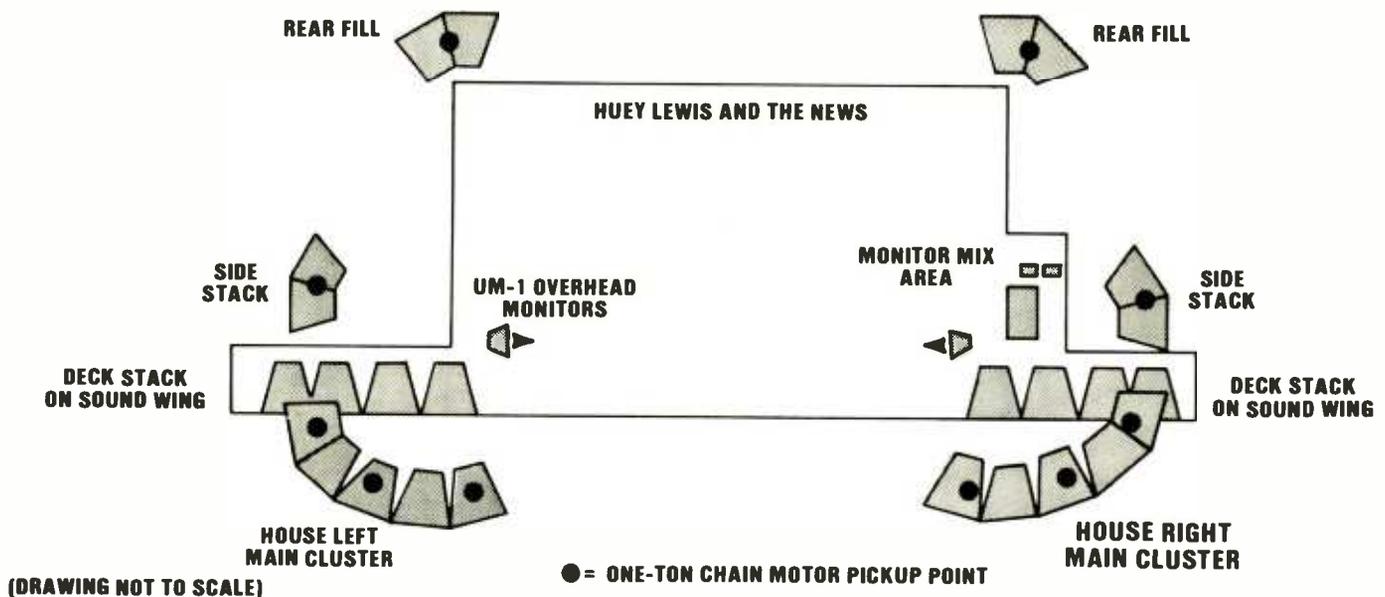
"In addition to the measured performance being very good the subjective impressions of the unit were excellent. This product has many novel and highly practical features all of which are quite simple to use but need not be used if simplified operation is required. Overall a very good compressor/limiter, well made and easy to service."

Hugh Ford, *Studio Sound*
November, 1983

"Overall, the 422A/424A should prove to be a system of diverse capabilities, able to tackle the widest variety of material—once the user masters its operation. In addition, its solid construction and excellent service documentation should insure years of reliable operation. Such qualities are typical of timeless designs that tend to retain their value long after the accountants have depreciated them away."

John Monforte, *db Magazine*
July-August 1983

Figure 7: Layout of Power Physics Loudspeaker Arrays.



Physics speaker system. Loaded six to a rack, the amplifiers used offer four different power ratings (Figure 9). Model 5000 amplifiers are used for the system's bass frequencies. The 16-ohm Gauss speakers are connected four to a side, giving approximately 600 watts per channel into the four-ohm load. Model 4000s power the 10-inch mid-bass horn-loaded speakers, with four transducers assigned to each 500-watt channel. A second Model 4000 is available in each amp rack as a spare or auxiliary unit.

A Model 2501 powers the horns, with four two-inch compression drivers loaded on each channel, a configuration that puts approximately 200 watts per channel into a four-ohm load. Crest Model 2001 amps power the super-high frequency tweeters, with four units assigned to each 120-watt channel. Total estimated system power available to the main speaker system is approximately 23,600 watts.

"As far as I'm concerned, the advertised number of watts in a sound system doesn't really tell you a lot," states Sound On Stage technician John Taylor. "It all depends on what sort of enclosures those watts are driving. The fact that this system relies on efficient horn-loading principles means that we can deliver the same sound-pressure levels as an infinite-baffle speaker system that needs more than twice as much power to drive it."

Stage Monitors

Jim "Bugsy" Moran (pictured right) oversees a streamlined stage monitoring system that is centered around a Gamble SC 32-16 console (Figure 10). "A lot of people aren't used to the Gamble boards yet, because there aren't that many of them around," Moran explains. "I think they're the best you can get. It's sort of like driving a really custom hot-rod car. If

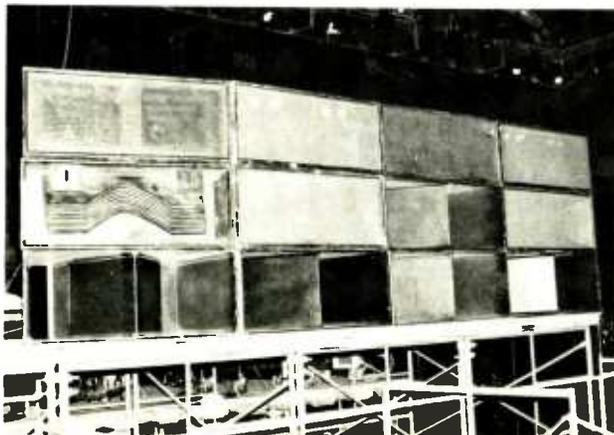
you're just used to driving run-of-the-mill clunkers, the performance car is a bit scary at first.

Then, when you sit down and get the feel of the controls, everything seems possible. It's the same way with this board. Once you spend a few hours alone with it, and put on the headphones and start to 'tweak' a few things, you can hear and feel the difference."



Sound On Stage owner Jerry Pfeffer feels that the firm's Gamble boards have more than paid for themselves. "It was scary at first, buying a console that cost more money than my first house," he notes. "The Gamble consoles that we own have turned out to be well worth the purchase price, both from a performance and an eco-

Figure 8 (shown left): Piled three high and five wide, this "deck stack" covers the forward floor seating areas. **Figure 9 (shown right):** Crest power amplifiers drive the Power Physics system. Each rack contains a Model 5000 (bass), a Model 4000 for mids and one for a spare, a Model 2501 (horns), and two Model 2001s (tweeters).



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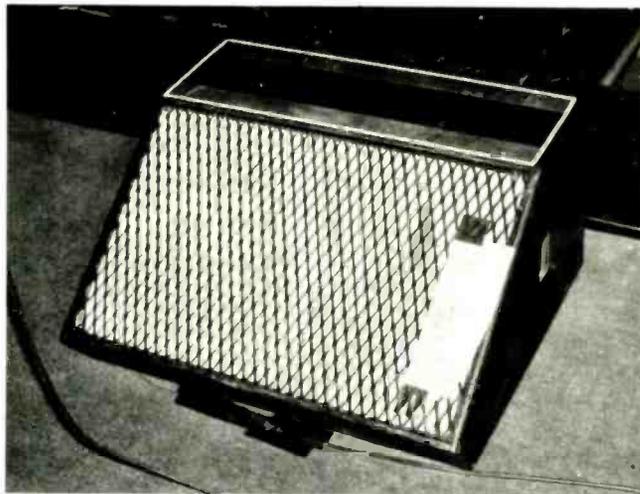


Figure 10 (shown left): The streamlined stage monitor system is centered around a Gamble SC 32-16 touring board. Yamaha F-1030 and Sundholm 202 electronic crossovers are used to offer bi-amped mixes. Figure 11 (shown right): Custom floor slants for Huey Lewis and guitarist Chris Hayes hold two JBL E-120 speakers and an Emilar driver. Sturdy bracing and a metal grill allow the performers to walk the front of the box and stand on it.

SOUND ON STAGE WITH HUEY LEWIS

onomic point of view."

For Huey's show, Buggy Moran provides a total of eight monitor mixes; on occasions when the Tower of Power horn section joins the group's tour, an additional two mixes are provided. Yamaha F-1030 and Sundholm Model 202 electronic crossovers split the mix

output signals for the bi-amplified floor slants. Klark-Teknik DN360 graphic equalizers are available for "critical" mixes. "The Gamble board has parametric equalization on its output mixes," notes Moran. "I don't use the graphics much." A dbx Model 160 compressor-limiter is channel-inserted for the kick drum.

Monitor system power is provided by Crown DC-300As and Phase Lin-

ear 700Bs on the low-end, while Crest Model 300 (Power Line Series) amplifiers push the high frequencies.

Huey Lewis' downstage vocal position is served by a custom-built two-by-12-inch floor slant housing two JBL Model E-120 loudspeakers and a two-inch Emilar compression driver (Figure 11). The enclosure has been constructed so as to allow the performers to walk up the front grill and stand on top of the sturdy box, which is capped with a non-skid material.

In addition, a flown pair of Meyer UM-1 UltraMonitor cabinets are targeted at the vocalist's downstage center position (Figure 12).

"It is not a very large, massive monitor system," remarks Moran. "Huey likes to be able to listen to the house sound coming back at him, and then sort of bring the monitor level up to that for a reference. This is not a blow-you-away stage level sort of show.

"Actually, we don't want to spoil the guys with too much gear all at once," he laughs. "They are only into their second real year of arena touring!"

Additional on-stage floor slants include boxes loaded with Gauss 15-inch loudspeakers and Altec 1.4-inch Model 290 compression drivers. Drummer Bill Gibson is flanked on each side by a pair of custom mini-stacks, each of which is loaded with two, 15-inch Gauss Model 5842 loudspeakers, a 12-inch JBL Model E-120, and a JBL Model 2441 compression driver (Figure 13).

"This band plays well together on stage," Moran explains. "They actually listen to each other, even on large stages. Nobody tries to blow everyone away — they consciously try to limit the on-stage level. It makes it easier both here on the stage, and in the

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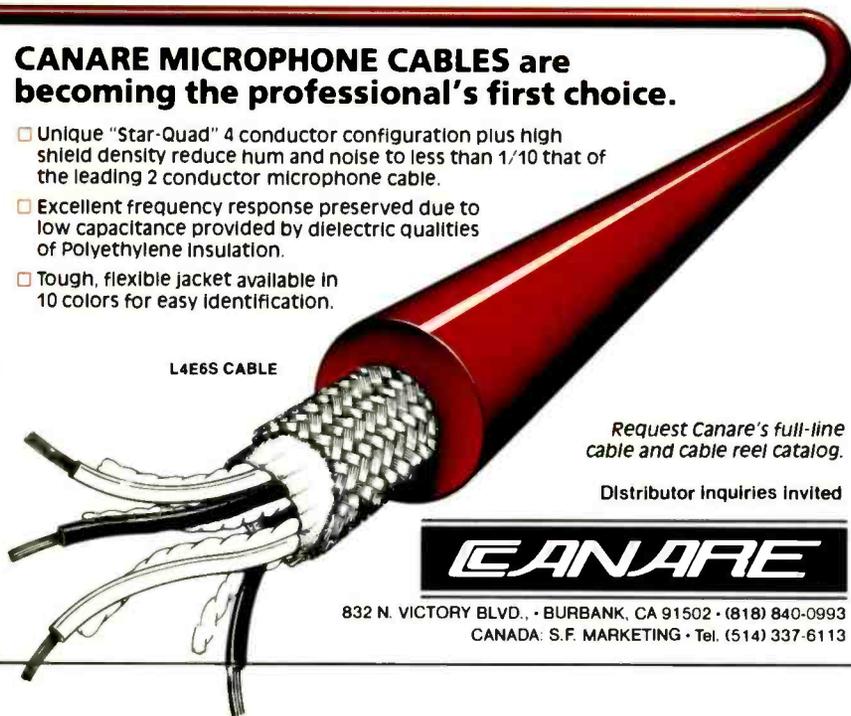
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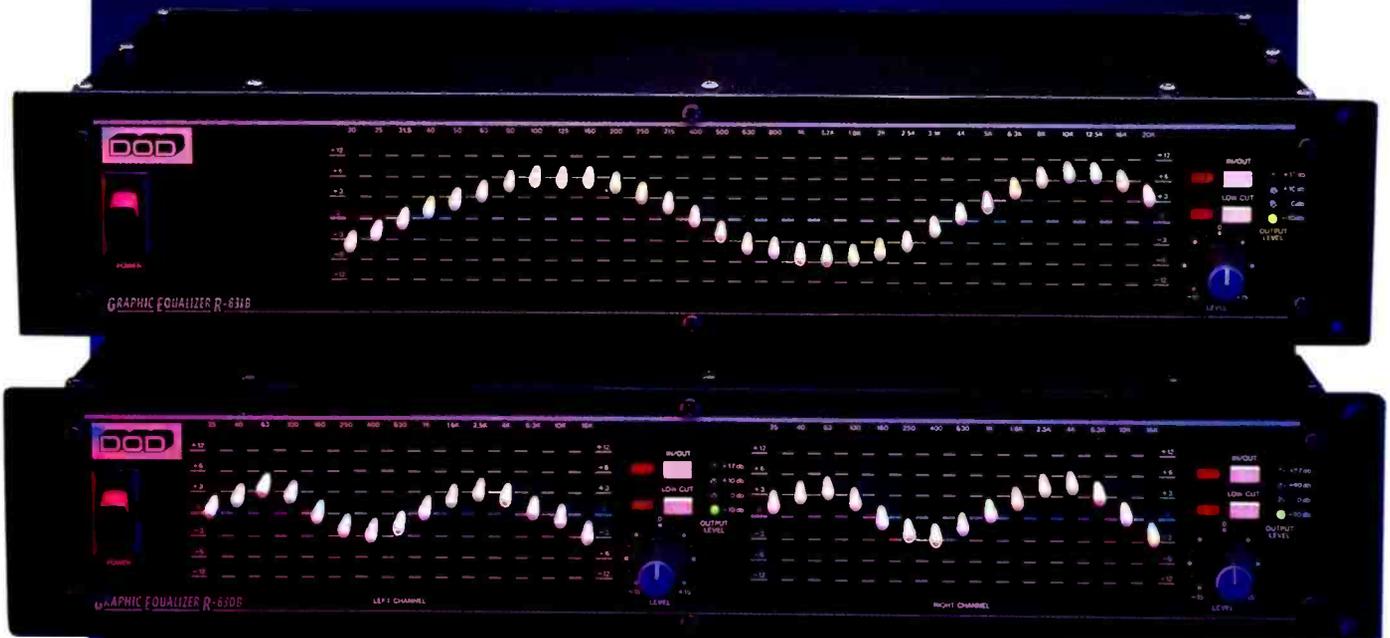
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house. Mario Cippolina, the bass player, used to have a big speaker stack when they played in clubs; that has been cut in half now that we're in arenas. The players let the main speaker system do the work. What we have on-stage is just for reference. We're *not* trying to fill up the whole arena with just guitar amps, or even monitors."

Stage Inputs

Featured performer Huey Lewis sings through a Shure SM-58, and blows harmonica through an old-style Shure "bullet" mike that is fed into a Fender Harvard tube amplifier which, in turn, is picked up with a Beyer Model 400. Other vocalists are supplied with Beyer M69 microphones.

Johnny Colla's saxophone is picked up both with a Beyer Model 201 and a wireless system. Shure SM-58 microphones are used on other guitar amplifiers, a Leslie cabinet (top and bottom rotors), and to trigger a Linndrum machine from the kick drum.

The kick is also given a Beyer Model 88. The snare is miked, top and bottom, with Shure SM-57s, and the hi-hat with a Sony Model CP23. Snyes are also supplied for the overhead cymbals, while Beyer 201s pick up the rack and floor toms.

When the guest horn section is pres-

ent, Sennheiser MD421 microphones pick up the trumpets, alto and tenor saxophones, and a Beyer 88 used on baritone sax.

House Mix Position

Soundmixer Mark Deadman (*pictured left*) has been with Huey Lewis and the News since the group's early beginnings. He has a long history of involvement with San Francisco Bay-area bands, including a stint with the Sons of Champlin nearly a decade ago.



"One of the most interesting things about the production crew on this tour is that nearly everyone has mixed sound at one time or another," Deadman points out. "Our stage manager, Alan Chinowsky, toured with Tower of Power doing their sound. Production manager Terry Persons was with Pablo Cruse. Everytime I turn around, another sound man is looking over my shoulder!"

Deadman mixes Huey's show on a Gamble HC 40-24 board. Additionally, a Studiomaster 8x4 rack-mounted mixer is available for use as a horn-section submixer (Figure 14).

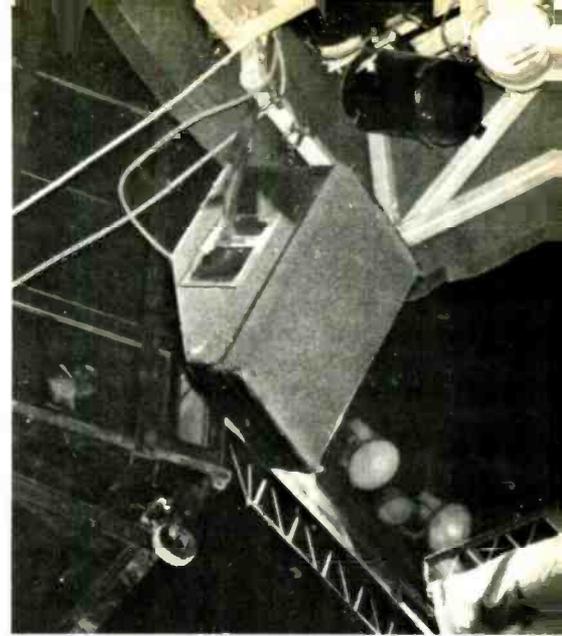


Figure 12: Hanging Meyer UM-1 UltraMonitors comprise the high-fidelity, low-visibility sidefills for Huey Lewis.

"Being able to pick and choose the consoles, and the sound system that we want to use, is a great position to finally be in," Deadman says. "A lot of people think that Huey was an overnight success, but that is not true. For *five* years, we've been out there, doing a lot of little clubs, a lot of opening-act slots for people like the Doobie

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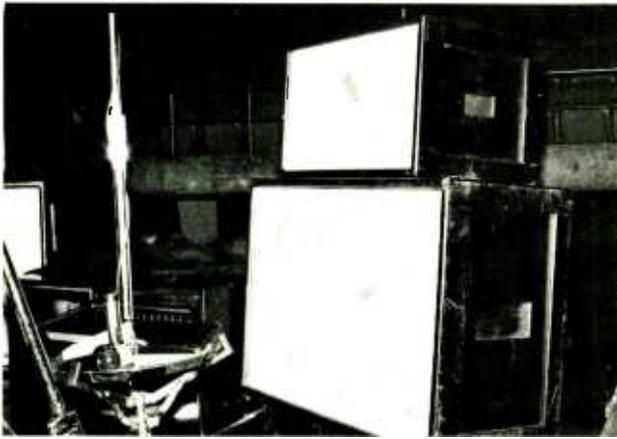


Figure 13 (shown left): Custom three-way drum monitor stacks house Gauss and JBL drivers. Figure 14 (shown right): House electronics gear includes a Gamble HC 40-12 board, a Studiomaster submixer, Yamaha Q-1027 graphic equalizers, dbx compressor-limiters and noisegates, Uptown Audio and Brooke-Siren Systems crossovers, Lexicon Model 200 stereo reverb, and assorted digital delay units.

SOUND ON STAGE WITH HUEY LEWIS

Brothers.

"When you are using someone else's system, it is hard to go for the sound you *really* want. That is probably the best thing about the position I find myself in now . . . being able actually to specify the equipment, and working with the tools I want to use. Sound On Stage has always given us good service, since the days we were doing smaller shows. Being able to work

together on developing this system has been good for both of us."

Deadman's house processing gear includes Yamaha Q-1027 graphic equalizers, dbx Model 162 compressor-limiters, and a dbx Model 160X provided for use by opening acts. Effects include a Lexicon Model 200 stereo reverb, two Korg SDD-3000 digital delays, a Roland SDE-3000 delay unit, and an MXR digital reverb.

"Even when a sound company has good effects 'toys' to supply, I have always felt it important to have our

own tools available. That way, no matter what system we were using, I was able to keep a consistent sound," Deadman confides.

A dbx Series 900 modular processing rack offers Deadman five 903 compressor-limiter modules (assigned to kick, snare, bass and Huey's vocal), and three 904 noisegate modules for use on the toms.

System Drive Rack

Sound On Stage drives the Power Physics system with an Uptown Audio CO-4C four-way electronic crossover. Uptown design engineer Chris Lovett is also, by coincidence, senior design and service technician for Sound On Stage. "This company used to use a lot of off-the-shelf electronic products," he states. "Around 1980, Jerry [Pfeffer] and I decided to design our own crossover based on the particular type of filters we wanted. Then, 18 dB Butterworth type filters were mainly available. We wanted to try the three-pole Bessel type, and found it to be the most satisfactory. Since then, I've looked at four-pole Linkwitz-Riley types. The steeper filters theoretically give you less interaction between adjacent bandpass frequencies.

"I am building a limited number of my UTA™ crossovers . . . custom devices can have a pretty high cost. There is a very specialized market for these crossovers, so I am not looking for a mass-market product. There are plenty of products out there for people who *just* need a crossover."

A spare Brooke-Siren FDS-340 crossover is provided as a standby unit, although Sound On Stage audio crew chief John Taylor professes not to like the fact that the unit "can't be turned off all the way." [Note: being able to completely turn down each frequency band of a crossover is often considered a "must-have" feature by touring sound engineers. Manufacturers, take note! — DS.]

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For additional information circle #43

Taylor sets up the speaker system in a stereo mode for each show, with the sidefill hanging stack being given the opposite stereo signal when compared to the adjacent main speaker array. The deck system is run mono for positive coverage of the front floor seating areas. The rear hanging stacks are given a stereo feed.



System levels are set early in the day. Taylor and Sound On Stage technician Rob Goodwin use walkie-

talkies for communicating information about crossover levels and system coverage. "The radios make it very easy," explains Goodwin (pictured left). "One man is at the house board, and the other walks the hall. We use the radios for setting the flying system height, and for getting the optimum crossover settings."

The Sold-Out Show

During 1984's touring season, two industry trade magazine's consistently reported Huey Lewis and the News as one of the 10 largest grossing tours with each passing week. The Sound On Stage Power Physics system was set up and used to fill some of

the nation's most popular performance venues. Capacity crowds were the general rule.

Since the system is driven by a power amplifier section rated at something under 25,000 watts, and many touring acts are carrying systems with power ratings four times as large, I was very curious to make an objective comparison of this horn-loaded, compact system, and a relatively typical massive direct-radiating system that I heard in the same 15,000-seat San Diego Sports Arena two nights previous. Both shows were sold out.

I personally enjoyed the sound of Huey Lewis and the News with this Sound On Stage system. It was a "clean" sounding show, with a relatively small amount of bass rumble for that particular arena. The collegiate crowd was exceptionally responsive, and the audience members spent much of the time on their feet.

I would have liked to have doubled the size of the loudspeaker system in the 15,000 seat venue to increase the system's headroom. The show mix was often approaching the system's acoustical limitations, and its ability to actually move the air without taking the power amplifiers into clipping.

Mixer Mark Deadman countered my suggestion with the following (realistic) comments: "Sure, more speakers would be nice; it's great to have more horsepower than you need. But we're talking *reality* here — more sound means another truck. At this point in this act's career, getting out and doing as many shows as we can in an affordable manner is important, more important than going after esoteric stuff. Our whole production is geared towards being *affordable*. The cost of a larger system has to come out of somebody's pocket. Besides, go ask these kids if *they* liked the sound of the show!"

(You're right, Mark. They loved it. The vocals were strong and clear. The kick and bass guitar had a solid impact at the rear of the hall. The high-frequency coverage was smooth and even.)

Economic realities are perhaps bringing about subtle changes in the thinking of some production managers and touring soundmixers. Sure, there will always be a "Mega-Tour" out there, hanging speakers from every rafter. For the many other shows on the road, however, an active search is on for sound systems that offer the best audio quality for the fewest feet of truck space.

The Power Physics system designed by Sound On Stage is a good example of a new, consciously-designed loudspeaker package for touring use that attempts to keep those parameters in mind. ■■■

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June 1985 □ R-e/p 61

RECORDING AND PRODUCTION APPLICATIONS OF NOISE GATES AND EXPANDERS

The Use of Gates and Keyed Expanders to Reduce Sound Spillage and Create Special Effects

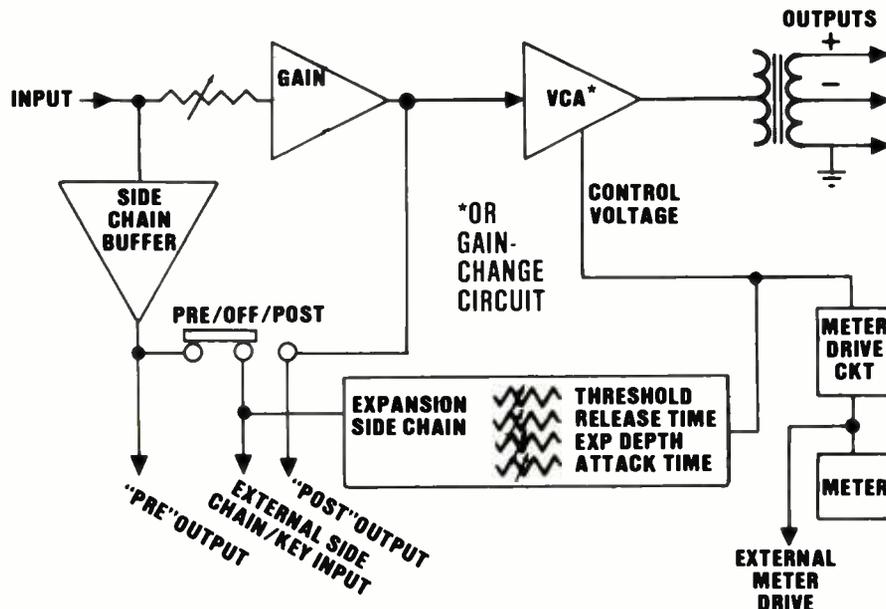
by Denis Degher

When most of us consider the creative processes that occur in the studio, the first thing that usually comes to mind is the artist's creativity. One of the most understated aspects of studio work, however, is the interplay in the control between the engineer and the artist or producer. Many concepts and directions for songs have been altered radically through the injection of new and foreign sounds by the recording engineer, in some cases prompting a complete rethink of the "sound" that

the artist and producer were striving to achieve.

In recent years, a growing trend in the studio appears to be away from the "natural sound" that most engineers sought in bygone years, and towards a "created" or "synthetic" sound. A premise, long overdue for revision, is the concept of a "natural" sound in the multitrack recording environment which is something of a misnomer. Once analog sound enters a microphone or a direct box it is immediately altered. Today, however,

Shown below is a block diagram of a "typical" expander/noise gate, detailing the main circuit elements. (Our thanks to Aphex Systems for providing a circuit diagram of the CX-1 compressor-expander, from which this figure is derived.) Shown right (top to bottom): Variations between output and input level with Range (B), Threshold (C), and Expansion Ratio (D). (All three figures were supplied by Valley People, and are derived from the Kepex II user's manual.)

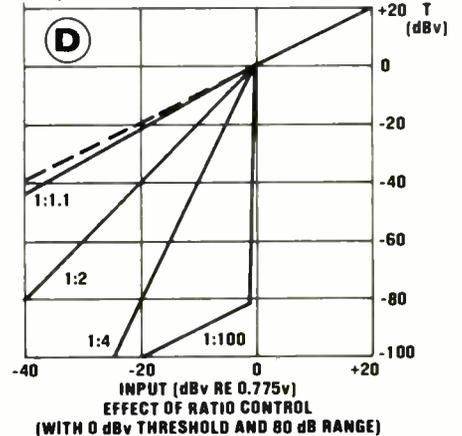
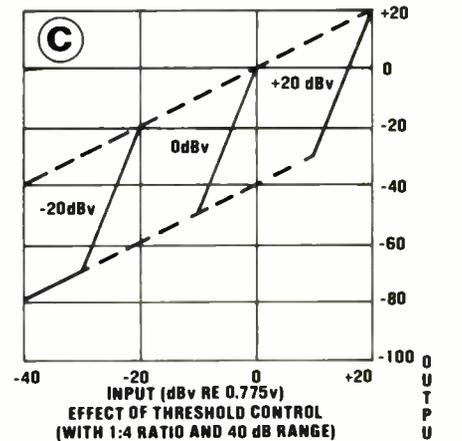
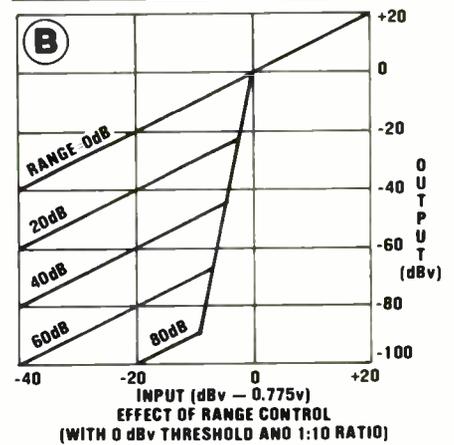


most industry professionals would admit that they are striving for new and original sounds, and not necessarily trying to achieve a natural sound.

The object of this article, and those to follow in subsequent issues of *R-e/p*, is to discuss new studio sounds and the devices that can be used to create them.

Principles of Gating

Engineers have been using gating devices, such as the Valley People Kepex, for many years to reduce sound leakage caused by multiple miking of drums, allowing individual control over a specific track during mixdown. Gates can also be used on tom tracks to control and create a uniform decay time between various drums. Gates



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NOISE GATES AND EXPANDERS

are also very effective in removing unwanted hums or buzzes in sections of a song where an instrument is not playing, thereby allowing the mixing engineer to devote his attention to important aspects of the mix, rather than on cueing out unwanted noise. Another application that is not so widely known is the use of a gate on an over-compressed or limited vocal to make it sound more natural.

Use of Key Inputs

Generally speaking, keying is the art of triggering specific added sounds from an established pattern or beat. Conversely, certain portions of a sound source can be keyed out to achieve the desired sound, leaving only the sought-after portion of the audio signal.

A keying device enables the engineer to trigger a sound or instrument from another track. During overdubbing, for example, a guitarist might be trying to lock-up with a snare back-beat, but be consistently ahead of the beat. By patching the guitar's incoming console signal into the gate input, returning it to the multitrack, and then assigning an auxiliary send from the snare to the key input of the same device, the gate will open on the snare hit making it *impossible* for the guitar to be ahead of the beat. Since you run the risk of clipping the attack from the beginning of the guitar strum, attention must be paid to ensure that it sounds natural.

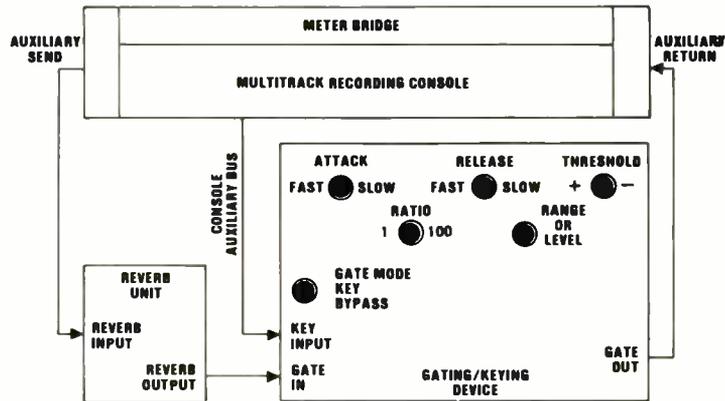
In recent years, recording engineers have begun to experiment with new ways to use gating and keying. Producer-engineer Joe Chiccarelli, who was profiled in the February 1985 issue's "Production Viewpoint," shared some of the tricks he has developed over the last few years.

"This technique was used on the new Robert Tepper album for Scotti Brothers/CBS on the song 'Angel Of The City.' The kick patched into a

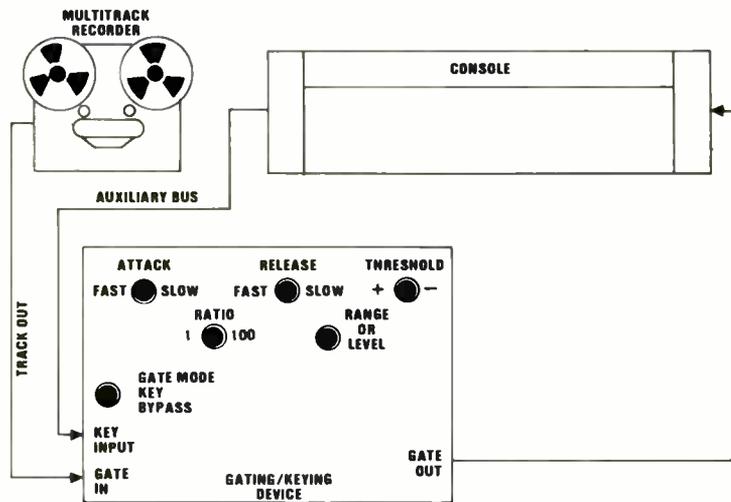
— Joe Chiccarelli —



GENERIC USE OF GATES FOR KEYING REVERB

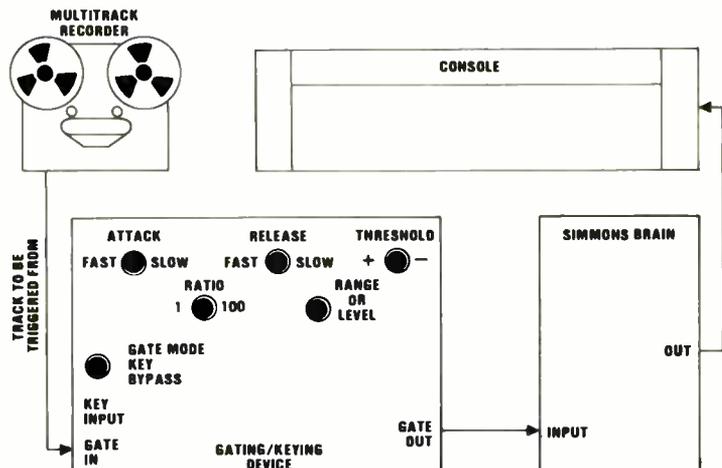


KEYING FROM PRE-RECORDED MATERIAL



SOURCE TRACK TO BE KEYED COMES FROM MULTITRACK INTO GATE-IN. AND IS THEN RETURNED FROM GATE-OUT TO CONSOLE.
AUXILIARY BUS IS ASSIGNED VIA CONSOLE FROM TRACK(S) CONTAINING KEYING MATERIAL.

GATING ELECTRONIC PERCUSSION FROM TAPE



POSSIBLE VARIATIONS IN THIS TECHNIQUE ARE:
1. ASSIGNING THE SIMMONS SIGNAL FROM THE CONSOLE BACK TO THE MULTITRACK TO RECORD.
2. ASSIGNING LIVE DRUMS FROM THE CONSOLE TO TRIGGER THE SIMMONS AND RE-RECORDING BOTH DURING TRACKING.

NOISE GATES AND EXPANDERS

Lexicon Super Prime Time to generate two delay times — one at 340, and the other at 620 milliseconds. A slight amount of feedback was also added on the Super Prime Time and the master output returned to the console.

"A buss was then used as input to the Kepex II [key input]. The bass drum and the Super Prime Time were then assigned from their console channel position via the bus to the Kepex II, creating a triplet-like pattern [see accompanying notation of rhythmic pattern].

"Simultaneously, a sustaining power-chord guitar track was patched into the gate input of the same Kepex. The end result was that the guitar track was triggered from the triplet, giving it a clavinet-like quality.

"Another way keying can be used is to gate a distant bass drum mike off the close mike, so that the distant mike will only open on the bass drum beat, and not be affected by any other drum hits."

"Essentially, anything can be keyed from another track," Chiccarelli offers, "but certain sound characteristics lend themselves to this effect. Keying string synths from the lead or background vocals and blending them together

The image contains two musical staves. The top staff, labeled 'ORIGINAL PATTERN', shows a snare drum track with a triplet of eighth notes and a kick drum track with a single eighth note. The bottom staff, labeled 'PATTERN WITH DELAYS', shows the same snare and kick patterns but with a series of 'X' marks above the snare notes, indicating a gating or keying effect triggered by the kick drum.

Joe Chiccarelli's keying/gating technique using a bass drum pattern (top) and delays (bottom) as a triggering input to produce a triplet-like pattern from a power guitar chord.

can create a unique quality.

"I have recently purchased the new Drawmer Dual Gate DS-201 which offers features previously unavailable on gating and keying units, such as variable highpass and lowpass filters on the key source [plus two-stage release function]. These allow certain frequencies to be removed from the signal path of the channel that the device is to be keyed from. This can be useful during a mix when you are trying to key a sound source off a tom track, for example, and there is either excessive cymbal leakage, or the toms and cymbals are recorded on the same track. By using the lowpass filter, the

sound of a cymbal can be removed from the [key] signal path so that they will not unintentionally key the new sound source, allowing for greater control."

Now that industry professionals and consumers alike are becoming more receptive to new and evolving synthetic sounds, there seems to be no limit to the sounds that will be created in the future, thereby providing an engineer with the freedom to maximize his or her creative skills.

Gated Echo Effect

Producer-engineer George Tutko was one of the first to popularize the gated-echo effect. "The first time that I tried gating the echo returns," he recalls, "was on John Cougar's hit 'Hurts So Good,' when producer Don Gehmann and I were looking for a unique snare sound. We were using an EMT 251 digital reverb. Sound quality on the 251 varies with reverb time, and we had found a sound that we really liked but it was just *too* long. We decided to experiment by putting gates on the reverb returns and blending this with the room mikes; the resultant sound is what's on the record.

"The interesting thing about gating and keying is that the technology has been around for at least 10 years, but it has only become a fashionable sound in the last few years. One of the earliest keying effects was to tape an Auratone [monitor speaker] to a Syndrum or Synare [electronic drum], and feed the keying sound through an auxiliary send. When the Auratone pops it would key the syndrum.

"Today," the engineer continues, "keying is much simpler, and there is a greater variety of things to key and trigger. One interesting way to maintain a live rhythm track feel — yet still create new sounds — is to record the drums live, and then key or trigger a Linn, Oberheim DMX, or E-mu Systems Drumulator drum machine.

"For best results, I use the MARC MX1 device when triggering [a drum machine] from the tape machine. With

In A/B tests, this tiny condenser microphone equals any world-class professional microphone. Any size, any price.

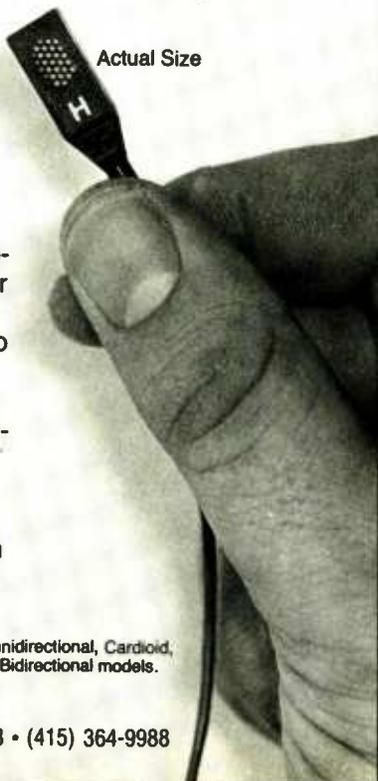
Compare the Isomax II to any other microphone. Even though it measures only $\frac{5}{16}$ " x $\frac{5}{8}$ " and costs just \$189.95,* it equals any world-class microphone in signal purity.

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— John Arrias —

the DMX, a passive envelope follower [a capacitor and a diode] must be inserted before the drum-machine input.” [Author’s note: When using a Garfield Electronics Doctor Click, this extra circuit is not necessary, since a passive envelope follower is built into the input.]

“The wave of the future,” Tutko offers, “is sampling, creating and storing sounds, and then keying or triggering them from another specific sound source. For Example, on the record *World Citizens*, which I am presently mixing, I don’t believe we used a real snare drum on the entire album.”

Engineer-producer **John Arrias**,

who was profiled in the October 1984 issue of *R-e/p*, revealed some of the effects that new technology has allowed him to develop over the last few years.

“The advent of the Simmons drum has enabled me to utilize a whole new array of sounds,” he concedes, “and blend them with the original drum kit. On Stephanie Mills’ album *I’ve Got The Cure*, I miked John Robinson’s snare top and bottom, and blended them together on one track, while I simultaneously bussed the same signal through a Kepex, gate-in/gate-out. The attack and release times were both set extremely fast so only the *slightest* spike would get through. I then patched into a limiter to boost the gain and into the Simmons brain [controlling computer], returned the signal to the console, and then to the multitrack. I likewise used this same effect to blend real and Simmons toms.

“Another interesting effect on that album was to gate the returns of an EMT 140 plate that was used exclusively on Stephanie’s lead-vocal track. An aux bus was assigned from the vocal to a mult and then into the key inputs of the same gates, enabling Stephanie’s vocal to key the echo. The end result was an echo that tracked *precisely* with the vocal with no hang

over to clutter up the mix.”

My own engineering and production experience has also yielded some interesting results with keying. On the song “Maybe Tonight,” by artist-synthesist Bruce Lowe, and intended for soon-to-be-released film *Casting Party*, I employed keying on the echo returns. The snare signal was assigned to an EMT 140 plate, and the returns patched into two Kepex IIs, gate-in/gate-out, and returned to the console. Simultaneously, a bus was assigned from the snare channel into a mult. The mult outputs were then patched into the key inputs of the same Kepex gates, enabling the snare to trigger the echo returns.

The end result was a very dense, yet controlled reverb sound. Because there is no delay, as with gating-only I was able to remove the primary snare signal from the mix and only use the keyed effect.

Another benefit of using the key inputs, rather than gating only on ambient sound sources, is the reduction of ramp-down glitches when the gate is closing, although certain units, including Aphex and Drawmer gates, do not glitch as much in the gating mode.

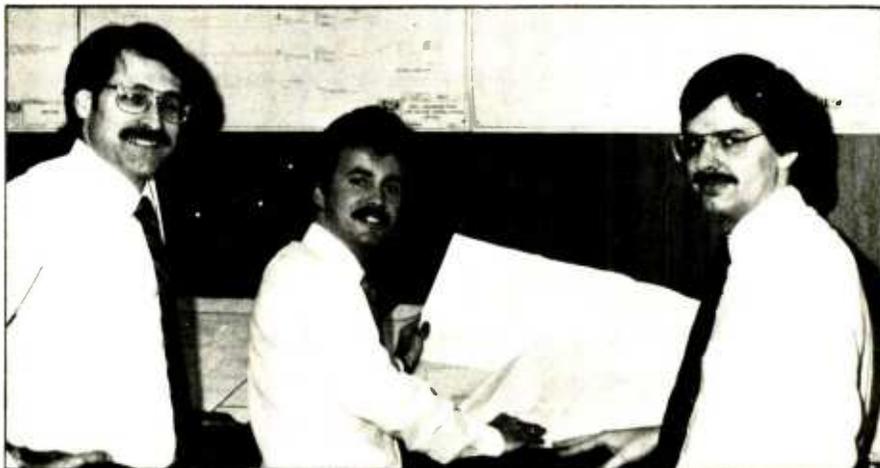
Another interesting sound can be achieved by using the key inputs on ambient-room mikes. By keying the

LAKE UPDATE

The last few weeks at Lake Systems, the Newton, Massachusetts based audio/video systems company have been hectic to say the least. Lake has just completed building Boston’s first stereo music television station, WVJV, Channel 66 and has been awarded over 5 million dollars in new contracts. They have also expanded their audio department with the addition of three new audio specialists. Steve Blake, audio/video and acoustical systems designer, recording engineer, and sales consultant. Jim Cook, audio sales consultant to the radio, television, and recording studio industry. Luke Furr, sales engineer, design and sales of turnkey systems to the professional audio/video industry. At a recent luncheon, I had an opportunity to meet with Steve and Luke to discuss their plans for Lake’s audio dept. (Jim was out-of-town.)

Interviewer: Tell me, what new audio lines have you added at Lake?

Steve: Well, you know that Lake has always had incredible video systems capabilities, with lines like Sony Broadcast Video, Grass Valley, Convergence and Ikegami. Now that we have added the Otari MTR Series, Harrison Consoles, Sound Workshop Consoles, Neumann Microphones, Orban Broadcast, Adams Smith and Timeline synchronizers . . . to name a



New members of Lake’s audio dept. from left to right: Jim Cook, Luke Furr, and Steve Blake.

few, we feel Lake has the best selection of professional audio/video lines in the industry.

Interviewer: What are the most active segments in the professional audio market today?

Luke: With the advent of stereo TV, the video production houses and TV stations are upgrading their audio systems with stereo mixing consoles, multi-tracks, and synchronizers.

Interviewer: Is that a complicated process?

Steve: Not really, but there are many details that must be addressed before we

can recommend a system.

Luke: It might sound corny, but Lake’s really on the cutting edge of this new technology. They’ve been putting sophisticated systems together for over 30 years, building systems that accommodate the artists/engineers requirements for today and tomorrow. Working at Lake gives us the opportunity to blend our audio knowledge and experience with their video.

Steve: I think the real winners will be our clients.

NOISE GATES AND EXPANDERS

ambient mikes from the console channel position, the room mikes will only be triggered by specific desired drum hits, thereby creating the ambient sound only on selected parts of the drum kit.

Keying synthesizer pad tracks from drum or percussive sources can yield very interesting effects. An example

of this was used on the forthcoming *Alien Western Sounds* album, by Darius and The Magnets. On the song "Laughing At Time," a synth track was recorded from beginning to end of the song. During the mixdown the track was patched into a Kepex II gate-in/gate-out, and returned to the console. Using a free bus as the send to the Kepex II key input, any desired track could be used as a source to trigger the synth sound. The keying source was variously the tom or conga

tracks and, by using panning changes throughout the song, interesting stereo movement was created in the stereo image. The primary source was removed at one point in the mix to create a totally synthetic sound.

Since the keying and triggering of synthetic and sampled sounds does indeed offer "The Creative Edge In The Studio," in subsequent issues of *R-e/p* I will discuss the use of new devices to create, store and replay sampled sounds. ■■■

EXPANDERS AND NOISE GATES

An *R-e/p* Guide to Commercially-available Systems

— FURMAN SOUND QN-4 —



The QN-4 features four separate noise gates in a 1.75-inch rackmount unit. Front-panel controls per section enable the input threshold to be varied continuously from -70 to $+20$ dBV (the control also incorporates a "channel-on" setting with associated LED), plus "fade time" of 0.005 to 5 seconds. Rear-panel jacks enable the unit's gain-control element to be controlled by an external keying signal.

For additional information circle #191

— SCV MODEL NGS-2 —



The NGS-2 combines two, independent frequency-selective noise gates in a 1.75-inch rackmount unit. Continuously-variable front-panel controls include highpass filter (40 Hz to 1 kHz, 12 dB per octave rolloff); lowpass filter (700 Hz to 20 kHz, 12 dB per octave); release time (0.1 to 3 seconds); and input threshold (-40 to $+10$ dBm). Pushbutton switches select input-program/key-trigger operation, filter section in/out, controlled-bandwidth/gating operation, and gate/bypass. Attack time is fixed at 1 microsecond.

For additional information circle #192

— DRAWMER DS-201 —



The DS-201 combines two separate noise gates in a 1.75-inch rackmount package. Continuously-variable front-panel controls include highpass filter (25 Hz to 4 kHz, ± 3 dB, at 12 dB per octave rolloff); lowpass filter (250 Hz to 35 kHz, ± 3 dB at 12 dB per octave); threshold (-54 dB to infinity); pre-release hold (0.002 to 2 seconds); release time (0.002 to 4 seconds); attack time (10 microseconds to 1 second); and input range (0 to 80 dB). The two filter sections are inserted permanently in the external trigger-key circuit. Toggle switches select internal program/key-trigger operation, gate/duck mode, Key Listen/Gate/Bypass operation (the former to allow monitoring of the trigger signal and filter sections), plus stereo link mode that enables the left-hand channel settings to affect both channels.

For additional information circle #193

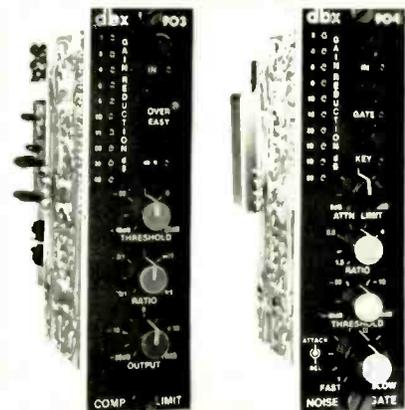
— USAUDIO GATEX —



The GateX comprises four separate noise-gates in a 1.75-inch rackmount unit. Each section features front-panel controls for continuously-variable input threshold (-40 to $+20$ dB); attenuation range (0 to -80 dB); and release time (0.05 to 5 seconds per 20 dB of gain change, with a Program Controlled Sustain feature that lengthens the release time as dictated by program content). A pair of three-position switches select Source (input/off/keying trigger), and Mode Expansion (1:10/1:2/2:3 ratios). Program Controlled Attack alters the attack time according to the demands of the material being processed. The unit uses the Valley People TA-104 VCA for gain control.

For additional information circle #194

— dbx MODEL 904 —



The Model 904 is designed to fit into the 900 Series Modular Signal Processing System, and features continuously-variable front-panel control of attenuation limit (0 to 60 dB); expansion ratio (1.5:1 to 5:1); input threshold (-40 to $+10$ dB); release time (2.5 to 22 dB per second); and attack time (500 to 2.5 dB per millisecond). Pushbutton switches select system in/out, PLM (Programmed Latch Mode) that provides automatic threshold-programmed unmuting of solo channels, and internal-program/external-trigger control.

For additional information circle #195

— VALLEY PEOPLE KEPEX II —



The Kepex II, designed to be housed in any of the Valley People 800 Series powered or unpowered racks, employs the company's EGC-101 VCA as a gain-control element. Front-panel controls include five, continuously-variable settings for release time (0.04 to 10 seconds per 20 dB of gain change); attack time (0.02 to 20 milliseconds); gain-reduction range (0 to 80 dB); expansion ratio (1:1 to 1:100/gating); and input threshold (-40 to $+20$ dBV). Toggle switches select linear or logarithmic release envelope characteristics, and input/off/key mode selection.

For additional information circle #196

— OMNI CRAFT GT-4 —



The GT-4 combines four separate noise-gate sections in a single 1.75-inch rackmount package. Attack time for each section is fixed at 1 millisecond, or less, while threshold is continuously variable between infinity and -40 dB, and release time from 0.1 to 1 second. A front panel pushbutton selects internal or external key-trigger mode. **For additional information circle #197**

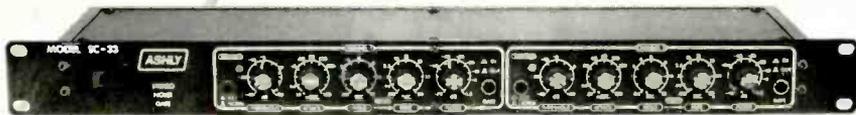
— SYMETRIX MODEL 522 —



The Model 522 is a multifunction dynamics processor that can be set up to operate as a compressor/limiter, expander, noise gate or ducker; the two channels may be used as independent units, or in a stereo interconnect mode. A set of four front-panel controls per channel adjust attack time, release time, attenuation range/ratio (dual-concentric), and input threshold. Three pushbutton switches select operational mode, internal-program/external-trigger, and system in/out. The gain-control element is a Valley People TA-101 VCA. (A four-channel expander/noise gate, Model 544, is currently under development.)

For additional information circle #198

— ASHLY AUDIO SC-33 —



The SC33 combines two independent noise gates in a 1.75-inch rackmount unit. Continuously-variable front-panel controls include threshold (-40 to +20 dBV); attack time (10 microseconds to 10 seconds, per 40-dB gain increase); hold time (0.04 to 12 seconds); fade time (0.015 to 30 seconds, per 40-dB gain decrease); and "floor" or noise attenuation (0 to 75 dB). A pair of front-panel pushbuttons provide normal/keying-mode selection, and system in/out. A rear-panel tie patch point enables stereo tracking of two or more units.

For additional information circle #199

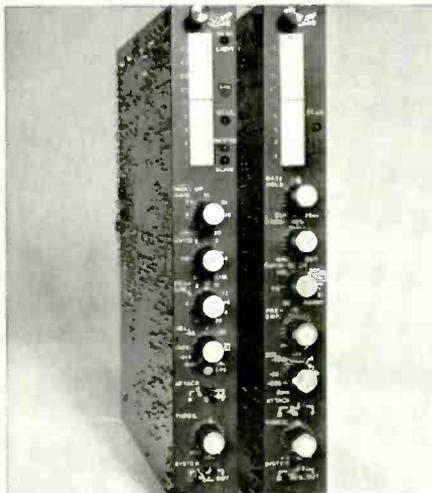
— APHEX SYSTEMS CX-1 —



The CX-1 is a modular, single-channel compressor/expander with an expansion section that features continuously-variable front-panel controls for threshold (-45 to +3 dBV); release time (0.05 to 2.5 seconds); input gain (-20 to +20 dB); and depth (0 to 100 dB). Pushbuttons select expansion function in/out, unit in/out of circuit, and meter select (compression and/or expansion, or both) — a dual-scale LED meter displays compression on one side, and expansion/audio output on the other. An internal PCB "sidechain-source" switch selects pre/post triggering (either before or after the input gain control), and external keying-trigger operation.

For additional information circle #200

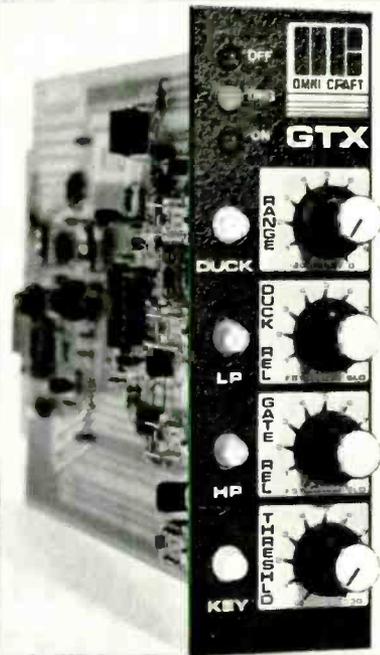
— AUDIO+DESIGN S30 —



The S30 is designed to fit into the SCAMP (Standardized Compatible Audio Modular Package) system, and features front-panel controls for continuous adjustment of Gate Hold (enabling a 0 to 2 second "window" to be opened prior to onset of the selected release time); attenuation range (in percentage of theoretical maximum); expansion ratio (1:1 thru 1:4 to 1:20 for hard gating); pre-emphasis of sidechain signal (up to 20 dB at either 100 Hz or 10 kHz); release time (0.025 to 4 seconds); and threshold (+12 to -50 dBm). A pair of three-position switches select attack time (0.1, 5 or 40 milliseconds), and input/off/keying-trigger operation.

For additional information circle #201

— OMNI CRAFT GTX —



Available in two modular configurations to fit into different styles of rackmount systems, the GTX features front-panel controls for gain-reduction range (0 to -20 dBv, plus switched -60 dB); Ducker release time (0.1 to 3 seconds); Gate release time (0.1 to 3 seconds); and input threshold (-40 to +24 dBV). Four pushbuttons select Ducking/Gate mode, lowpass filter in/out, highpass filter in/out (either or both filters being inserted into the trigger-signal path), and input signal/keying-trigger operation.

For additional information circle #202

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For additional information circle #50

Sound for The Visual Age



IMAX six-channel mix for Skyward

DIVERSIFYING FROM TRADITIONAL RECORDING SESSIONS TO THE SPECIALIST AUDIO REQUIREMENTS OF VIDEO AND FILM POST PRODUCTION

by Doug McKenzie and Bob Predovich, The Master's Workshop Corporation, Toronto, Canada

There was a time, not so long ago, when studio owners would bow to the every whim of the record producer, and happily lavish upon them the most extravagant facilities and "creature comforts" that long-term financing could buy. It was a time when record budgets were known to exceed a million dollars, and the projected returns from record sales made such an advance seem feasible to record-company executives. In 1978, on the crest of a wave capped by successes like the Bee Gee's *Saturday Night Fever*, the major labels began settling their sights even higher and, somewhat less than cautiously, committed themselves to large staffs and even larger production and promotional budgets. Who could have known that a significant downturn in the industry, almost overnight, would not only cause these same companies to retreat on many ambitious fronts, but would seriously disable many large and small record com-

panies, to the point of suffering major layoffs and bankruptcy.

Many offered that a poor economy had eroded the industry, yet admitted that historically, the business had been "recession-proof." Others claimed that over-zealous administrations had jeopardized their companies by their budget policies. Most critics, perhaps because they desired so, predicted a complete recovery in one year.

In the case of the management of Master's Workshop, the indicators were read and interpreted in an entirely different way. The key indicators we observed were as follows:

- The industry has been built on the "star" system, in the wake of such notables as Frank Sinatra, Buddy Holly, Elvis Presley and the Beatles. Yet it was apparent that due to a move towards an emphasis on production techniques (Disco, etc., a trend that became the great leveller of true talent) and the effects of market satu-

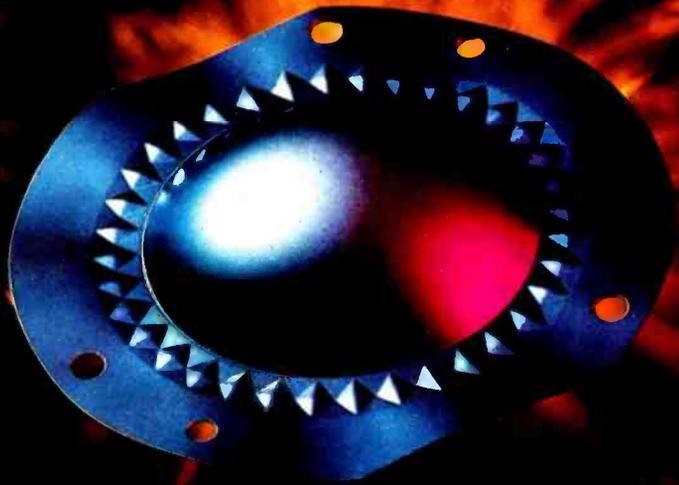
ration, the star system was being broken down.

- "Punk" music exploded on the scene, but only deterred further the already shrinking industry, by virtue of its "anti-everything" philosophy. Even the music was deliberately discordant — in a sense "anti-music" — thereby working completely against the grain of an industry founded on "feel-good" entertainment.

- The economy naturally was a factor, but primarily in later creating a new "leaner" industry run according to proper business practices.

- Home-entertainment dollars were redirected from record collections and stereo systems to video products and accessories. Television became a predominant influence in home entertainment and communications.

- The consumer suddenly became aware of new audio technology that was destined to revolutionize the home stereo system, with the introduction of the Compact Disc, and began to



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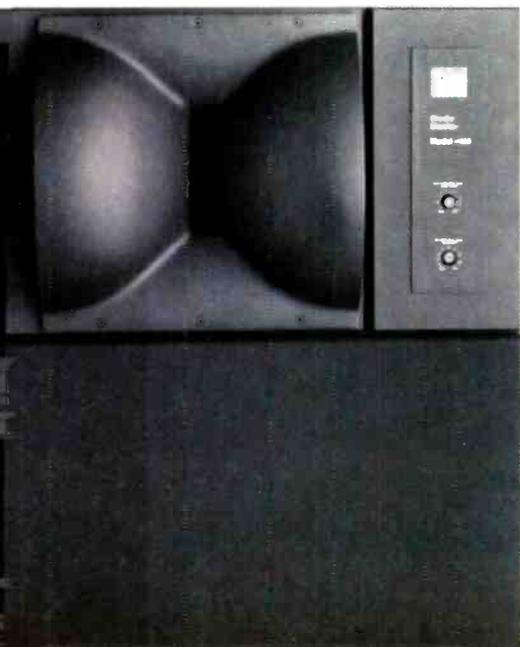
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SOUND FOR THE VISUAL AGE

adopt a wait and see attitude.

•Discussions about Stereo Television by the FCC, and increasing demands by the consumer for better TV audio, became prevalent.

•The onset of Music Videos had the effect of instilling the notion that music could actually be a *visual* experience. The progression of this theory is now being considered, as artists are actually signed to audio/video deals with broadcast and home videocassette implications.

The Move Towards Sound-for-Picture

By Master's assessment, the solution to the problem, which by that time had plagued almost all recording studios and caused the demise of many throughout North America, was to move aggressively into the realm of Sound-for-Picture — be it video or film — by using the facilities at hand plus the addition of sophisticated synchronization systems to interface audio with video. This decision was not seen as a retreat from the music industry, but rather a diversification and redirection that would advance the studio into music and entertainment field of the Eighties and beyond.

Although it would require much dedication and capital in development costs, the new market sectors targeted in the television field were large, lucrative, and stable in comparison to anything the record field had ever offered a studio operation. It was accurately predicted that as the music industry advanced itself into the visual age, our facility would be ready and waiting.

Diversification also led to new services, as we began to take on the complete packaging of sound for a given production, including script consultation and pre-production services. Coupled with 10 years of music production experience, this gave us the opportunity to function well at all levels of the audio industry.

By our initial studies it was clear that high-level broadcast and feature production had always been a "film process" with respect to sound. Although we felt certain that timecode-based tape systems would provide a suitable and efficient alternative to 16 and 35mm mag, it was from the outset, and is today, our intention to preserve most of the revered creative techniques of film-sound editing and mixing, and simply adapt our technology to those standards. In so doing, we have continued to enjoy a growing relationship with the film production community, in as much as these producers have never been alienated by



Master's Workshop boasts a fully-equipped Record/Mix Theatre, which features a Sony MCI JH-636 automated console, JH-24 multitrack, JH-110 eight-, four- and two-tracks, plus a wide selection of outboard signal processors.

our high-tech approach. Understandably then, many of the comments in this article are directed at film/tape comparisons, since we find this is, indeed, the most common concern. A successful approach to the film community was made possible by experienced "feature film editors" who, early on, became associated with us in a hands-on sense, thus developing sound tracks that were not only efficiently delivered, but which were as full and detailed as the producer had come to expect.

Our studios were set up into four basic production areas allowing many

functions in the editing process to take place concurrently. Production areas included editing suites with 16/24-track capability and a full sound-effects library; an ADR (Automated Dialog Replacement) booth; a complete Foley stage; and our original music studio, which then became a scoring stage and mixing theatre. By dedicating facility and staff to sound editing and mixing-for-picture, we may have suffered momentary loss of business from certain record clients. Our total immersion into the field was necessary, however, considering the all-important commitment to delivery schedules, last-minute changes, and the capacity to handle a large volume of business.

In certain production centers the type of audio work will vary but, in our case, almost 90% of Master's business is post-production sound. We have found that the greatest amount of time is spent not in directly marketing the services, but in advising the marketplace of the virtues of our in-house systems, and skills in using them. Separate sidebars written by a couple of our engineers highlight the changing roles of music engineers in post-production operations. Curiously, their ability to perceive sonic subtleties and simultaneously manipulate computer-automated editing/mixing systems makes them particularly well suited to the Sound-for-Picture field. In our case, a blending of such people with our other experienced television/film mixers has ensured high quality in technique and technical efficiency.

It has been our experience, particularly in the television field, that many producers would prefer to deal with

— McKenzie — — Predovich —



— the authors —

Doug J. McKenzie founded Master's Workshop in 1972, after gaining some university training in music and broadcast. He fully maintained and operated the facility as a writer, producer, engineer until staff were employed.

Bob Predovich has an Honours Bachelor of Fine Arts degree from York University in Toronto, Canada. From 1976 to 1982 he was at Global Television gaining extensive experience and knowledge of television operations, including studio camera, video tape and timecode systems, and has five years of audio mixing experience encompassing studio and remote projects. He supervised Global's post audio facility for two and a half years prior to joining Master's as director of post production in February 1982.

AUDIO PROCESSING

For the Digital Era



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SOUND FOR THE VISUAL AGE

one house for an entire soundtrack. This is clearly a sound-production service, and often involves script consultation, on-location recording/supervision, and the track's entire post production. All services are usually delineated up front with cost estimates, and budget and time parameters must be strictly observed throughout. Obviously, changes in the schedule, production requirements or the

edit imply extra time and cost, and this would not be disagreeable to most producers. While the "one-stop shopping" approach provides many benefits to both the producer and the sound company, it is also true that many discriminating directors have certain people they wish to use in some of the sound-production roles. At times like these, it is important to be prepared to accommodate the blending of a certain outside creative/technical person with your own people and, more importantly, your

systems.

Also, on the subject of packaging, it is true that some producers recognize the specific abilities of certain facilities to record Foley, create special synthesized FX, and provide other related services; as a result, they wish to "a la carte" their sound post. In order to accommodate such a mosaic of facility standards and creative input, we must examine the compatibility of the systems being used. Only through open-line dialog and industry-wide acceptance of certain stand-

CUSTOMIZED TIMECODE SYNCHRONIZATION AND EDITING SOFTWARE FOR THE IBM PC COMPUTER

by Bob Predovich and Andy Staffer

The adage that "necessity is the mother of invention" could certainly be used when discussing the evolution of our timecode-based audio controller/editor, SoundMaster. For well over a decade, the marriage of computer power and timecode has been under intense development in the field of videotape editing, but the lack of motivation for good sound quality and content had stunted a parallel advance in audio. Without an "off-the-shelf" system being available, we set out to design a microcomputer-based software package that would be specifically tailored for audio post production.

The design philosophy was to provide tremendous system power while, at the same time, making the computer as invisible as possible between the human creative element and his or her final product. This is clearly demonstrated by the use of colored symbols instead of a clutter of words and numbers, so that a glance at the display quickly delivers a lot of information.

SoundMaster runs on an IBM Personal Computer, and presently supports up to three BTX (now Cipher Digital) Shadow synchronizers as intelligent interfaces between the computer and the audio or video transport, providing for four-machine control. The program consists of three major sections/displays: the Controller, the Edit List, and the Set-Up page.

The Controller screen facilitates control of all the tape machines, and simultaneously displays important data such as lock indication, presence of code, code-type and transport status. It also allows access to all modes of synchronization available within the intelligent interface. This section also includes a timecode calculator that allows for addition and subtraction at 30, Drop Frame (29.94), 25, or 24 fps rates; subframe (0.01 of a video frame) calculations can also be selected. A provision is made to mark code from a selected machine's running display into the calculator, and then easily trim and enter the number as an event into the Edit List with a minimum of keystrokes.

The Controller screen displays two events of the Edit List at a time, and allows for the programming of all transport functions, GOTO's, record in/out and address start in/out (relay closures within the Shadow) to occur for specified machines at selected timecode locations. Up to 2,550 events, divided into 10 lists with 255 events each, can be loaded in one file and stored to standard 5¼-inch floppy disks. The lists can be merged to allow for flexible storage capacity; over 40 files can be stored on one disk.

When a list is executed, the top events displayed will be performed at the specified timecode number. The Edit List then scrolls up one position automatically, and this event is performed at its specified timecode number — and so on, until the end of Edit List, or until the abort key (space bar) is hit.

For a more detailed look at the Edit List, a second screen is provided that displays 20

Shown below is a typical off-screen menu of timecode edit points and accompanying annotations created by the SoundMaster software. (Although reproduced here in black and white, screen displays are in full color.) The screen shown below right is of timecode offsets and related events.



MASTER'S WORKSHOP RECORDING EQUIPMENT

Studio A:

MCI JH-636 automated console
MCI JH24 multitrack
MCI JH-110 eight/four-track
MCI JH-110 four/two-track
Revox B77 two-track
Staffer 4A custom monitors, plus Yamaha NS10 and Auratone 5C monitors
Lexicon 224 digital reverb
Two EMT 140 stereo reverb plates (one tube, and one solid-state)
Eventide digital delay
Eventide Harmonizer
Orban parametric EQ
Orban de-essers
Klark-Teknik stereo graphic EQ
Four dbx 160 and 160X compressors.
Two UREI LA4 compressors
Four Valley People Kepex noise gates
Four Pultec equalizers

Studio B:

Yamaha RM1608 console
Lyrec TR532 24-track
MCI JH-110 eight/four-track
Studer A810 with center-track timecode
Otari MX-5050 two-track
JBL 4311 and Auratone 5C monitors
Two dbx 160X compressors
AKG BX10 reverb

Edit 1:

Audioarts 16-input console
Lyrec TR532 16/24-track
Three Scully 280B two-tracks
JBL 4301 and Auratone 5C monitors
Two Dolby A-Type NR frames
AKG BX10 reverb

Foley Stage:

12 surfaces and water tank
Audio Developments 16-input console
JBL 4311 and Auratone 5C Monitors

Equipment for use in Any Studio:

Three IBM Personal Computers with MW's Sound Master editing/control software
BTX 4600 edit controller
BTX 4730 controller
Two BTX 4500 synchronizers
Four BTX Shadow synchronizers with wide-band timecode readers
Sony BVU-800 U-Matic
JVC 6650 ¼-inch VCR with address-track timecode
Two JVC 6400 professional half-inch VHS machines with RM70 remote
Leitch video sync generator
BTX TimeCode Centre
Custom ADR cue system
Auratone T5 two-way monitors

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ards — couple with suitable audio supervision on any given production — can a compatible blend be attained.

Facility Implementation: Emphasis on Timecode Synchronization

With experience as a recording studio, it was a natural transition for us to adapt the use of multitracks to the synchronization of sound elements to picture. Although, in our case, it certainly was the most convenient format to adopt, the advantages of synchronizing a 24-track to a videocassette machine via timecode, versus the use of dubbers, projectors and sprocket registration, are tremendous.

In each case, there are numerous strengths inherent in the components of a timecode-based tape-lock system. VCRs offer a tremendous shuttle and wind capability, which is a major consideration since the speed with which visuals can be accessed plays a significant part in the efficiency of the whole audio-for-video process. Top-of-the-line VCRs do not enter an unthread mode, allowing for rewind or fast forward rates of up to 40 times play speed directly from stop. With shuttle commonly variable from 1/30 to at least 10 times play speed with picture, a VCR offers strong competition to a conventional film projector. (The compact packages now available include stereo half-inch VHS



The Foley Stage at The Master's Workshop houses a total of 12 "surfaces" and a water tank. Microphones are connected through a 16-input Audio Development console. JBL Model 4311 and Auratone 4C Sound Cube monitor speakers are also provided.

videodecks with full freeze-frame capabilities and up to 12 times shuttle; their two audio channels allow for a standard configuration of guide audio on channel #1, and timecode on #2).

Multitracks are known for their superior sound quality and noise specifications, especially when running at 30 ips. In addition, compared to standard film configurations, one piece of tape can physically contain many more individual tracks, and the

transport's wind capability is not hindered by the fear of tearing sprocket holes or losing synchronization.

Timecode is the "electronic sprocket hole" of a tape-lock system. Unlike the simple mechanical synchronization role of its film counterpart, however, SMPTE address code brings many more benefits to the process: its simplest application is as a "smart" sprocket hole that does not require a head-sync reference. In fact, it can resynchronize on its own anywhere in the reel automatically. A micro-computer-based timecode system opens up the possibilities of autolocation, programmable events, electronic editing and offsets, while promoting improved machine control.

Although the principle of synchronizing a multitrack to a VCR via timecode dates back a number of years, we feel that the concept had not been fully developed as a working system capable of fulfilling the needs of the production community used to working on film. One of our main goals, therefore, was to ensure that all capabilities available in the film-sound world could be handled by a timecode system.

System Design Criteria

As components, our multitrack and VCRs had inherent speed and efficiency; it was important to maintain these features as the overall system developed. Ease of operation was also paramount, so that creative aspirations would not get lost in the communications between man and machine.

Our aim for flexible operation led to the development of a modular frame-

CUSTOM SOFTWARE FOR IBM PC — continued . . .

events at a time. The list can be scrolled up or down to view all 255 events, or requested event numbers can be selected at will, with the computer remembering the position of each list upon calling another.

The Edit List screen also displays the calculator section that can be utilized to enter events quickly into the list. List-management capabilities include the editing of an existing event, the deletion of one or a block of events, and the ability to insert a new event anywhere in the list with full "ripple" of the following events. Editing and insertion capabilities are accessed by a moveable colored "ruler cursor," which enters the screen to enclose existing events that need to be edited, or can be positioned between events for inserts. The ruler cursor also is useful for highlighting events one at a time, as information can be scrolled through it.

Parameter Customization

The Set Up screen allows for customizing the program for various applications. User-variable parameters, such as the record-in ramp time of various multitrack recorders, and the value for the automatic calculation of address starts (the tripping of an external device, typically a ¼-inch machine, at a specific timecode address) can be loaded into the system via the Set Up page, and the program will act accordingly. This feature allows for a single number in the calculator to be loaded into the address-start and record-in register with, for example, 15 frames automatically subtracted for the address-start point, and two frames off for the record-in point to compensate for the recorder's bias ramp delay.

The Set Up section also can be loaded with data for the various types of machines that could comprise the four transports controlled. In this way, specific damping and latching information need not be delivered to the intelligent interface as number codes. Instead, this information forms part of the program, allowing users to list their equipment in the English language with the computer sending the proper code to the synchronizer. (Such data can also be stored to disk, so that on program initialization the relevant information would be sent automatically by the computer.)

□□□

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SOUND FOR THE VISUAL AGE

work for all our systems. All machines have "one-plug" type connections for audio and video distribution, as well as single harness cables for synchronization control. Many racks are designed for "air pack" specifications, allowing systems to be conveniently transported with protection. Multitracks were also purchased with head stacks that could quickly convert their track format as our needs dictated.

A synchronizer to provide machine control and interlock between audio and video would also have to follow the modular nature of the rest of the system. BTX Corporation's (now Cipher Digital) Shadow synchronizer was chosen because of its intelligent design and capabilities, as well as the system's RS232C serial port that allowed an external computer control.

The lack of an "off-the-shelf" control system that could properly access the capabilities of the system in a way that easily facilitated audio post production was a major concern. A decision was made to write a custom audio-editing program for the IBM Personal Computer. Now called SoundMaster, the software has been in use for over two and a half years (see accompanying sidebar).

As the system developed, it was important that film and broadcast clients felt comfortable in the environment. In some cases, we purchased equipment that would be clearly recognizable to a sector of our clientele. A good example is the Sony BVU-800, a premier VCR with 40 times shuttle speed. Although it costs considerably more than competitive machines, the BVU-800's capabilities and reputation helped to demonstrated our commitment to excellence.

It is not only familiar equipment that helps foster a sense of well-being in a client. We make a point of talking their language, stressing how our systems are an evolution of the tried and true techniques used for decades in the film world. In this regard, Master's Workshop has incorporated the traditional services of sound effects and music editing, ADR, dialog editing/pre-mixing/Foley, and final mixing into our facility, in a way where much of the work can be done concurrently. In each case, there is a strong link to the concepts of the past using the technology of today.

Our Foley soundstage, we feel, represents a good example of our thought process in developing the system.

When first confronted with the idea of a person performing sound effects in sync to picture, and the need to build a proper stage to facilitate this, an alternative was proposed. At the time, the first generation of computer sampling devices was hitting market. Would it be possible to have someone at a keyboard "performing" naturally-sampled sounds, like footsteps, in sync with the picture rather than physically on a surface? The answer is no, for two main reasons. The first was that the process was no faster than a highly trained Foley artist, who can often perform a footstep track in dead sync in one or two passes. However, there was also a key component missing with the computer-accessed sounds: the human element. A Foley artist is just that; someone who really adds the flair to the sound that makes it fit, in ways other than simple synchronization.

We decided to build a dedicated Foley Stage, with permanent surfaces that would not have the tell-tale sound of portable structures rolled into a studio. While we would use a concept that dates back to the Thirties, our shuttle and synchronization capabilities, together with the ability to roll in a 24-track if many tracks are required, advance the art so that we end up with the best of both worlds. One key side effect of the process is that since it requires such little time to re-cue and roll again, hardly ever do we have to fit Foley sounds in a edit suite after a session — it is faster to simply do a second take in sync.

Our effects editing suite is similar in concept to an edit room with a Steenbeck or Moviola, but the capabilities are much broader. Our editor works to a VCR picture and lays sound directly from our ¼-inch tape library onto an interlocked 24-track. The ability to source directly from ¼-inch and fit simultaneously to the multitrack frame-accurately combines two film-style processes into one. (Sound editors are used to transferring from source to sprocketed magnetic film, and then manually fitting to picture.)

The suite is also equipped with a small mixing console, and a monitoring system similar to that used in the mix theatre, which not only allows the editor to hear more channels at once than he is used to, but also facilitates many other capabilities within the sound-effects editing domain. The ability to equalize library sound effects can help the editor make more accurate decisions as to the viability of a sound early on in the process,

Production and engineering staff at The Master's Workshop includes (from top left): engineer/Foley recordist Frank Morrone, editor/mixer Terry Gordica, sound editor Yanina Jezik, chief engineer Paul Massey, technician John Scott, and engineer Jim Frank.



rather than in the mix stage where it can cost time and money. Even though the editor doesn't have to lay the effect with equalization, knowing that some bass boost, for example, will make an earthquake effect work can save hours of searching for a replacement.

The ability to pre-mix sound effects tracks within the suite has obvious benefits. This capability is a direct result of multitrack recording technology, allowing space on the same piece of tape for discrete sound elements and a composite pre-mix. In a final mix, no phasing occurs when cross-fading between the elements and pre-mix because they are on the same piece of tape, a problem that arises when separate dubbers contain the components.

A good example of the use of pre-mixing in the sound-editing suite is a car chase. Individual tracks of tire squeals, engine revs and the like, are first fitted to the picture. The editor then combines these sound elements in the way he envisions them working to a parallel pre-mix track. When it comes to the final mix, the mixer could use the single pre-mix track and augment, if necessary, any element that needs boosting with the discrete tracks. If the pre-mix was not at all satisfactory, he closes one fader and opens the discrete channels to mix the sequence himself. In practice, since the editor has the best idea of how the components are supposed to merge together as a package, the end result is that most of the time the pre-mix is acceptable with minor modifications. This saves time and thus money, in the mix theatre and editor goes away happy that the sequence is as he envisioned it.

This philosophy of having the person most familiar with the tracks to be the one laying and merging them into submixes, is one we uphold throughout our facility. This is true when we score programs from individual music cues from a show library, as well as in our work with dialog. In the latter, our editor/mixer doesn't separate the tracks so that someone later in the process can combine them in a mix. Instead, he produces a balanced dialog pre-mix incorporating the traditional editing and fitting.

A question that often arises is just how accurately one can edit electronically, compared to the precision of manually cutting sprocketed magnetic film. With 35mm mag, where there are four sprockets per frame, and film runs at 24 frames per second, typical audio editing accuracy is to 1/96 of a second. Electronically, our smallest increment is 1/100 of a video frame, or 333 microseconds. Clearly, there is no question of the precision

available, and an extra bonus is that the track does not have to be physically cut.

ADR is also made more efficient with computer technology. Our SoundMaster system allows us to pre-load looping sequences, as well as relay closures to activate external count-down beepers. With a simple videotape search machine and the computer in an office, events can be stored to disk in files for separate actors if necessary. Later, in the studio information can be recalled from disk and easily modified. This capability, together with the speed of shuttle, speeds up ADR sessions.

One of the first questions we were asked years ago by a drama producer skeptical about mixing "tape-lock" was: "How can you possibly slip tracks?" Of course his question related to the fact that we had 24 tracks locked in sync on one reel of tape, and he found it difficult to understand how we could physically cut away track #5 from the tape and reposition it! (With film-mixing techniques, as most of you will know, it is customary to take a dubber out of interlock, reposition it so the sound is in the revised location, print that new position as part of the final mix, reposition the dubber back to correct sync, and carry on.)

The answer comes from the multiple machine control we utilize during mixing. One possible scenario might find music and sound effects on a 24-track, dialog and ADR on an eight-track, with another eight-track recording the stereo English and M&E (music plus effects) mixes. As part of the sound design of the project, we leave at least one free channel on each of the source machines. Moving a sound effect from the 20-minute mark of a film to the two-minute mark is all done in a matter of seconds from the SoundMaster keyboard, without anyone leaving their chairs. We offset the 24-track, trimming the new location a frame at a time, or less, from the keyboard until the sound is perfectly in sync in its new location, and then print that new location on the eight-track source machine that still has a zero offset with the video. Once complete, the 24-track's offset is cleared, it autolocates back to its proper position automatically, and we now have the sound in two places. This procedure is very handy, especially if the repositioning was only a small amount, and the producer decides he likes the sound better in its first position. Although we do drop a tape generation, the signal degradation on correct multitrack technology is minor compared with the time saving that



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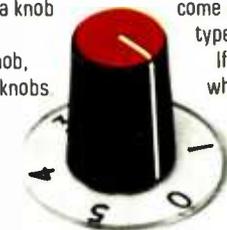
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occurs.

Another added benefit to utilizing multitrack arises in the mix theatre when a new sound effect has to be added in sync. There is no need to tear down a reel, go back to an editing room, transfer the effect to mag, fit it, and re-lace the reel. Our mix theatre is equipped to frame-accurately trip a tape loaded on a rack-mounted ¼-inch machine onto the multitrack.

There are two other main benefits of mixing at our facility we feel to be of paramount importance: console automation, and the ability to perform invisible audio insert edits. Our modifications to the tape-machine electronics are a custom design circuit that enables punch-ins and -outs without holes, bumps or clicks, in practically any program material. Together with the programmable capability of SoundMaster, and the fader-level information provided by the console automation, frame-accurate, insert edits allow modification to previously mixed material with confidence. The pick-up capability alone eliminates the need to look for a place that will disguise the punch-in.

Our Sony/MCI JH-50 console automation system records VCA level data on a free tape track. At a pickup point, the data is fed back to the console, and the mix machine pro-



Edit One, a sound-effects suite, features an Audio Arts 16-input console, a Lyrec TR532 16/24 track, and three Scully 280B two-tracks.

grammed to go automatically into record at that point. We can rest assured that the pickup will work, without the need to manually A-B what is on the tape compared to what is coming out of the console at a specific edit point.

Console automation, however, has a much broader significance to audio post production. There is never the need to say "Let's not try another pass to correct that problem because we might not get the rest as good again." Our JH-636 automated con-

sole provides fader and mute information for each channel strip, with the ability to update on successive passes. For a very complicated scene in a drama production, our two engineers — one mixing sound effects and the other dialog and music — take the mix to the ballpark stage. When it is agreed we have a good foundation to build on, successive automation passes maintain the base data and incorporate updates of fader-level changes. If a particular sound effect was slightly low on the first write, it is updated and increased in level on the next pass, with all other levels being automatically adjusted to recreate our live performance.

Specific Production Applications

Toronto is an interesting marketplace in the television and film production field. In terms of size, it is now the third largest market in North America behind New York and Los Angeles. However, the city is somewhat free of the traditional and labor restrictions of a community like Los Angeles, which is steeped in the business of film traditions.

Multitrack for Video

For soundtrack production of *Pygmalion*, a television play starring Peter O'Toole and Margot Kidder, and produced by Astral/20th Century Fox, the director wanted feature-quality recording of original dialog. In order to deliver this, plus allow for greater flexibility in post, we recorded all sound elements, including radio microphones, booms and ambience pickups to a 24-track installed in the television studio's audio booth. Time was saved in the shoot due to the lack of concern for audio problems relating to boom cross fades, RF "hits," and extraneous noise (clothes rustle, etc).

During subsequent post production, the multitrack tapes were conformed to the final video edit reel using our



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To obtain fast release times with freedom from dynamic distortion, there's Program Controlled Sustain, which automatically lengthens release times as dictated by program content. Program Dependent Attack is employed in the GateX to shorten attack time automatically

when required by program content. The inclusion of Valley People's TA-104 VCA in the GateX ensures that no noise or distortion is ever added to the signal being processed.

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SoundMaster system, individual tracks being kept discrete until the final mix stage. A dialog pre-mix was performed to ensure that at no time in the production was more than the minimum number of microphones open to the studio floor, which allowed for a very clean final dialog track. Then our editors created suitable atmospheres and specifics in layers in the edit suite, and one of Toronto's top Foley artists contracted to recreate movement sounds such as footsteps, clothes rustle, water, and doors. Finally, the elements were brought together on various multitracks, locking up to as many as four machines in the final mix.

Live Concert Video Shoots

In many cases, our facility is utilized on large-scale music productions, as was the case in the recording and mixing of a TV special for Supertramp. To facilitate the mixing of 46-track material recorded live at the C.N.E. Stadium in Toronto, two 24-tracks were interlocked to a 3/4-inch video reference with timecode. Utilizing a printed Edit Decision List (EDL), determinations were made as to the position of each song in the final show, and with calculated timecode offsets, the original multitracks were locked to picture. After completion the mixes were stored, in show position, on an eight-track "pile-up" reel. Adjacent tracks on this same reel were used for the layering of audience and other backgrounds to fill out the show, and a final stereo mix then delivered from this element.

Other similar systems have been utilized in the production of shows for The Police, Chris De Burgh, The Band, and a television and theatre

special for Yes.

Combining Film and Tape Elements

In some cases our work involves the

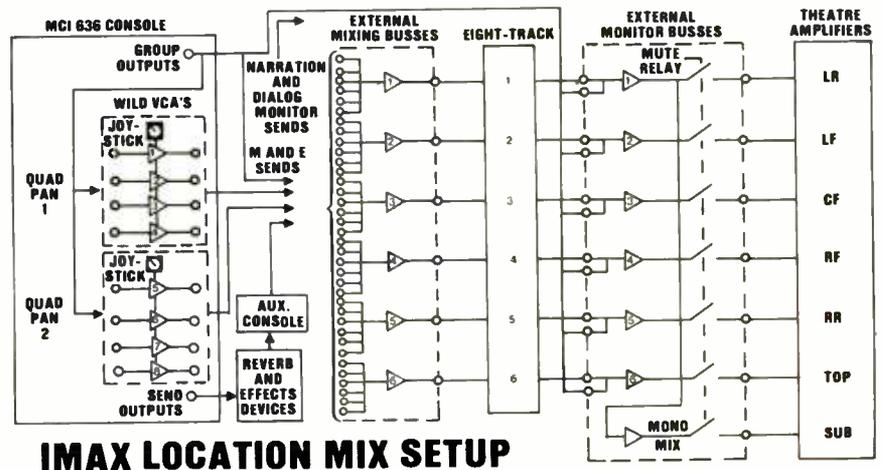
blending of certain film elements with our own tape elements. Such was the case in a 26-show series of nature programs, titled *Profiles of Nature*. Here, some specifics were cut on a film

MIXING TECHNIQUES FOR IMAX 70mm SIX-TRACK PRESENTATIONS

Being well versed in stereo mixing for video, the prospect of mixing the IMAX film *Skyward* presented two major concerns, the first of which was how best to monitor a six-channel mix. After many discussions regarding the feasibility of simulating an IMAX theatre in a control-room environment — with its inherent guesswork, screenings, and remixes — it was decided that mixing in an actual IMAX theatre was the only way to obtain accurate results.

This approach involved renting the Cinesphere Theatre at Ontario Place, Toronto, removing several seats and installing a 10- by 25-foot platform. We also rented and installed an MCI JH-628 console (upgraded to 36 inputs, plus eight wild VCA faders); and additional 16-input board for echo returns; two JH-24s for playback; one JH-110 eight-track to record the mix; three BTX Shadow synchronizers controlled by our custom SoundMaster software for the IBM PC; a projector to display the video image on the IMAX screen; plus a comprehensive complement of outboard gear.

Most of the audio mixing was done to a timecode-stripped VCR master for improved shuttling speed. When a section was complete, however, it could be reviewed while locked to the actual IMAX print — this merely required having a timecoded-reel loaded on the IMAX six-track mag dubber, which the eight-track slaved to while the IMAX print was



IMAX MIXING TECHNIQUES — continued . . .

rolling. (Changeover between the two master codes took only a couple of minutes.)

The second concern in setting up for an IMAX mix was how to adapt the JH-636 console for six-channel mixing. Since it was designed for stereo mixdown, there were shortcomings in the areas of assignment and panning capabilities, and six-channel monitoring. (The fact that the console was rented made circuit modifications inappropriate.) The IMAX playback system is basically a discrete six-channel, full-range format, supplemented by a single subwoofer channel that receives a mono mix of all six discrete channels, lowpass filtered at 80 Hz (see below). While the JH-626's 24 bus assigns offer plenty of routing options, busses cannot directly represent speaker channels because the console only allows panning between odd/even bus pairs, and therefore would not accommodate panning between LF and C (2/3), RF and RR (4/5), RR and LR (5/1) or CF and TOP (3/6).

To accomplish the non-standard assignments, panning was done between the standard MCI odd/even bus pairs, which were then recombined in an external mixing bus package to route them to the proper speaker channels. As can be seen from the accompanying schematic, the external package consisted of six mixing busses — one representing each speaker channel — with assigns to each bus in the form of input patch points (six input patches per speaker channel).

Aural and Visual Perceptives

Mixing inside an IMAX theatre allowed precise localization of sound relative to image. To make full use of this ability it was necessary to incorporate multichannel panning with full automation capability. Instead of using a conventional quad panner to pan an audio signal to four channels, it was used to pan the control voltages of four VCA fader modules, enabling the pan moves to be repeated under automation control.

Panning was achieved by affecting the relative control-voltage levels of the four VCAs. Depending on the signals sent to the VCA inputs, one mono signal could be panned between any four channels, or a stereo signal could be panned between any two sets of stereo channels (i.e., front L and R to back L and R). The quad pan signals were recombined into the mix by patching the VCA fader module outputs into the four selected external mixing bus inputs, which fed the channels across which the signal was to be panned. Two such automated quad panners were provided, controlling eight VCA fader modules.

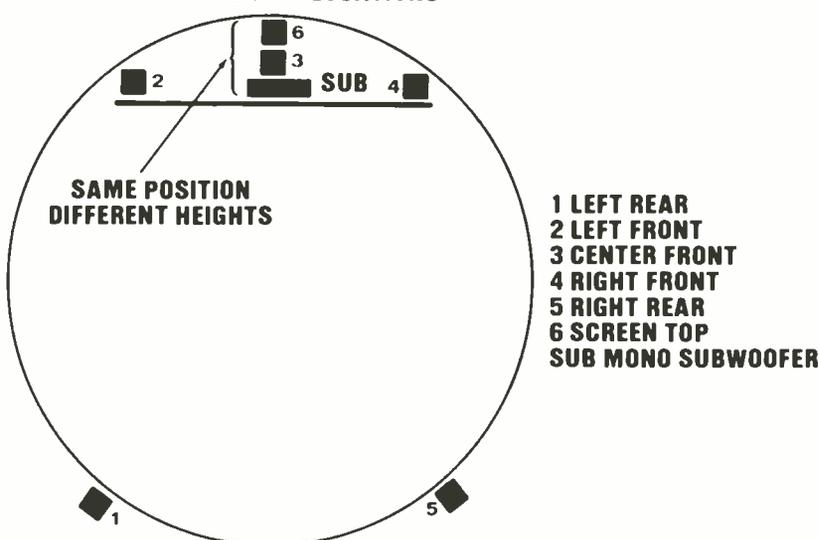
Six-channel monitoring was the final shortcoming to be addressed. To enable the recording of an M&E (music and effects) mix, while still allowing narration and dialog to be monitored, it was necessary to provide another six monitor mixing busses that combined the six-channel M&E mix with the positioned monitor feeds of narration and dialog. This was built into the same external package with patch inputs, although only two inputs per speaker channel were necessary in this case.

To achieve muting of monitor feeds during shuttling of audio machines, a mute relay was added in series with the monitor bus outputs, and was controlled by the timecode synchronizers. These post-mute-relay monitor signals were fed directly into the theatre's power amplifiers.

With minor maintenance being performed either late at night or early in the morning, the mix was completed with no downtime. The success of this approach, and the systems used, can be confirmed in light of the second such project currently being undertaken for the Omnimax film *A Freedom to Move* by Nanouk Films. (OMNIMAX is a planetarium type adaptation of the IMAX format, using fish-eye lenses in filming and projection.)

□□□

IMAX SPEAKER LOCATIONS



SOUND FOR THE VISUAL AGE

bench along with the picture, transferred to VHS in PCM-F1 digital form with an analog SMPTE timecode track, and later locked to our 24-tracks and transferred. Then, in our edit suites, other atmospheres and specifics were layed, Foley recorded, and music fitted. When the stereo mix was complete, we restriped the one-inch video master and, having made suitable timecode, speed and frame-rate provisions on the initial film-to-tape transfer, we also transferred to a 16mm mag dubber to provide for film and tape distribution (a common practice). *Profiles of Nature* now airs on over 40 PBS stations in the U.S., and was one of the first shows to be broadcast in stereo from WTTW, Chicago.

IMAX: Six-track Audio

Perhaps the most intriguing application of audio-for-video technology can be demonstrated in our process of sound recording and mixing for a 70mm, six-channel IMAX film, entitled *Skyward*, currently showing at the Japanese World's Fair. In this case, our associate supervising editor, Bruce Nyznik, prepared all the tracks on 35mm mag, and here again we transferred up to 24-track via the PCM-F1 digital format on VHS videocassette. The musical score, recorded by our chief engineer, Paul Massey, who also mixed the film with Bob Predovich, was recorded and pre-mixed into 10-channel configurations to allow for maximum flexibility of all musical and FX sounds in the final mix. The intention was to create the optimum mixing environment for such a property by actually mixing *inside* an IMAX theatre.

In order to accomplish this, our technical department developed several custom boxes to enable access to the six-channel monitoring and interlock to a 70mm projector system, and installed a complete 48-track computer-automated mixing system inside Canada's first IMAX theatre, Cine-sphere, at Ontario Place in Toronto.

The mixing process proved to be quite an exercise in "cerebral dexterity" for Predovich and Massey, who found themselves immersed in timecode numbers during the pre-mix process. In this initial stage, blocks of up to 66 FX tracks were reconfigured into more manageable 22-track pre-mixes, and simultaneously conformed into show position on a second 24-track master. Later, as picture revisions occurred during the 10-day mix, adjustments were made in the soundtracks by re-enacting this process utilizing new timecode offsets. The multi-

channel music was moved into position in the same manner, and the final mix then involved a total of 30 to 40 FX and music elements.

Once again, console automation proved invaluable as the mixes were built in stages with data stored on open tape tracks. Through a unique six-channel monitor package designed by David Armstrong of our technical department, we were able to monitor all elements, including dialog, store the data relating to the mix, yet only print a six-channel M&E to a one-inch eight-track. This technique enabled us to later add back the dialog utilizing the automation data in a pass to a second eight-track and, more importantly, add foreign languages in the same manner, thus avoiding any actual remix outside of the theatre.

Many other examples could be discussed of the flexibility and efficiency of our audio-for-video systems as they relate to serial television (*Littlest Hobo* for CTV, *Hitchhiker* for HBO); specials (*Magic Planet* with Toller Cranston for ABC, *A Case of Libel* with Ed Asner for Showtime); concert specials (as above, plus many more); and features (*Skyward*, an IMAX film for Japanese World Trade Expo) and, in production now, *A Freedom to Move* for the Theme Pavilion at Expo '86 in Vancouver.

Stereo Television and the Future

There are many questions and concerns centering around the future of Stereo Television; our involvement in the mixing of over 60 stereo TV programs has led us to some important conclusions. First, it is evident that the increasing awareness of the consumer to improved television sound will have a continuing impact on the production industry. Sound specialists — particularly those already versed in multitrack recording and mixing — are being challenged to meet these demands which, in terms of fidelity, stereo capability and efficiency, can best be handled by a time-code interlock system.

The production of stereo sound is, however, a question that still requires a proper answer. Seemingly, no standard exists. Some feel that all original sound elements should be shot in stereo, which obviously creates problems when later marrying sound and picture perspectives. All too often, stereo sound is over-emphasized to the extent that, rather than simply creating a fuller and more natural track, it becomes a two-channel special-effects device.

We have found that most of the imaging for Stereo Television can be subtly accommodated in the mix itself. Backgrounds may be layed in

stereo, and a stereo music track used to tremendous effect. Specifics can be positioned or panned if required to enhance the image, while dialog is usually best located in the middle of the mix.

It is worth repeating that those of us equipped and qualified to deliver such sound production can quickly solve a producer's dilemma over how best to mix stereo, by taking charge and delivering a stereo video master that is mono-compatible. Whether or not the product is immediately slated for stereo broadcast is immaterial, given that it will have increased shelf life and marketability by *not* being limited by a mono-only track for future

distribution.

The future holds many exciting prospects for the audio industry as digital technology takes hold and audio post systems became standardized and accessible. Our development plans include random-access sound effects recall, the ability for Sound-Master to communicate directly with videotape editing systems, highly variable and programmable monitoring systems, and much more. All systems are intended to provide audio post with the same efficiencies learned in the videotape world, in terms of off-line/on-line editing. The future looks exciting, and we hope to be able to help shape it. ■■■

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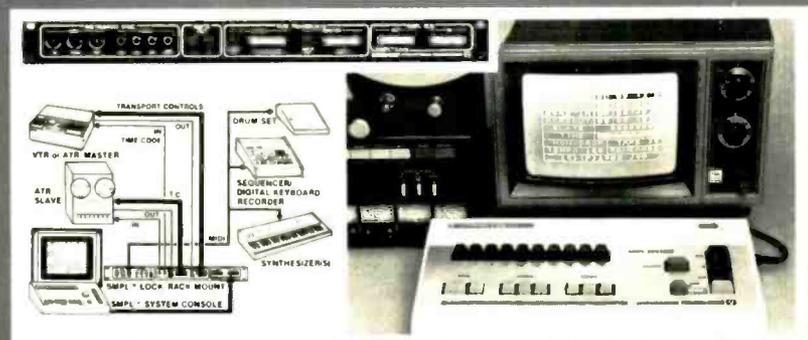
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STUDIO FACILITIES EQUIPMENT PEOPLE UPDATE

heast:

NIQUE RECORDING (New York City) has added a second **Quantec QRS Room Simulator**, and its fourth **Otari MTR-90** rack. In addition, the studio is Beta testing two new products for **Roland Corp.**: the **MPS** (MIDI Processing System) sequencing, editing, and music scoring software written for the IBM PC; and the **MUSE** eight-track sequencer for the Apple IIe. 701 Seventh Ave., New York, NY, 10036. (212) 921-1711.

□ **EUROPADISK** (New York City) has acquired the first **Teledec Technology DMM** (Direct Metal Mastering) system in the U.S. **Gotham Audio**, the sole agent for the system's U.S. sales, says that the **Neumann** lathe-based DMM system simplifies the manufacturing of records, reduces pre- and post-groove echo, and retains high sound quality through the inner diameter of the record by incorporating copper instead of vinyl material for cutting blanks. Installation of a second system is expected at **Amigo Studios**, North Hollywood, CA, in the near future. 75 Varick Street, New York, NY, 10013. (212) 226-4401.



EUROPADISK — first U.S. DMM system

□ **SOUND IDEAS STUDIOS** (New York City) has taken delivery of a **Solid State Logic SL 6000 E Series Video System**. The 56-input mainframe is fitted with 48 input/monitor-output modules, and includes **Plasma Metering**, **Studio Computer**, **Total Recall** console automation, plus a three-machine **Integral Synchronizer** and **Master Transport Selector**. With the new installation in **Studio B** — which measures 28 by 34 feet, with an 18-foot ceiling — the facility is anticipating an increase in film and video post-production sessions. 51 West

46th Street, New York, NY, 10036. (212) 869-2666.

□ **EASTERN ARTISTS RECORDING STUDIO** (East Orange, NJ) has installed an **E-mu Systems Emulator II** digital synthesizer, together with a **Yamaha RX-11** digital drum machine, and a **Tascam Model 122** cassette deck. 36 Meadow Street, East Orange, NJ, 07017. (201) 673-5680.

□ **INNER EAR** (Queens, NY) has added a **Roland SDD-3000** digital delay line and **SD-1000** digital delay, two **Symetrix** noise gates, a pair of **Beyer M260** ribbon mikes, and an **E-mu Systems Emulator II** with sequencer. In addition, an **Oberheim DX** digital drum machine is also available. 118-7 97th Avenue, Queens, NY 11419.

□ **CENTURY III AUDIO** (Boston) has added the following hardware to its recently completed **Mix-to-Picture** audio post-production suite: an **Eventide H969 Harmonizer** with pitch-change capabilities for voice-overs and special-effects mixing; a dedicated one-inch videotape machine to handle the increasing volume of commercial sound mixes that are being made to that format; two channels of **Dolby A-Type** noise reduction; and updated software for the facility's **Lexicon 224X** digital reverberation system, including backwards reverb. 300 East 44th Street, New York, NY, 10017. (212) 949-7000.



INNER EAR — new outboard gear

□ **NORTHEASTERN DIGITAL RECORDING** (Shrewsbury, MA) has installed a **Sony DAE-1100** digital audio editor, possibly adding credence to the claim of being New England's only facility to handle professional digital recording, editing and mastering for **Compact Disc**. 12 Sadler Ave., Shrewsbury MA, 01545. (617) 753-1192.

□ **CRITERIA STUDIOS** (Miami) has ordered two **Solid State Logic SL 6000 Stereo Mastering** consoles with **Total Recall** and **SSL Computer**. Formerly called **Eastwing Studios**, the renamed **Studio A** and **B** will also share a **Mitsubishi X-800** digital 32-track. In addition, **Studio C** is receiving a new monitoring system designed by **Ed Long**, consisting of custom-built, **Time-Aligned** speakers housing **TAD** drivers. The facility's owner/president **Mack Emerman** says that his complex is going through a major upgrade, and that **Studio A** will open by mid-July, and **Studio B** by mid-September. Miami, FL (305) 947-5611.



UCA — completes major renovation

□ **UCA RECORDING** (Utica, NY) has completed a year-long renovation of its facility. The equipment list now includes a **3M M79** 24-track, an **AMEK Angela** console, and a **Sony PCM-701** digital processor. Outboard gear comprises a **Lexicon 224XL** reverb with **LARC** remote system and **Prime-time** digital delay, an **EMT** plate reverb, a **Deltalab ADM-2048** programmable digital delay, a **Roland SDE-1000** digital delay, **Orban 622B** and **67A** parametric EQs, **UREI 1176 LN** limiters, and **Valley People Kepex II** noise gates. Microphone selections are from **Neumann**, **AKG**, **Sennheiser**, **Crown PZM**, **Shure**, and **Electro-Voice**; a seven-foot **Steinway** piano, a **Yamaha DX-7** synthesizer, and a **Fender Rhodes** electronic piano form part of the keyboard arsenal, while an **Oberheim DX** drum machine,

and **E-mu Systems Drumulator** comprises the electronic percussion section. 1310 Lenox Avenue, Utica, NY, 13502. (315) 733-7237.

Midwest:

□ **ARS RECORDING STUDIOS** (Alsip, IL) has added an **Otari MTR-90** 24-track, in addition to updating its **Trident** console to a 28-by-24 configuration. 11628 South Pulaski, Alsip, IL 60658. (312) 371-8424.

□ **3001 RECORDING STUDIOS** (Columbus, OH) has completed construction of its second recording studio, and has added the following hardware to the complex: a **Yamaha TX816 FM** synthesizer rack; an **Ensoniq Mirage** sampling keyboard; new sequencing and editing software for its Apple-based system; and a **Cipher Digital/BTX** synchronizer for the facility's existing 10-synthesizer MIDI system. 300 Indianapolis Ave., Columbus, OH 43202. (614) 262-3001.

□ **FIFTH FLOOR STUDIOS** (Cincinnati) has added an **Audio Kinetics Q.Lock 3.10** SMPTE timecode synchronization system, a digital automation system for the facility's **Sphere** console, and a **Sony MCI JH-110B** Audio Layback System for recording final mono/stereo audio mixes on the master one-inch C-Format videotape master. 517 West Third Street, Cincinnati, OH 45202. (513) 651-1871.

□ **TRACK RECORD STUDIOS** has relocated to the midway area of St. Paul, Minnesota, and now offers full eight- and 16-track facilities based around a new complement of control-room equipment that includes **Tascam** multitracks, **Audiotrack** and **Studiomaster** consoles, plus a wide selection of outboard processors. Future plans for the 4,000 square foot complex, which currently houses a main studio and control room, include the construction of a second studio/control room and a tape

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*Dolby HX Pro is a trademark of Dolby Laboratories.

STUDER REVOX



STUDIO FACILITIES EQUIPMENT PEOPLE UPDATE

copying/editing room. 1561 Sherburne Avenue, Saint Paul, MN 55104. (612) 645-928.

□ **THE ALLIANCE RECORDING CO.** (Fenton, Michigan) is a new, 24-track recording studio located at the former Grand Funk Railroads' "The Swamp" studio. The facility, measuring 40 feet by 36 feet, houses a 56-channel **Neotek** console, **Sony/MCI JH-114/110** 24-track and mastering decks, **Lexicon 224XL** digital reverb, various outboard gear, and classic microphones from **Neumann, Sennheiser, AKG, Beyer, Shure, Electro-Voice, and Crown**. Several instruments are available to clients, including an **Oberheim OB8** synthesizer, and a **LinnDrum** machine. Owners **Mark Farner** and **Al Hurschman** say the studio design was under the consultation of **Milam Audio's Jerry Milam**. 8449 Parshallville Road, Fenton, MI 48430. (313) 632-5653.

Southeast:

□ **SKYELABS, INC.** (Dover, Delaware) has installed two **Otari MTR-90** 24-tracks, two **MX-5050 Mark III** two-tracks, and a 384-point patch bay into its mobile recording unit. 58 West Tidbury Drive, Dover, DL 19901. (302) 697-6226.



SKYELABS — adds new Otari tape machines

□ **CRITERIA STUDIOS** (Miami) has ordered two **Solid State Logic SL 6000 Stereo Mastering** consoles with Total Recall and SSL Computer. Formerly called Eastwing Studios, the renamed Studio A and B will also share a **Mitsubishi X-800** digital 32-track. In addition, Studio C is receiving a new monitoring system designed by **Ed Long**, consisting of custom-built, Time-Aligned speakers housing TAD drivers. The facility's owner/president **Mack Emerman** says that his complex is going through a major upgrade, and that Studio A will open by mid-July, and Studio B by mid-September. Miami, FL. (305) 947-5611.

□ **SHEFFIELD AUDIO-VIDEO PRODUCTIONS** (Phoenix, MD) has completed the construction and outfitting of its new custom-designed, 24-foot remote truck, which is equipped with a new **Trident Series 80** console, a **Sony PCM-3324** digital 24-track recorder, dual 24-track **Studer** multitracks, and 48 channels of **Jensen** mike splitters. 13816 Sunnybrook Road, Phoenix, MD, 21131. (301) 628-7260.

□ **MORRISOUND RECORDING** (Tampa, FL) has installed an **Otari MTR 12** half-inch two-track mastering deck to complement its existing **Sound Workshop Series 34** console, and **Otari MTR 90** based control room. 120 North Florida Avenue, Tampa, FL, 33603. (81) 238-0226.

South Central:

□ **SOUNDS UNREEL** (Memphis) has added a **Soundcraft TS-24 32-by-32** console, and an **AMS RMX-16** digital reverb system to its 24-track facility. In addition, the facility also opened a separate room for audio pre/post production, and synthesizer/sound effects overdubbing. 1902 Nelson Avenue, Memphis, TN, 38114. (901) 278-8346.

□ **TELE-IMAGE** (Dallas) has acquired **Gary French**, as supervisor of its new 32,000 square-foot production facility headquartered in The Dallas Communications Complex. Previously, French was chief mixer and head of sound for **Allied ± WBS Film Video Services** in Dallas, where he worked for seven years. Dallas, Texas. (214) 869-0060.

□ **GENESIS SOUND** (Dallas), a 24-track studio formerly known as Rainbow Sound, has formed a new in-house production company titled **Fourth Day Music**. The facility's owners, manager **Glen Sloan** and creative director **Charles F. Brown**, say that the new service will help writers and composers contact viable publishers and record labels within the field of religious music. 1320 Inwood Road, Dallas, TX 75247. (214) 637-0678.



SOUNDS UNREEL — console addition

Southern California:

□ **JUNIPER RECORDING STUDIOS** (Burbank) a 24-track recording facility, has acquired an **Sony/MCI JH-110** two-track, and **Aphex** compellor/limiter, two **Hitachi** cassette decks, and the **LARC** remote control system for its existing **Lexicon 224XL** digital reverb. **Jan Harrison**, studio manager, says that these new additions will add to the facility's album, post-production, and jingle capabilities. 719 South Main Street, Burbank, CA 91506. (818) 841-1244.

□ **THE RUBBER DUBBERS**, an ADR (Automatic Dialog Replacement) facility has re-located to Glendale, CA. The new 1,800 square-foot building is reported to house capabilities for high-speed Foley/ADR 35mm mag dubbing, with equipment comprising a custom **Veedor Root EPROM-based ADR** computer system, a custom-built **Quad-Eight/Westrex** 12-in/six-out console linked to an **RCA PM-861** and **MTM** recorder/dubbers, backed by an **Ampex ATR 102** two-track. Outboard gear includes **Dolby A** noise-reduction, **EMT 240 Gold Foil** reverb, **Valley People Kepex** noise gates, **UREI Little Dipper** filters and **LA-2As** limiters. Microphones supplied by **Neumann, Crown, and Sennheiser**. In addition, 27 editing bays, two transfer bays, and a sound effects library are available. The facility is also planning to build a six-track stereo dubbing theater. 626 Justin Avenue, Glendale, CA, 91201. (818) 241-5600.

□ **ARTISAN SOUND RECORDERS** (Hollywood), the music recording and record mastering facility formerly owned by Kendun Recorders, Burbank, has been purchased by the **Latorre Family** of El Paso, Texas. **Fernando Latorre**, spokesman for the family, says that he retained **William Rogers** as general manager, and **Greg Fulginiti** as director of mastering for the new company, which will continue to operate under its previous name. "We intend to continue the [facility's] established tradition — excellence in engineering, state-of-the-art equipment, and the best possible service for our clients," Latorre states. Hollywood, CA. (213) 461-2070.

Northern California:

□ **SAN FRANCISCO RECORDING** (San Francisco), is the name of a new studio located at Wally Heider Recording's former Studio C, which recently opened its doors with an automated 40-input **API** console and custom monitoring system. Owner **Dan Alexander**, former owner of The Hyde Street Studios and Tewksbury Sound Recorders, says that the studio also includes many rare tube equalizers and limiters, a **Publison** pitch-shifter, **ITI/Sontec** EQ, and four reverb systems including two acoustic chambers. 245 Hyde Street, 2nd Floor, San Francisco, CA 94103. (415) 474-0377.

STUDIO FACILITIES EQUIPMENT PEOPLE UPDATE

□ **MUSIC ANNEX** (Menlo Park) has acquired several new items of digital hardware, including the **ADR/Sony 701-ES** digital audio processor and **Lexicon PCM 60** digital reverb, the latter added to Studio C along with an **AMEK 2500** console. For audio sweetening sessions, an **Audio-Kinetics Q.Lock 3.10** timecode synchronizer with ADR upgrades and a **JVC VHS** video recorder have been added. In addition, a pair of **Yamaha NS-10s** are available as secondary monitors, and Studio B has received **UREI** third-octave equalizers. The facility's new **Tape Duplication Division** recently upgraded its new plant with the addition of another **King 790** loader. 970 O'Brian Drive, Menlo Park, CA 94025. (415) 328-8338.



MUSIC ANNEX — new AMEK board

□ **PRAIRIE SUN RECORDING** (Cotati) has taken delivery of a **Studer A80** 24-track machine with autolocator and remote control, and a second **AMSRMX-16** digital reverb, with updated software. In addition, the studio is now equipped with **Monster Cable's** audiophile speaker cable, and **Pro Link Series 1** microphone cable. Instrument additions include a **Sequential Circuits Prophet 10**, and an **E-mu Systems Drumulator**. P.O. Box 7084, Cotati, CA 94928. (707) 795-7011.

Great Britain:

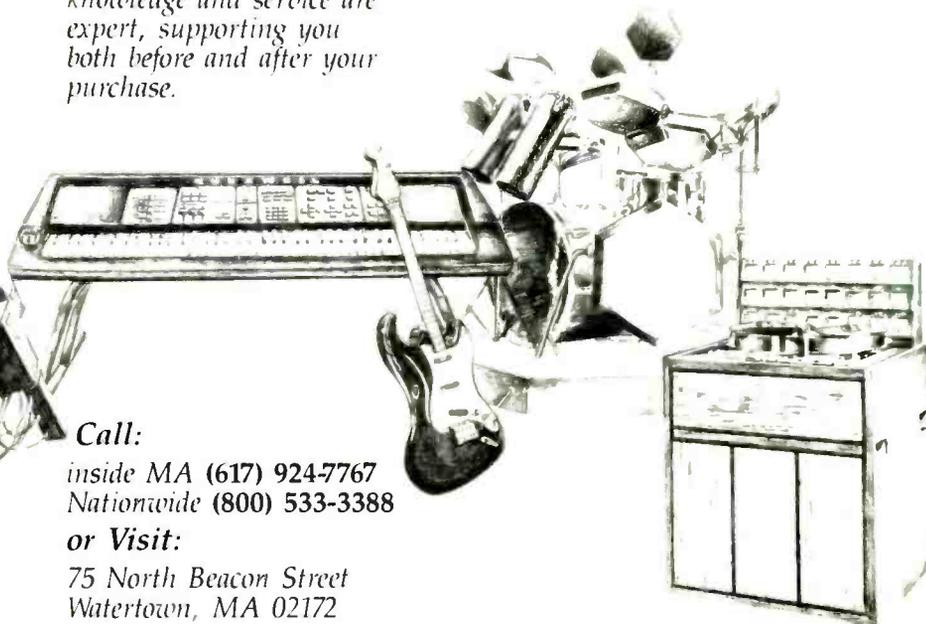
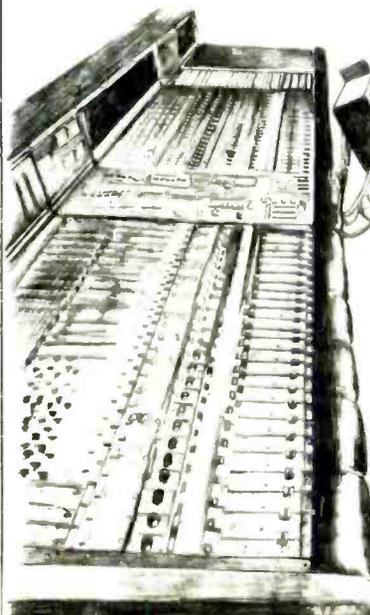
□ **THE BRITISH BROADCASTING CORPORATION** (London) is scheduled to install a pair of 40-channel **Solid State Logic SL 4000 E Series** consoles with Studio Computer in two new Stereo Control Vehicles (SCVs) that will be put into operation during the summer. Both mobiles are based on 35-foot articulated trailers, and are intended for radio outside broadcasts, music recording, and Stereo TV simulcasts. SCV-5, which will be based at the BBC's regional production center in Manchester, England, also will be equipped with Total Recall automation, allowing complete console settings to be transferred via floppy disk between other BBC facilities equipped with SSL consoles. SCV-6, will be based at Birmingham, and fitted with the SSL Real Time System, thereby allowing preset sequences of all fader, group and mute settings to be run during live broadcast. Both vehicles are scheduled for operation by summer of 1985. The Corporation already has two SSL-equipped mobile vehicles in operation: SCV-3, based in London, and SCV-4 in Glasgow, Scotland. *London.*

□ **PWL STUDIOS**, (London) is a newly opened, personal-use, two-studio complex that houses a 48-channel **Solid State Logic SL 4000 E Series Master Studio System** with Total Recall and Plasma Metering. Owner **Pete Waterman** says that the studios premises was originally an emergency power station for a local hospital, then became Vineyard Studios. When Waterman acquired the property, he had **Eastlake Audio** provide the studio design, with assorted furnishings by **XL Designs**. *London.*

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Advertising's not our business, but we assumed that something as unique as Turbosound should practically describe itself. Our agency kept telling us to "stress the *benefits*, not the *features*," but the printed page has a way of reducing those benefits to the same glowing terms everyone uses in speaker advertisements. Those worn-out superlatives reduced Turbosound to just another version of the over-processed, two-dimensional "PA sound" concert-goers have been enduring for the last decade. That it most definitely is not, as you know if you've heard Turbosound. For those who haven't, we offer the following mildly technical exposition of our unique solutions to the problems inherent in typical speaker designs.

Conventional wisdom considers enclosure design to be the art of compromise, but trade-offs never produce artistic or technical excellence. Our refusal to accept the usual limitations is one reason Turbosound is different by design.

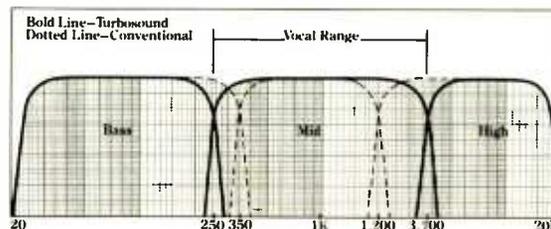
The TurboMid™ Device

Typical PA systems compromise the integrity of the midrange, dividing it between a cone speaker and a horn-loaded compression driver. The "seam" between two types of sound source causes coloration and phasing problems, too high a price for the increase in projection and efficiency. The patented TurboMid device, a new method of horn-loading, allows our proprietary 10" speaker to reproduce the full midrange from 250 Hz to 3700 Hz. It projects vocals, piano, guitar, snare drums, etc., all the way

to the back row, with clarity and presence. The high frequency driver also performs better thanks to TurboMid, because it no longer strains to cover the upper midrange.

The TurboBass™ Device

Conventional 'bass bins' rely on enclosure volume (typically over 20 cubic feet), mouth area and path length to generate adequate low frequency energy. They require compromises between system size and weight, efficiency and bass response, cone diameter and transient



response. The muddy, undefined sound produced by those bulky, heavy stacks blunts the impact of kick drums, bass guitar, synths, etc.

Our solution is the patented TurboBass device, a partial horn-loading tech-

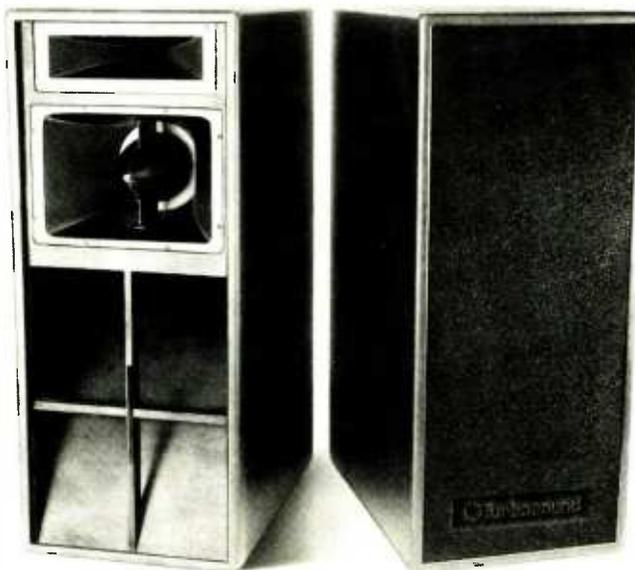
nique which pressurizes both sides of the speaker cone. It enables our TMS-4 full range enclosure, for example, to develop a peak SPL of 132 dB at 45 Hz in a *total* enclosure volume of only 14¾ cubic feet. The uncompromised accuracy and physical punch of Turbosound's low end make a difference you can feel as well as hear.

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Back To Square One

Conveying the realism and dimensionality of Turbosound with a vocabulary already debased by extravagant advertising claims really is an impossible job. We can only suggest that you audition Turbosound in concert, or call us for the name of your nearest dealer. We know you'll *feel* the difference you're hearing. And if you find the way to put it into words, please let us know.



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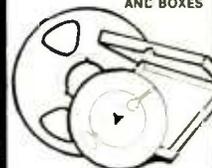


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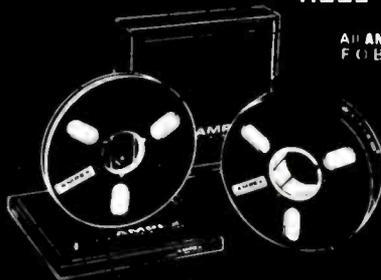
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Photography of Synchronicity film mix by Larry Blake



MIXING TECHNIQUES FOR DOLBY STEREO FILM AND VIDEO RELEASES

by Larry Blake

As of June 1985, over 600 films have been mixed in Dolby Stereo, averaging approximately 120 releases per year during the past two years. Along the same lines, the use of Dolby 70mm prints by major Hollywood studios has been steadily increasing over the past few years. (Almost all 70mm releases since 1977 have been in the Dolby "baby boom" format, with channels 2 and 4 — left and right-center — used only for bass extension information below 200 Hz.) Since 1982 approximately 15 films per year have been released in Dolby 70mm prints, and by the end of last year the grand total hit the 75 mark.

The wide release in the 70mm films such as *Indiana Jones and the Temple of Doom* (250 70mm prints in the United States and Canada), *2010* (200), *Brainstorm* (175), *Return of the Jedi* (150) and *Star Trek III: The Search for Spock* (140) has brought the roadshow format into smaller cities and theaters. (There are currently over 6,200 theaters equipped with Dolby Cinema Processors worldwide.)

It has become standard operating procedure for the largest screen in a

new multiplex theater located in even relatively small cities to be equipped for 70mm Dolby presentation. As a result, approximately one out of four Dolby Cinema Processors sold is the top-of-the-line CP-200 unit, which in its basic form is equipped to process standard Dolby 70mm prints, and can be outfitted to play Dolby "split-surround" and "discrete" six-track 70mm prints with the purchase of additional Cat. 22 noise reduction and Cat. 64 third-octave equalization cards. This extra equipment adds approximately \$3,500 to the \$15,000 price of a standard CP-200.

Much has been said of the ability of 70mm six-track magnetic prints to give moviegoers a loud and "visceral" experience. Reality, though, imposes the same limitations on 70mm six-track prints as it does on two-track, four-channel Dolby Stereo optical releases. Such factors as sound system headroom, theater noise levels, and the intolerance of "little old ladies" to loud sounds conspire to bring the dynamic range of 70mm

mixes closer to those expected of 35mm Dolby Stereo optical.

Stereo Optical Versus 70mm

Dolby marketing vice-president Ioan Allen notes that the big difference between 70mm and 35mm mixes is "not the overall dynamic range. What happens on a 70 is that an occasional peak will get through that is louder on a simple peak basis. The median levels of the loudest music, effects above the dialog is probably very comparable to stereo optical. It's just that stereo optical is a hard-clipping medium; you cannot go over 100%."

Until recently, Max Bell served as a Dolby film consultant to the Hollywood community. He believes that the biggest factor in regard to the playability of any Dolby Stereo mix — 35mm or 70mm — is the probability of low-level playback. "The most common mistake [in a 70mm dub] is to mix to a wide dynamic range, resulting in a very loud mix. These people [directors and mixers] are later upset that it won't go to optical, when in fact it is unplayable even if you are running six-track double system. The dynamic range is just too wide.

"Most theaters run the fader between 80 and 82 for both 35mm stereo optical and 70mm six-track magnetic — it is down 4 dB for every movie. [Dolby playback level is supposed to be set to 85 dB/c, slow, per channel, for 50% modulation.] Theater managers set it for the loudest music and effects. *Every* theater I go into is playing the movie too quietly — certainly quieter than the dubbing theater where the film was mixed. If you take that into account, there is *plenty* of headroom in stereo optical. And if you were to monitor [during a mix] at a lower level [than 85 dB/c], you would have a ridiculously tight dynamic range, not to mention throwing away 3 dB of headroom on the film. There is no way around it as long as theater managers are turning faders down."

Bell had a preview in a theater a few months ago where he "had to walk through another theater in the complex to get to the projection booth. That theater was playing a Dolby film with the fader down 5 dB. I had them turn it up and ended up having a row with the manager. He said that the music 'stingers' were too loud. When he turned it down, it sounded like Muzak. Naturally, I didn't try to discuss the subtleties of dynamic range with him; I said that the dialog was being lost. He said, 'I don't care; it was too loud.'

"While this film was being mixed, the director complained that he could not get as wide a dynamic range on

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... continued overleaf —

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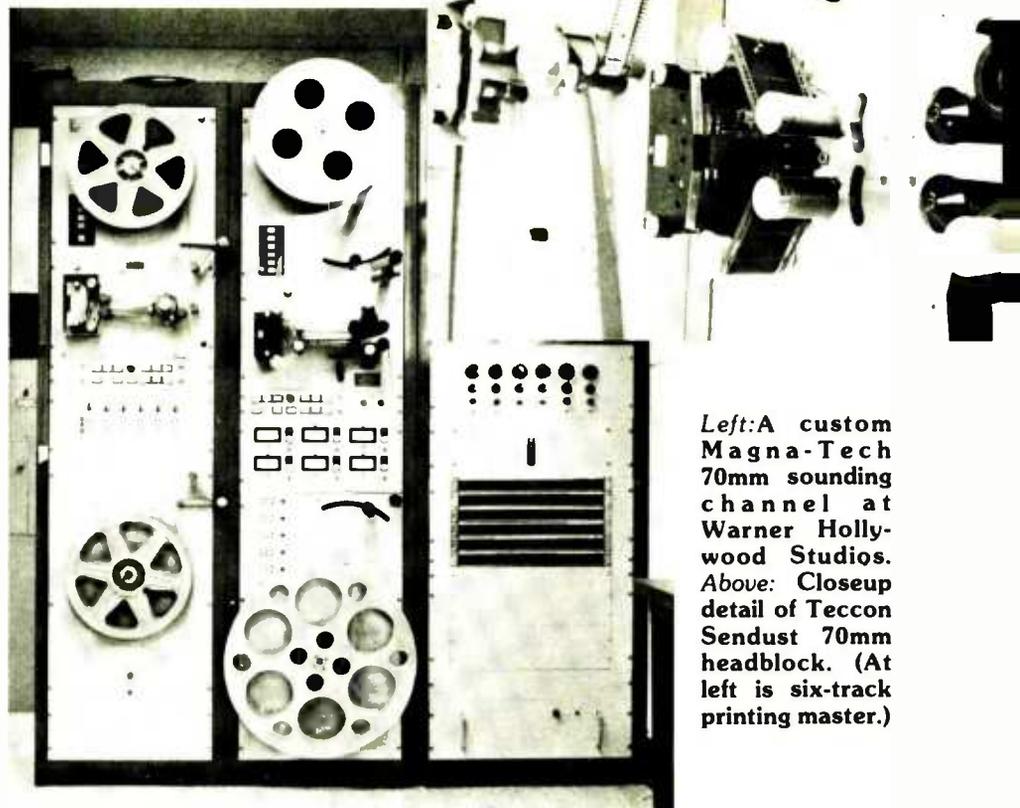
MIXING DOLBY STEREO

the optical as he had wanted."

Monitoring with the Dolby Stereo Matrix

As many readers may already know, the 35mm Dolby Stereo system involves the matrix encoding of four channels of audio — left, center, and right behind-the-screen channels, plus surround — onto two Dolby A-encoded optical tracks, designated Lt (Left total) and Rt (Right total). In the movie theater, after noise reduction decoding, *matrix* decoding is handled by a Dolby Cat. 150 card that converts the two tracks into four speaker channels, thus completing the encode/decode 4-2-4 process. The behind-the-screen channels are equalized to the wide-range ISO "X" curve (flat to 2 kHz, 3-dB-per-octave roll-off after that) using third-octave equalizers.

In the early days of Dolby Stereo there was much discussion about monitoring the mix through the 4-2-4 matrix. Many mixers, accustomed to the four-track mag format (with four magnetic stripes on a 35mm release print), resented having to adapt their mixing styles to a matrix-encoding technique. However, sensible minds prevailed, and today there is no argument as to the wisdom of hearing what will happen to the mix when decoded in neighborhood theatres.



Left: A custom Magna-Tech 70mm sounding channel at Warner Hollywood Studios. Above: Closeup detail of Teccon Sendust 70mm headblock. (At left is six-track printing master.)

Briefly, these are the steps involved in producing a Dolby Stereo mix today:

- Dialog and sound effects are pre-mixed to three- or four-track 35mm fullcoat. Music is usually recorded multitrack, and mixed down in a standard recording studio to 35mm

three-track (described below).

- The final mix is recorded as separate stereo left-center-right-surround (LCRS) dialog, music and effects "stems," either on multiple pieces of 35mm mag or on a multitrack recorder.
- The stereo DME stems are combined onto a two-track Lt-Rt "printing master," which will be transferred 1:1 to an optical negative for use in making 35mm stereo optical prints. (Later, this two-track mix is also used for stereo home video release.)

- If the film is to be released in 70mm, the stems are used to produce a six-track "baby boom" printing master. During this step, low-frequency information, usually only sound effects, is added onto channels 2 and 4. (The left-center-right speakers are channels 1-3-5.) The six-track printing master is copied in real time to each 70mm print.

One of the practical benefits of Dolby Stereo, taking into consideration both 35mm stereo optical and 70mm baby boom, is that four-track master mix can be easily converted "down" to a two-track Lt-Rt printing master, and "up" to a six-track printing master, with boom information added for channels 2 and 4 on a 70mm print. Since most major studios are recording their master mixes as separate four-track music, effects and dialog stems, the dynamics of each section can be separately controlled during the print mastering step, which usually takes no more than two days.

As a rule, the pre-mix, the final mix and, of course, the two-track printing

SURROUND-SOUND PLAYBACK IN THE HOME

Despite the aborted start of quadrophonic sound over 10 years ago, surround sound at home is currently making a comeback courtesy of the proliferation of stereo movies being released in high-quality home video formats such as LaserDisc and Beta and VHS Hi-Fi. Today, there are almost a half-dozen surround decoders available for home use, offering widely varying features. At present, only two of them carry the "Dolby Surround" logo, indicating adherence to specifications laid out by Dolby Laboratories (see below).

At the recent CES show in Las Vegas, Surround Sound Inc., whose M-360 unit was the first home decoder licensed by Dolby Labs, released its SI-720 unit featuring a matrixed center-channel output, a subwoofer output, and wireless remote control. The other licensed decoder is the Audionics SD-2 Surround Processor, which features a rear-channel delay adjustable from 5 to 30 milliseconds.

The Fosgate 3601 also carries the "Dolby Surround" logo and, in addition, to center-channel output, features a 40-watt amplifier and optional wired remote control. Also in the Fosgate line are the 3600 for use in automobiles and the 3602, designed for the "high-end audiophile" and decoding surround information from records.

The remaining surround decoder currently licensed by Dolby is the first entry in the home-video market by Aphex Sound Field Systems, a division of Aphex Systems, Inc. Licensed decoders by major manufacturers are expected to be introduced at the June CES Show in Chicago.

Of course all the decoders mentioned above can be used for surround-channel synthesis of stereo records and CDs.

Among the other surround decoders designed for home video use are the Pioneer SP-101, and the Phoenix Systems P-250 (also available in kit form). For the DIY fanatics, Dolby Labs offers a schematic of its home decoders for people to build for personal use only.

Many consumers might be confused about the precise meanings of the various Dolby logos used both on home surround decoders and on pre-recorded videocassettes. "Dolby Stereo," the familiar registered trademark used in prints and on movie ads to denote a Dolby Stereo motion picture, is found only on pre-recorded VHS cassettes that employ

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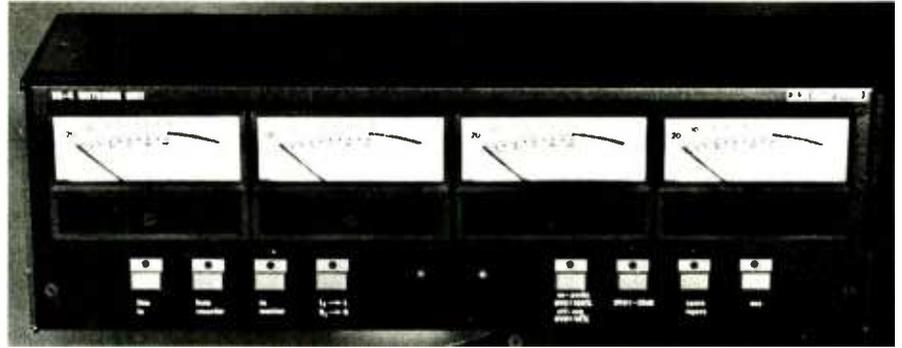
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MIXING DOLBY STEREO

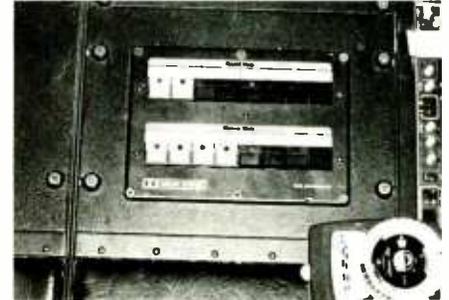
master are all monitored through the 4-2-4 matrix, utilizing a Dolby DS-4 monitoring and recording unit.

However, there is often a question of how much emphasis should be placed on the constraints of the matrix when the release involves a large number of 70mm prints. One of the key issues is stereo width: either it will be exaggerated in 70mm if the film was mixed with the matrix inserted into the monitor chain, or it will be too narrow in 35mm stereo optical if the mixers only monitored discrete, in anticipation of the 70mm release. David Grey, Dolby film consultant in Los Angeles, warns mixers against neglecting to check a mix through the matrix: "If you are going to do a multiple release [35mm and 70mm], and you mix discrete all the way through, my opinion is that you will get an extremely narrow, very compromised stereo optical, because you can't make a mix wider once it is narrow. And if a pan doesn't work, it doesn't work; you won't be able to re-do it.



The Dolby DS-4 meter bridge (above) and remote control (right) enables recording and monitoring of the 4-2-4 matrix-encoding process used to produce the Lt-Rt Dolby Stereo mix.

"Our approach has been to keep the matrix in the line: do all your pans through it and get it as wide as you need it, knowing that you are not putting any matrix encoding onto the four-track track master. You are mixing in relation to the monitor. What is sitting on the track is, if anything, perfect in terms of width. In other words, nine out of 10 times you want it a little bit wider than the matrix is capable of giving you. It will widen



out when you play it discrete; probably too much. It's very easy to bring it back in; it's virtually impossible to widen it."

SURROUND-SOUND PLAYBACK — continued . . .

B-type decoding on the two standard "linear" tracks. Furthermore, "Dolby Stereo" only appears on videocassettes of films that are licensed by Dolby Laboratories — "Dolby System" can be found on B-encoded cassettes of non-Dolby Stereo films that were released theatrically either in four-track magnetic stereo or Academy mono. Therefore, no Dolby logo will be found on a videodisc or a Beta cassette; although the LaserDisc and Beta Hi-Fi formats are high-quality mediums, they simply do not employ Dolby noise reduction. Likewise, while the linear tracks on a VHS cassette might say "Dolby Stereo," the "VHS Hi-Fi" logo is not accompanied by any Dolby trademark.

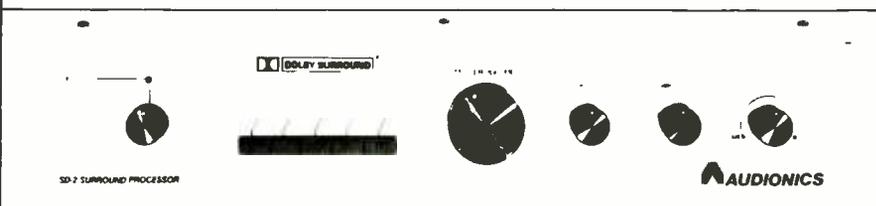
On the hardware side, home surround decoders licensed by Dolby Labs have carried the "Dolby MP Matrix", whose exact meaning was a mystery to most people. To help solve this problem, and to indicate the presence of Dolby Labs on the growing number of non-Dolby-B home video formats, a new trademark, "Dolby Surround," was introduced. The new logo will appear not only on licensed decoders, replacing "Dolby MP Matrix," but will also be on all forms of video release, including the non-Dolby-B stereo formats such as VHS and Beta Hi-Fi. Thus, "Dolby Surround" will indicate the presence of stereo audio with surround information recorded and encoded with a Dolby DS-4.

Although most Dolby Stereo films these days are mixed with surround information, this is not the case with all films; two of the best-known examples of non-surround films are *The Black Stallion* and (in 35mm prints) *Apocalypse Now*. Although the filmmakers didn't intend for these films to be replayed (in theaters or at homes) with a surround channel, there is undoubtedly enough out-of-phase information — especially with orchestral music and stereo backgrounds — that the two-track Lt-Rt will give the home decoder user something to show off.

Obtaining the "Dolby Surround" logo means that a manufacturer adheres to the basic outline provided by Dolby Labs. In general, licensed decoders have to contain:

- Metered input calibration to optimize levels for different VCR and videodisc output levels;
- A basic L-R surround matrix to extract the out-of-phase surround information;
- A delay line, not only for time coherence of information that is both in the surrounds and

— Audionics Model SD-2 Surround Processor —



Theater Alignment of 70mm Prints

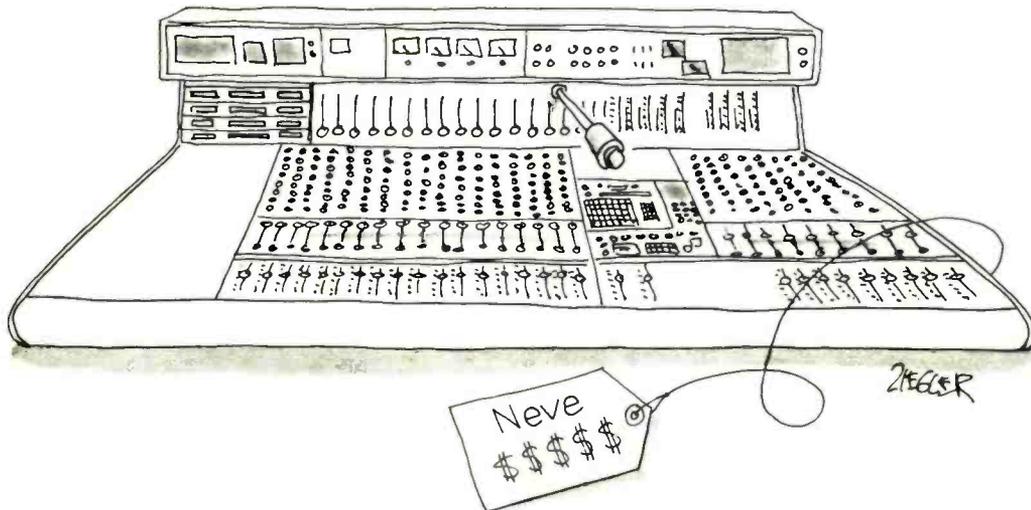
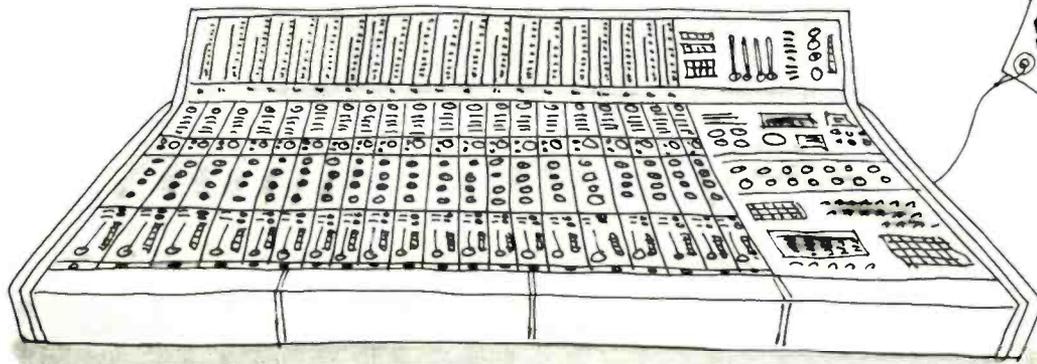
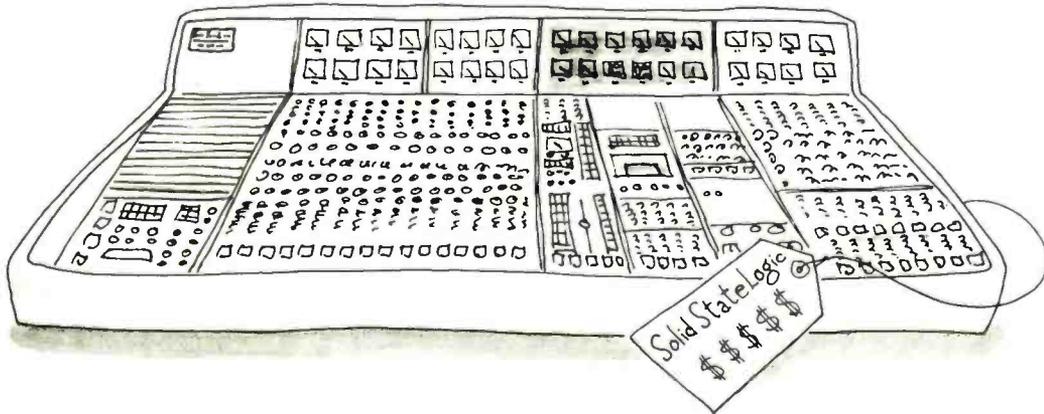
Two-track and six-track Dolby Stereo printing masters are always A/B'd with test prints to check the transfer quality. In the case of the two-track Lt-Rt, a stereo optical negative is "shot" from the printing master, and then a sound-only print is made from that negative.

With 70mm Dolby Stereo, the six-track printing master will be transferred to a striped print of the film. Often the blow up (no films are photographed in 65mm these days) is not ready by the time the six-track mix is finished; in these cases a 70mm print from another film is degaussed and is sounded for this test procedure.

The major Hollywood facilities that sound 70mm prints observe the same equalization and level standards, in spite of the fact that there are no published standards for the 70mm six-track format. Currently, the "zero" VU reference flux is 185 nanoWebers per meter, and 35-microsecond equalization is employed. Until 1983, most 70mm printing was done at a reference flux of 90 nWb/m. Tests by Lucasfilm, Twentieth Century-Fox and Warner Hollywood for *Return of the Jedi* lead to the establishment of the 185 nWb/m flux level, 6 dB above the previous standard.

Such standardization was made possible largely because of the development, by the Los Angeles facilities Film Processing Corporation (FPC) and Magna-Crafts, of improved mag-

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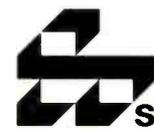
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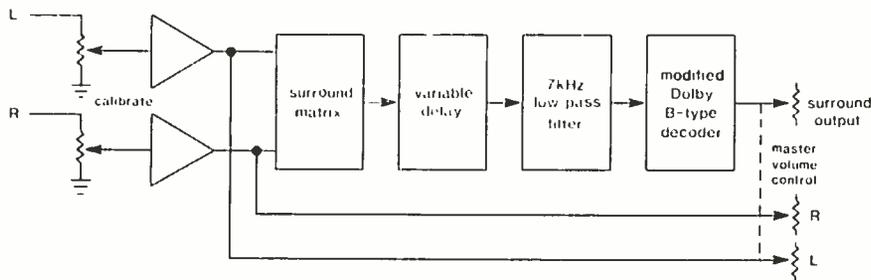
It makes sense.

SURROUND-SOUND PLAYBACK — continued . . .

front speakers, but also to reduce the perceptibility of unintentional surround leakage, especially the sibilant "splatter" sometimes caused by azimuth errors. The recommended delay range for home decoders is 10 to 30 milliseconds. (Dolby Cinema Processors are adjustable from 30 to 100 milliseconds because of the larger front-to-back size of motion-picture theaters.);

- A 7 kHz low-pass filter. This is the high-frequency cut-off chosen by Dolby Labs to prevent bothersome hiss coming from surround speakers in theaters during quiet or inactive periods. The relatively steep HF rolloff also helps reduce delay-line noise and rear-channel sibilant splatter;
- A modified Dolby B-type decoder. Lt-Rt masters contain this modified B-type decoding on the surround-channel information to aid the low-pass filter in noise reduction and masking of sibilant breakthrough. It should be made clear that the two tracks on a Dolby Stereo Lt-Rt always employ A-type noise reduction that is decoded at some stage prior to videocassette duplication. The modified B-type decoding remains on the surround channel; and
- An output stage with a ganged master level control.

Even though dialog (in home stereo playback) seems natural coming from the phantom center, many believe that the addition of a center speaker helps to "lock" the dialog to the image on the television, with benefits observable even with standard 19-inch sets. In large living rooms, especially, a center channel can help stabilize the dialog (which is almost



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MIXING DOLBY STEREO

netic stripping for 70mm prints. There is general consensus in the industry that the three-percent harmonic distortion point is not reached until 15 dB over 185 nWb/m, headroom which is comparable to that of 35mm mag fullcoat mastering stocks. "Your distortion is going up more, but the signal will get there. We've frequently seen 15 dB above 185 without perceptible heavy distortion," says John Bonner, chief engineer at Warner Hollywood Studios.

Recently, great strides have also been made in standardizing the equalization of 70mm printing. Bonner notes that "five or six years ago we were radically far apart — you'd see a 10 dB difference on the high end."

Before a roll is sounded, industry s.o.p. dictates that it has to be checked for bias requirements and striping consistency, the latter being checked by recording pink noise and observing the results on a third-octave real-time analyzer. "If the striping is slightly thin, you will get what looks like an increased high end," says Bonner, "although I think it is really a decreased mid and low end. *Every* roll must be checked."

To aid theater service technicians in aligning the mag pre-amps in theaters, rolls of pink noise and Dolby-level tone are sent with each print. In previous years this was mandatory because of the wide level and equalization differences among 70mm sounding facilities in Hollywood. The situation has changed today, and David Grey says that "you can use the pink noise from any studio to set up any 70mm print which came out at Christmas."

Mixing for the Optical Medium

Since late 1979, all Dolby Stereo mixes have been monitored and recorded using a Dolby DS-4 unit to simulate the effects of the Cat. 150 cards used in Dolby Cinema Processors.

Throughout the pre-mixing and final dubbing, the DS-4 is used to check the effect of the matrix on stereo elements and panning. The unit must be present during the recording of the encoded two-track printing master from the composite four-track master (or, in some studios, from separate stereo dialog, music and effects four-track masters).

The Dolby DS-4 unit has a monitoring function called "optical process," which is designed to give mixers both visual and aural indications of what will happen when the two-track mix is transferred to a stereo optical negative. First, the optical process mode

limits response to that of the Dolby Stereo optical medium — approximately 25 Hz to 12 kHz. An optical clash simulator also provides an aural approximation of the effect of exceeding 100% modulation.

For the eyes, there are two lights on the front panel of the DS-4 — “yellow” means that you have been in clash for 10 milliseconds or less, and “red” that you have been in clash for over 100 milliseconds. Grey regards the optical clash lights as “the definitive benchmark. The yellow light is in effect telling you that you are very close to clipping. In fact you are in it, but you won’t hear because it is generally accepted that it takes 10 milliseconds for the human ear to hear distortion. The red light means have been in clash for 100 milliseconds or more, and you *will* hear it distort.

“I can’t count the number of times I have been called in and a mixer has said ‘That button makes it sound like crap.’ I say ‘I know it makes it sound like crap, that’s why it’s there; that’s the reality.’ ‘I know,’ they reply, ‘but it sounds awful. I had to take it out it was so bad.’

“You won’t believe how many intelligent people do that because they don’t understand that this is what’s going to happen inside the [optical] camera.”

Along these lines, John Bonner talks of the most common problem he faces when shooting a stereo optical negative: “I’m surprised at the number of print masters that we get where the people who mixed it don’t seem to know where 100% is; they don’t appreciate the 100% optical clipping point. When an optical track exceeds 100% there is nasty clipping, and they should be aware that the track is going to clip exactly 6 dB above that reference tone. We really don’t care what that level is — 185 nanoWebers, 250, etc. — as long as that is the Dolby-encode level, and that they expect it to clip *exactly* 6 dB above it. That’s all we’re interested in. If we can’t fit the track in, then we have to decode the print master and encode again so that the Dolby level on the optical negative is 6 dB below 100%. Each master must also be accompanied by pink noise, which we use for azimuth and EQ alignment.”

The above discussion has referred to, for the most part, lack of concern over the distortion and compression due to excessive levels. David Grey says that a common problem is that little attention is paid to what will fit to optical in the four-track stage (pre-mix and final mix). “You can’t have something that is playing at 90 dB and pull it down to 80 and expect it to sound the same,” he offers. “Not only does your frequency response subjec-

tively change, but you change the dynamic range, which means you change the whole feel. If people stayed closer to what is possible on optical from the get-go, it would be a

tremendous help.”

Nevertheless, he feels that the “optical process” switch on the DS-4 control unit should be kept off when making four-track mixes for a film

SURROUND-SOUND PLAYBACK — continued . . .

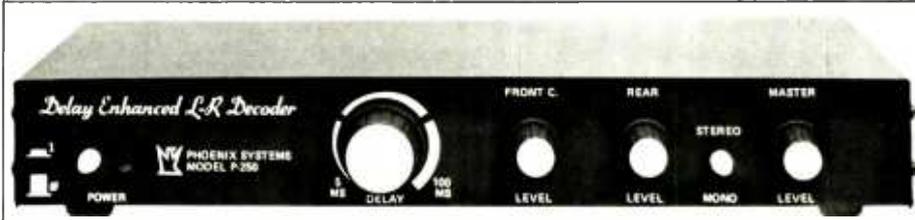
always in the center) for those seated next to a front (left or right) speaker.

The sample circuit provided by Dolby Laboratories includes a provision for an L+R center-channel output. Many decoder manufacturers have taken this idea one step further and have included a *matrixed* center “dialog” channel, a technique which will result in a wider sound than that obtained with an L+R center channel. Most decoders have a separate center-channel volume control.

The term “dialog channel” is something of a misnomer; the matrix, of course, doesn’t really care whether a signal is dialog or kick drum — all it knows is that it is present on both tracks with equal phase and voltage. By using a matrix instead of simply summing the two tracks, the home-decoder user can achieve separation among the front channels approaching that obtained in theaters.

Readers who are interested in the on-going developments in professional and consumer surround-sound technology might want to subscribe to the *MCS Review* (P.O. Box 19, Capron, VI 23829-0019; \$8/one year, \$14/two years, \$18/three years). This quarterly publication, whose name stands for Multi-Channel Sound, covers the field of surround-sound decoders and records. Each issue contains a good technical article or two, along with updates on the field. □□□

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ROCK MUSIC AND DOLBY STEREO

Or: Why Your Two-Track Album Master Should Not Be Used in a Dolby Stereo Movie

The increasingly frequent use of rock music in Dolby Stereo films has led many re-recording mixers to the same conclusion: a two-track record (or stereo TV) mix will sound too "narrow" through the matrix. The solution is simply to remix the multitrack masters, and monitor and record with a separate center channel. The mix is transferred to 35mm mag for editing, and is then taken to a film dubbing stage for final re-recording to picture.

"Most record mixes, especially rock 'n' roll, are not very wide in terms of stereo width, to begin with," says Dolby film consultant David Grey. "The matrix is determining what it's going to keep left and right with a combination of level and phase. So, every time it sees something on left and right that's relatively the same phase, and relatively the same level, it ships it directly out of the center.

"What happens with two-track record mixes [played through the Dolby Stereo matrix] is that the panning and image is so narrow that there is not enough on the right of, say, the Fender Rhodes, which is panned left of center, for the matrix to see that it's left of center. So what you get is a gigantic mono.

"If you are doing a record mix and you want something left of center, you can take the panpot and put it there, and that is exactly where the image will show up. In Dolby Stereo you almost have to be panned hard left to get it there."

Joel Moss' first experience with music films was when he recorded, mixed and dubbed the documentary *Gospel*. He has also recorded and mixed the music for *Staying Alive*, and on *Footloose* he recorded the underscore and remixed the songs for Dolby Stereo. A few months ago, Moss was called in to do mixes of some material for *The Slugger's Wife*, and had a chance to play back mixes of other material in the film that had not been done through the matrix. "They were about 90% mono, and much of the other stuff was so out of phase that it was completely in the surrounds.

"It all boils down to a lack of education. Nobody wants to take the time to figure out what it [the matrix] does. Record people want things to sound like records, and if they don't, they're pissed."

Moss also finds that coordination with, and the understanding of, the film's picture editor is vital, as was the case last Spring when he and Steve Maslow mixed the *Talking Heads*'

are 100 dB or 90 dB, the average dialog level will always be around 85 dB.

"When the film gets to the theater, they set the fader by the *loudest* sound, and, as a result, the dialog will go down very much if the mix has a wide dynamic range. In stereo playback you might get away with it, but in a mono theater [to replay a Dolby Stereo print properly] the dialog really has to be up at between -6 and -10 all the way through to be intelligible. Of late, the art of getting a mono-compatible stereo mix has gotten much better."

If while making the Lt-Rt Dolby Stereo two-track printing master the director and dubbing mixers decide not to compromise the stereo mix to allow for compatible mono playback, a separate mono mix will be made for exhibition at non-Dolby theaters.

This is easier said than done, since the existence of two types of prints — Dolby Stereo and Academy mono — makes life much tougher for the studio exchanges that have to distribute the prints to hundreds of theaters.

In fact, the possibility (some might say probability) of a non-mono-compatible Dolby Stereo print being sent to a mono theater, or an Academy print going to a Dolby house, is the prime reason that most (80%) Dolby Stereo

MIXING DOLBY STEREO

that definitely will have a 70mm release. "There is no sense in keeping something back if you know you are going to go 70, although I obviously would like levels reasonably close to optical limits."

Mono Compatibility

The question of whether or not Dolby Stereo optical prints are compatible with mono playback is no longer an issue in Hollywood: Six years and hundreds of films have proved that mono compatibility can be achieved, though often at the expense of compromising the stereo mix. Again, the emphasis is on the playback level, although this time the focus is on the dubbing stage, and not the theaters.

"The key issue, more and more," says Ioan Allen, "is that it is the monitor level which affects [mono] compatibility to the greatest extent. The old problem in film mixes was that the director and the dubbing mixer would enjoy playing it loud in the dubbing theater, not realizing that the music and effects were loud, and that you always set the dialog level to match the action on the screen — the sensible dialog level for the 'size of the heads.' In other words, regardless of whether the loudest music and effects

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films are released single inventory with mono-compatible mixes.

Films with a very large number of prints, such as *Indiana Jones and the Temple of Doom*, and *Star Trek III: The Search for Spock* (1,500 and 1,900 35mm prints respectively in U.S. and Canada), are almost always released single inventory because print placement problems are greatly magnified. Thus, almost 95% of the prints of Dolby Stereo releases are mono-compatible stereo prints.

Single inventory is of greatest significance when replacement reels are ordered: exchanges often store films by reel numbers, and not by print number, which might indicate the soundtrack format. Thus there is a 50-50 chance that the print that is shipped will be the print that is needed.

Still another way of looking at the issue is the fact that in 1985 almost all major first-run theaters in the U.S. are equipped with Dolby Cinema Processors. In addition, the attention devoted to sound in theaters that haven't converted to stereo playback often leaves much to be desired. Joan Allen: "The deviation from any kind of standard in the [non-Dolby] theaters is much wider than the difference between a mono-compatible Dolby

... continued overleaf —

ROCK MUSIC AND DOLBY STEREO — continued . . .

Stop Making Sense. On that film, "they might have the intro from the first night, the first verse from the second night, then all the choruses from the third night, etc. We had a picture editor who was very insensitive to the fact that this was going to be a problem. She would cut wherever she wanted and expect it to work."

Steve Maslow is a re-recording mixer at Warner Hollywood Stage D, where he mixed (with Bill Varney and Rob Fraboni) the landmark rock concert film *The Last Waltz* for six months (original schedule: two weeks). Among the music-laden films that he has dubbed since then are *The Jazz Singer*, *The Kids Are Alright*, *Hair*, *Divine Madness*, and *Koyaanisqatsi*. Maslow says that "a lot of times record people come in with hard and fast ideas, and they tell you how to put their film together. It helps if they use your expertise and

Engineer Joel Moss recording synthesizer overdubs for the mini-series, *Space*, at Record Plant Studio C, Los Angeles.



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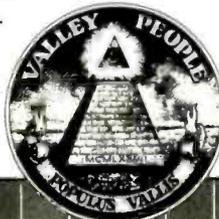
De-essers have typically carried the warning, For use on vocal tracks only. While a few manufacturers have boldly stated that their de-essers can be used on mixed program material, experience has taught us that most of these products restrict high frequency response, thus removing the harmonic content of vocals, cymbals, and strings.

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Optical Bass Extension

One of the most intriguing products that Dolby Laboratories offers the film-sound world is the CN-160 optical bass extension card for Dolby Cinema Processors. The 160 extracts low-frequency information below 100 Hz recorded on the two tracks of a 35mm Dolby Stereo optical print, and feeds it (in a 70mm-equipped theater with five speakers behind the screen) to channels two and four or, preferably, to a separate amplifier/subwoofer combination. This card is standard in a CP-200 and can be installed in a CP-50. (It cannot be used in a CP-100 Cinema Processor.)

In its simplest form, optical bass extension can be thought of as a way to help 35mm Dolby Stereo optical prints sound more like 70mm Dolby Stereo prints, since the information that both send to loudspeaker channels 2 and 4 (or to a subwoofer) is very similar: low-frequency music and sound effects.

While this sounds very good in theory, mixers have found that occasionally too much dialog will bleed into the bass extension channel, resulting in decreased dialog intelligibility. This points to the primary difference between 35mm and 70mm bass extension: in 70mm, the extra low-frequency information is selected and monitored by the mixers. While problems can arise by the 70mm bass extension

information being played too loud, at least crucial dialog will not directly be affected.

"I would be the first to admit that, set up badly, [optical bass extension] can muddy the dialog and cause room tone ringing," says Allen. "It's a dangerous weapon in the hands of an incompetent installer. Correctly set up, it's a thing of elegance and joy."

"First, it has to be set up so that it's not excessively loud. In addition, the 160 board has a tuning circuit in it so that you can avoid the most bothersome peaks which would also make it too loud.

"Finally, there is a very sophisticated circuit in it that reduces the level of any low-level spurious, unwanted rumble components.

"So, the only thing that gets through when it is working properly is stuff like tympani, gunfire and material that is obviously intentional. I set it up by the book, and then I raise the level of the boom to where it does muddy up dialog, and then reduce it [the boom level] about 3 dB below that point. I'll usually find that I'm back at the book setting again, and I know that I have a 3 dB margin against the chance of it affecting the dialog quality.

"Switching it in and out has a radical effect, and yet when it's in, if you're not doing an A/B, it just sounds good. You're not conscious of sudden bass thumps all of the time. It sounds as it should, which is as if the loudspeakers are extending to a lower frequency." ■■■

ROCK MUSIC AND DOLBY STEREO — continued . . .

experience in the film medium. Otherwise I am just a button pusher."

Film Mixes in Recording Studios

The best way to mix a rock song for a motion picture is obviously to take the multitrack masters to a film dubbing stage. This is rarely done simply because of expense; a stereo dubbing stage costs over \$600 per hour. Short of that, the next best approach is to mount a separate center-channel loudspeaker in the recording studio and monitor the mixdown through a DS-4.

(In 1984 a stripped-down version of the DS-4, the DS-424, was introduced by Dolby Labs to assist recording engineers who need to know how the matrix will affect a mix, but who don't need the comprehensive recording outputs, metering, or optical clash simulation afforded by the DS-4. Primary use of the 424 will be in music recording studios, helping to assess stereo width during mixdowns. Dolby's loan Allen notes that for the unit to function, there has to be a separate center-channel speaker. "The 424 is a four-in/four-out unit, and its function is to show how the matrix will behave, in particular, between the left, center, and right channels. If you feed a discrete center and a left and a right, you can't then just listen to left and right coming out because the whole nature of the matrix during decoding is in fact to steer the signal left, center and right. Whether or not you're recording on two [Lt-Rt], three, or four tracks, you need a discrete center to make any sense of the operation.")

The mixdown from a multitrack master should be recorded on a one-inch eight-track, using only six channels for audio, a procedure that will allow the mix to be transferred to six-track 35mm mag for editing. The six tracks can be allotted as left-center-right rhythm mix, with separate vocals and solos. Grey says that "if there are nice stereo background vocals, it might be prudent to build the solos into the LCR rhythm mix, and have stereo background vocals on two tracks and the main vocal on another. Then again, you may

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ROCK MUSIC AND DOLBY STEREO — continued . . .

want to restrict the dubbing mixer's ability to change the balance between the background and lead vocals, so you could mix the vocals together on two tracks, and put the soloist on the vacant channel. There is no question that this is better than providing a two-track."

A partner in For Score Productions with Doug Parry, Moss frequently mixes at Smoke-tree Ranch, which is owned by Parry and his brother Daryl. For film mixes, Smoketree has three matching amps separate from those that power its stereo system, and uses three ADS-710 speakers, with roll-off for the high end to remove some of the "spit" and to more closely match the ISO "X" curve required for Dolby Stereo films. "We use a [UREI] Sonipulse analyzer to match the speakers, but don't use any equalization to speak of. Since we are pretty close to the speakers, we made a point of checking on a dubbing stage — with the speakers 40 feet away — a few mixes that we had made at Smoketree. We figured out what we have to compensate for." Because there isn't a one-inch eight-track machine at Smoketree, Moss records his film mixes on six tracks of a Studer A800 16-track. This procedure is also helpful as overdubs can be made on the open tracks, and transferred to mag for editing.

If multitrack masters are mixed directly to separate pieces of 35mm mag, even with sync pops and start marks, the individual 35mm elements can be accidentally slipped a sprocket or two when placed on the mag dubbers. (There are four sprockets per 35mm frame.) On *The Police Synchronicity Concert* (see below), Maslow mixed from 35mm mag and found that "if you solo the vocal mike you can hear the instrumentation. You can hear the drum kit and the bass, but it is not so loud that it tends to phase. For it to be a problem, the music that bleeds into the vocal mike has to be so loud that it would come up to the level of the instrument in its own channel." Maslow said that on a few tunes in the *Synchronicity* film he has had to adjust sync because of the loudness of drummer Stewart Copeland's snare. "He tunes it so tight that it really cuts through, and if that is off [i.e., the sync between band track on one of 35mm mag elements and the vocal track on another] you can hear the drums start to flam. That's where you really start to notice."

Addressing the subject of signal processing, David Grey notes that a "major mistake is sending a single point source into a 'stereo' echo or reverb unit: I guarantee you that the matrix won't see it as left and right. It will take not only the stereo echo channel, but a goodly portion of the direct sound with it to the center. That is probably *the* most common mistake. Also, if you have a lot of flanging, there will be a lot of surround information, which may or may not be a negative thing, depending on how much surround information the people want in the first place."

Moss and Maslow agree that there are no hard and fast rules regarding the use of effects devices, panning, etc. Moss says that "whether you're David Grey, who probably knows the most about the [Dolby] system, or somebody who has never seen it before, one thing that is always the same about the matrix is that you never know. If you are talking about two or three discrete elements, you can probably place them where you normally would in a stereo mix and the chances are a little better than even that they will show up in the same place.

"But if you are talking about any kind of live recording, with any kind of phase differential, you're in a big mess unless you mix it through the Dolby matrix with a separate center speaker. You literally have no idea where it is going to show up.

"My only advice to someone who has never used the Dolby Stereo system before is to have Dolby Labs come to their studio and set the monitoring system up and then experiment with it for a few hours. They might kick their chair and slap the tape machine, and get all frustrated about what the box does, until they can begin to understand it and make it work. You have to change your thinking about stereo in a very radical fashion in order to get the box to be your friend, and it really is your friend: There is really no choice between doing a film in Dolby Stereo and Academy mono. If you don't use the Dolby system, with its wide frequency response, you go back to Academy mono and the Stone Age."

Maslow deals with music films on the dubbing stage, where everything has to come together to make the printing master, and has found it helpful if recording engineers "mix the first tune the way they like it at their studio, and then they can bring it in to my dubbing stage so we can listen to it. You can see if you're in the ballpark. It's important, in addition to monitoring through the DS-4 [or DS-424], to use the proper monitoring level of 85 [dB/c; see main article] so that they don't hype themselves." Maslow finds that he is "frequently pushing the vocals at the final mix," especially if the singer is on the screen.

If a producer is willing to spend Big Bucks, mixdown from the multitrack masters can be made on the dubbing stage, as was the case on the Talking Heads' *Stop Making Sense*. "The whole idea of the Heads was that they wanted to approach this as a record mix, except to picture," says Moss. The mix took two weeks at Warner Hollywood, which Moss considers to be sufficient time: "I think if you give yourself too much time you can end up polishing too much and you lose a lot of the life and energy." Maslow adds that "you don't have the time luxury with film that you have with records. You can't 'tweak and peak' forever. It's a high-pressure situation."

... continued overleaf —

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ROCK MUSIC — concluded . . .

Although a multitrack mix on the dubbing stage is the optimum procedure, there are other high-quality procedures. Joel Moss' personal preference is the use of a multitrack digital recorder synchronized with the film chain: "In this method the music editor works with the recording engineer so that each piece of music is transferred in its multitrack form to a 32-track digital recorder.

"This leaves eight or more open tracks which are used to bounce a LCR mixdown [through the matrix] as well as any additional information such as vocals, solos, and effects. When synchronized with the other elements on the dubbing stage you have perhaps the most flexible situation possible — a pre-mixed track as well as any elements of the original multitrack — should a particular piece of music need any enhancement to fit the scene."

Making Two-Track Record Mixes Work with the Dolby Matrix

Moss blames the majority of the misuse (and lack of use) of Dolby Stereo on the producers "who make the effort to do their pictures in Dolby, but then don't pay any attention to what it means for the music. There really is no mystery regarding what you need to do to get the music to sound better in the theaters. But in cases nobody is allowing any post-production of that kind to take place." How late the producers decide on what music to use is a major problem, he

notes: "I'd say that with 80% of the movies that have rock soundtracks, the deals aren't made until 15 minutes before the movie hits the theaters. They end up buying two-track mixes.

"There are many mixers who are technically versed in the requirements of the Dolby process; all they need is the same attention that the producers give to other technical personnel."

While a two-track record mix can be made to work with the matrix, the large amount of signal processing necessary to "widen" a record mix often sacrifices mono compatibility. An example of this was *Risky Business*, notes Grey, since "the mixers played a lot of tricks with EQ and delay lines to make a reasonable stereo image out the stereo album tracks that were available. It sounded great in stereo, but was awful in mono."

Maslow says that if he does get a record mix, he tries to make "the most out of it. I'll take the left and right signal, sum them together, flip it out of phase, and put it through the dip filter and bring that information into another fader. You can get some weird stuff out of this — hard center information that is different from left and right. It is still a little bit narrow."

Grey cites *Footloose* as "musically speaking, the widest stereo optical that I've been involved with. All of it was mixed through the Dolby Stereo matrix, either with DS-4s or DS-424s. The mixers achieved the maximum amount of separation possible with the format. There was an extreme amount of care



Mixing the *Police Synchronicity* film (l-to-r): producer Jim Duncan, mixer Steve Maslow, and engineer Brad Aaron.

taken with *Footloose* to make the music work with the matrix. They did nothing really unique; it was simply done in what I consider to be the correct manner right from the start."

Among the Los Angeles studios used to mix songs for *Footloose* were Lion Share, Evergreen, Westlake, The Record Plant, and The Complex. The final film re-recording was done at Compact Video Services in Burbank.

Although recording engineers will find familiar outboard gear on dubbing stages, one of the most acclaimed and ubiquitous pieces of hardware in film sound is virtually unknown in the recording world: the Dolby Cat. 43 playback-only noise reduction device. In essence it is a Dolby Cat. 22 noise reduction card used in the expanding mode, with the frequencies of the four processing bands changed to those more usable for problems that occur in film work: 30 to 80 Hz, 80 to 1,000 Hz, 1 to 3 kHz, and 3 kHz-up. Dolby Labs warns that the filters on a Cat. 43 are different from those used in a Cat. 22, and are not relevant to removing hiss from music recordings, for example. In other words, it is not a four-band Kepex™, whatever the similarities.

Sliders on the face of a Cat. 43 panel enable independent expansion or compression of the four bands, with up to 10 dB of expansion available at low levels. High-level material is not affected, because of a side-chain device similar to that employed in Dolby A-type noise reduction.

A primary use of the Cat. 43 is to reduce broadband noises like traffic rumble and camera noise, and it is recommended that a dip filter be used in conjunction with, or instead of, a Cat. 43 if the offending noise can be pinpointed.

The Music Theatre Network

This year, rock fans will have the opportunity to see "Cinema Concert" features with top groups presented in Dolby Stereo at their local theaters courtesy of The Music Theatre Network (MTN). Started last July by Bob Wilson and Robert Kardashian, who had previously founded *Radio and Records*, the broadcasting trade publication, and former pro football star O.J. Simpson, their initial involvement was in distributing Music Videos to theaters as pre-feature shorts. Among the songs presented were Van Halen's *Panama*, *All Night Long*, by Lionel Richie, and Billy Joel's *Keeping the Faith*.

MTN encountered a problem in transferring the one-inch video masters to 35mm film for projection in theaters. Because standard

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motion pictures present a wide-screen 1.85:1 image, the 1.33:1-aspect ratio video image has to be selectively cropped during transfer to film to prevent heads from being chopped off. Although this can be done with digital video effects devices, this procedure entails another video generation and unacceptable picture quality, according to MTN president Wilson. The Music Theatre Network has recently developed a proprietary computerized repositioning process that adjusts the placement of the picture for the desired crop to 1:85 through frame-by-frame scanning.

The second problem the company faced when into in producing the featurettes, and which is probably of greater interest to *R-e/p* readers, is that, according to Wilson, "very few people in the record industry knew anything about the Dolby theater format. We found a group of people who make great records but who don't know how to give you what you want [with a film mix]. With our shorts, we went through agonizing pains because we could not get back in the theaters what was heard in the studio."

The shorts were released "dual inventory" in both Academy mono and Dolby Stereo prints, and the staff at MTN ran up "very large" phone bills contacting managers at every theater where the films played, making sure that a Dolby-equipped theater did not receive an Academy mono print.

The Police Synchronicity Concert

The expansion of MTN to full-length features began last February with the release of *The Police Synchronicity Concert*, taped in 1983 in Atlanta. This film played in three test markets on President's day weekend and went "wide" into approximately 300 theaters on Easter weekend. Wilson notes that in their last tour, The Police only played in 30 cities, and the film will allow people in "the other top 270 markets" to see them in concert. Distribution will be via Warner Bros. The feature was shot (on tape) by Kevin Godley and Lol Creme, and was recorded 46-track by Eddie Offord and Chuck Allen.

The Police's mixer, Pete Smith, Brad Aaron of MTN, himself an independent recording engineer/producer, and veteran film scoring mixer Dan Wallin mixed the 46-track masters down to three, 35mm three-track recorders. Aaron and producer Jim Duncan chose the 35mm format because, as Aaron notes, "you can hit it *real* hard. I love tape compression." (The punch of the three-track 35mm format can be attributed not only to a track width of 200 mils, compared to 43 mils for two-inch 24-track, but also to the thickness of the oxide coating.)

On mag element A there was a LCR band mix, mag B contained Sting's vocal on track one, and the girl backup vocals on tracks two and three, and on the last three-track mag element there was bass and stereo audience. AMS digital effects were summed onto selected tracks during this mixdown: "AMS mania" according to Aaron. For some songs, additional three-track mag elements contained percussion and effects which the mixers thought could best be integrated in a theater-size environment.

Aaron notes that the pre-mixes were done

in Record Plant Studio M not only because of the cost savings (compared to mixing on a dubbing stage), but also because it featured studio monitoring, i.e., the speakers were not hidden behind a screen 40 feet away, which helped to put Pete Smith at ease. "Right away Pete felt real comfortable," says Aaron. "One small change was that, instead of using pan-pots, you hard-bussed things left, center, or right."

The final mix took place at Warner Hollywood Stage D with Steve Maslow. He and Aaron protected themselves against too many surprises by checking, in a dubbing theater situation, the first few mixes that Smith, Aaron, and Wallin made. Aaron found out that theatrical mixes have to be over-exaggerated compared to record mixes.

"Everything has to be much bigger than life due to the medium you're playing in. One dB is not usually enough; it takes three to make a difference."

Regarding MTN's step up to features, Bob Wilson says that "the audio problems we had to solve on the shorts gave us the experience to produce, with the Police *Synchronicity* film, what we consider the finest-sounding soundtrack ever on a feature concert film."

The MTN concert films play in each city for four performances only: Friday, Saturday and Sunday nights, plus one matinee. The next film will feature Genesis and is one of the last concerts that they will transfer from an already-shot tape; future films will be *filmed*, and in negotiation are upcoming tours by Foreigner and Billy Joel. □□□

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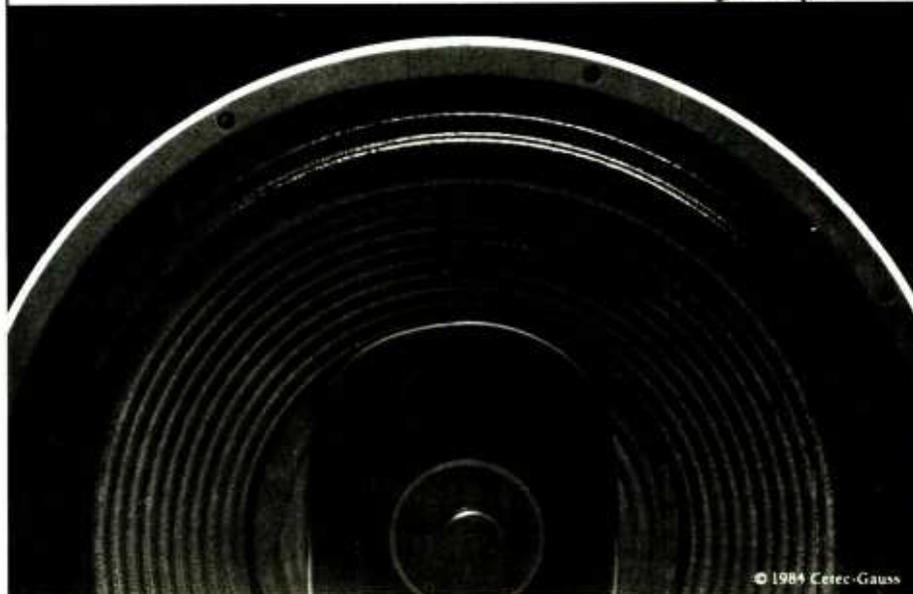
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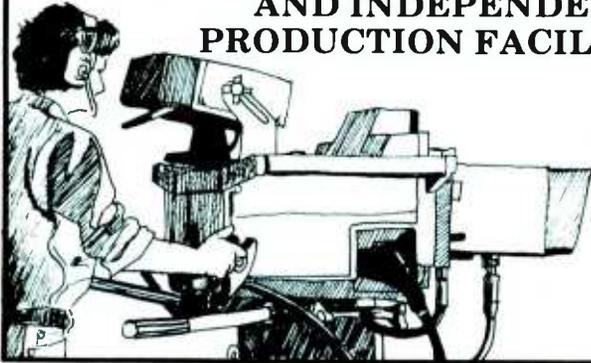


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STEREO AUDIO FOR TELEVISION

OPERATIONAL FACTORS AFFECTING MAJOR NETWORKS, PUBLIC BROADCASTING AND INDEPENDENT PRODUCTION FACILITIES



by *Ralph Jones*

Without question, the dominant topic of discussion in today's television broadcasting circles is multichannel sound. At last year's NAB Convention — which followed the FCC's adoption of the Zenith/dbx standard for stereo transmission — the Television Sound seminar was singularly crowded and provoked avid discussion, and at recent Consumer Electronic Shows, most of the television manufacturers displayed stereo receivers (sales for which are reportedly brisk). Similarly, papers and workshops dealing with broadcasting at the Spring AES Convention in Anaheim, CA, were dominated by stereo audio for television.

According to estimates provided by Ed Williams, staff engineer of the National Association of Broadcaster's Science and Technology Department, approximately 60 television stations across the country already broadcast stereo audio, and a recent survey by *Television Digest* concluded that now, at least one stereo station exists in each of the top 10 U.S. markets. To put these figures in perspective, consider that the 60 stations now on-line serve approximately 60% of the total U.S. viewing audience.

Clearly, the field is reacting quickly, with 1985 promising to be the year of Stereo TV: Williams told us that the NAB expects over 200 stations nationwide to be on-line by the end of the year. Four major manufacturers — Modulation Sciences, Broadcast Electronics, Harris Broadcast Equipment, and Orban Associates — already offer stereo encoders.

But the television industry is enormously complex, and a prodigious

effort will be required to change over existing systems to the new standard. Stereo Television raises significant issues for all those who are involved in broadcast production, regardless of whether their primary responsibility is technical or creative. Furthermore, there are no models to emulate: television professionals stand at the border of an uncharted frontier. The paths that they choose to follow now will have a tremendous influence on the character of the industry for years to come.

In this article, we will examine the issues raised by stereo audio for television from the standpoints of three different segments of the industry: a major network, an independent post-production facility, and a Public Broadcasting System affiliate. For each of these entities, stereo television poses unique challenges: for the majors, the dominant problem is the conversion of in-house and networking facilities; for the independent post house, creative techniques are the chief concern. For PBS affiliates — possibly the true pioneers of stereo audio — the eternal problem is, of course, money (that is, enough to get on-line).

KCET, Los Angeles

Located in Hollywood, KCET-TV is an affiliate of the Public Broadcasting System. At KCET we spoke with three-time Emmy winner Tom Ancell — head of the station's audio department — who provided some history of audio in the PBS. Ancell is well qualified to speak on the subject, since being directly involved with most of the events that he described.

Long before anyone was seriously

considering stereo audio for television, PBS was experimenting with stereo FM simulcasting and producing shows with, for the times, unheard-of audio quality. The lion's share of the credit for this history of innovation must be given to PBS' involvement with classical music and opera, Ancell recalls. Since such programming appeals largely to an audience that is notoriously picky about the intrusion of technology upon the aesthetic experience, those at PBS who chose to involve themselves in translating that experience to the small screen were faced with some real challenges.

Fifteen years ago — in the earliest days of simulcasting — KCET experimented with use of two videotape machines to record stereo audio. The left audio channel was recorded on one machine, the right on the other, and the two recordings played back together as synchronously as possible. Naturally, more often than not, there was a phasing offset between the two machines, and the channel signals never recombined well. Accordingly, a mono mix — recorded at the same time as the "stereo" mix — was aired over the normal television audio channel. For a viewer listening to the FM simulcast in those early days, however, the technique provided some spatial separation, albeit crude.

Some 12 or 13 years ago, KCET turned to the use of an Ampex AG-440 four-track, recording two tracks of audio and a 59.95 Hz sync resolve signal on a third track. Shows recorded at that time had a minute and a half of click track printed at the head of the tapes: it was the operator's responsibility, when the station went on the air, to manually sync up the two-inch Quad videotape and the four-track audio. "He had one shot at it," Ancell remembers. "It was the *only* way we had to do it, because there were no synchronizers then."

The next step that KCET took was to split-head the audio on the two-inch videotape. Around 1968, the station built record/reproduce Dolby units and modified the head assembly, taking out the mono head and replacing it with a custom two-track head. Audio electronics were separated from the Ampex VTR machine and located in another rack, with Inovonics rec/repro electronics and Dolby noise-reduction cards for each channel. The drawback of this system, however, was that the channel track wasn't wide enough to support good audio. "With the Dolby system," Ancell recalls, "we had around 50 dB signal-to-noise, which couldn't have been accomplished without Dolby."

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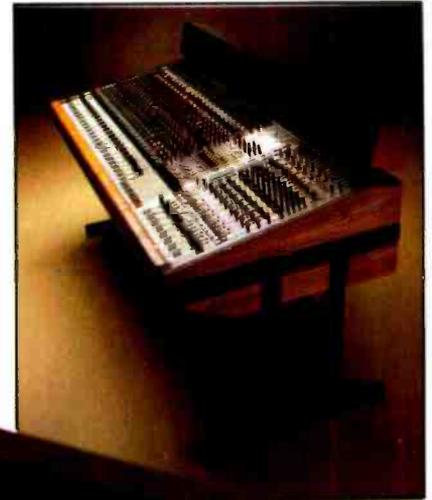
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STEREO TELEVISION

Today, KCET's production facilities are such that the station could go on the air with stereo audio immediately. The station recently completed construction of its new master control room, which is fully stereo-equipped. The monitors are full-sized JBL units, mounted in soffits, much as one might find in a music studio. In a studio control room that currently doubles for production recording and post-production, the ensemble of audio recorders includes an Ampex MM-1200 24-track, a 3M M-79 half-inch four-track, and an MCI JH-110 quarter-inch two-track master deck. Dolby noise reduction is provided for every record/playback channel. The console is a 26-input Audiotronics that was sent to Westlake Audio for a host of modifications; it now features a Valley People Fadex automation system, new pre-amps, phasing keys, and other changes to make it more suited to television recording and production.

In terms of in-house production, of which there is a prodigious amount, KCET presently handles everything from full-fledged network dramas to music programs. Virtually all of the music shows have been produced in stereo in the last five years, as have most of the dramatic shows.

Mixing is very often done "on the fly," with little or no opportunity to go back and re-adjust balances at later date; in Public Television, the emphasis is on capturing the event as it occurs, with little post-production. As a matter of course, KCET makes a live stereo mix, but also tracks the show on two-inch 24-track tape, so that production staff can go back and remix if necessary. Sweetening is most often done only for applause (simply because it is difficult to get a large enough audience onto a television stage). Normally, the live stereo mix — sweetened for applause — is the one that is broadcast.

KCET Dolby encodes all audio tracks in production (both the two-channel live mix and the individual channels of the multitrack), affording an extra 10 dB of signal-to-noise ratio, and has also recorded some shows in the Sony PCM-F1 digital format. Ancell admits to some yearning for a digital multitrack: "It would be great, but we don't have the financial resources right now to get into it," he told us.

"The biggest advantage for us would be the signal-to-noise ratio: noise can be a big problem in post. The rest of the PBS transmission system is clean and quiet enough that the noise buildup from a multitrack can be a significant factor."



— Tom Ancell of KCET —

Referring to the transmission system, Ancell regards its design as impressive, reflecting much forethought. The Public Broadcasting System is set up so that stereo audio distribution is an easy task, chiefly because PBS incorporated the DATE system a number of years ago. DATE — Digital Audio for Television — is a transmission system that carries four discrete audio channels on one multiplexed digital channel. The four digitally-encoded channels are transmitted on a subcarrier independent of, and in addition to, the normal subcarrier audio channel that is broadcast monophonically via satellite. (For the last few years, National Public Radio had been leasing DATE channels 3 and 4, because they were not yet needed, and NPR did not have its own satellite links in place. This is no longer the case, and DATE is now primarily a PBS system.)

In everyday broadcast operation at KCET, audio comes from the one-inch videotape. Where that audio is stereo, KCET mixes to mono unless the program is FM simulcast. In the case of programming that is picked up from the Network, the originating source always provides a mono mix on the normal satellite subcarrier.

If the program is simulcast in stereo, as is very often the case with music programs, KCET simply patches in the DATE system feed, picking off the stereo channels. Since the odds of the program arriving off the satellite at the appropriate air time are slight, the feed normally is recorded on one-inch videotape, with Dolby-encoded audio recorded on the VTR auxiliary tracks. At air time, the audio channel signals pass to the participating FM station via 15 kHz phone lines.

On the average, about 10% of PBS satellite programming each week — regardless of where it originates — is

accompanied by stereo audio. "It's already there," says Ancell. "With the DATE system, it comes down the pipe ready to go on the air in stereo. Stereo broadcast will simplify things for us, not make life more complicated; it will be so much easier when we don't have to deal with telephone lines to FM stations and the attendant phase problems. I think we will start to see a payoff for thinking ahead, whereas a lot of other people will be catching up."

KCET is not on-line in stereo yet, however, except for simulcasting. Predictably, the problem is one of financing, and the affiliate doesn't want to go on the air haphazardly. "There are some upgrades that have to be made," Ancell concedes. "We are hoping to do it sometime in the near future. Having been pioneers in stereo sound for TV, we certainly don't want to be left in the dust at this point."

"Years ago," Ancell concluded, "I didn't even think about where we would be now: we were just finding the best possible solution to getting the best quality sound out, preferably in stereo."

"Developments of the near future are going to be *very* interesting to watch, because now we have to make stereo audio a useful and interesting tool for the viewer. Simulcasting showed that people *do* care about quality audio in stereo, because it has remained as a viable option: I thought it would have an initial surge and then die out, but it hasn't."

Indeed, simulcasting has been confined to fine arts programming aimed at a relatively small audience. Only recently has it proven as a significant aspect of broadcasting, undoubtedly serving as the impetus for current developments towards stereo transmission.

ABC, Los Angeles

For the past four years, staff at ABC's production and broadcast center in Los Angeles have been totally rebuilding the central facility which comprises the videotape suites, central routing, and equipment for transmission to and from the network. *R-e/p* was taken on a tour of the plant by Louis Brown, Audio/Video Systems Engineer for the network.

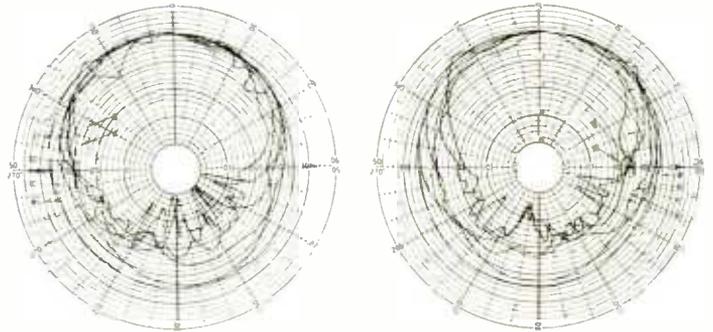
The core of the recently completed facility, referred to now as Television Center, is located on the site of the old Vitagraph Studios movie lot. All of the Center's videotape machines are located on one floor — organized into suites — and are assigned on an as-needed basis through a routing switcher that passes audio, video, and control to the machines. Four channels of audio accompany each of the video channels. . . *continued overleaf* —

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STEREO TELEVISION

Rather than use conventional analog audio switching, ABC digitally multiplexes the audio, switching the signal through a video matrix. The audio signal is band-limited to 15 kHz; to avoid beat problems, the multiplexers sample at four times the horizontal line rate (approximately 65 kHz), the sampling clock being derived from the master house sync generator. The resulting digital bit-stream passes through video lines. While a 5 Mhz bandwidth is adequate for the multiplexed signal, ABC normally uses 8 Mhz lines. [Such a multiplexed digital audio transmission system was utilized during ABC's coverage of the Summer Olympics last year, as described in a feature article to be found in the December 1984 issue of *R-e/p* — Editor.]

This aspect of the facility seems well-designed for stereo audio, and should accommodate even the option of an SAP (Second Audio Program) audio channel for bilingual transmission. Other parts of the ABC plant will have to be totally renovated, however.

For example, consider control-room monitoring. Both JBL and Electro-Voice monitors are used at ABC Television. While we saw a couple of stereo monitor arrangements — a pair of JBL BiRadials located in a post-production control room, for example — mono configurations predominated. Typically, small Electro-Voice monitors are used in production control rooms to monitor the "A" and "B" audio channels, with a large E-V studio monitor in the center for the mono signal. This type of configuration — one which clearly reflects a mono bias — is standard in the industry.

Changing over to stereo monitoring in network facilities will not be sim-

ple, however. Television production is a collaborative effort, and has more in common with moviemaking than with music recording. Louis Brown elaborates: "As a minimum for a show, you have a Technical Director, a Production Director, and generally one or two assistants up front. In back of them, at another desk, sit the producer and associated people. You cannot provide an accurate stereo image to more than one of those people from one set of loudspeakers." ABC is looking into the concept of using multiple small loudspeakers to provide close-field monitoring to each individual.

Another obvious category of equipment to consider in the changeover to stereo is mixing consoles. Most of ABC's consoles date from the late Seventies, and the majority bear the McCurdy and Ward-Beck names. All the consoles are multichannel devices but not stereo *per se*, with one exception: ABC had a unit constructed for its integration control room, and it is a true stereo console, with a stereo path for each of the faders. (Several of the facility's newer consoles are equipped with at least some stereo inputs.) Here again, substantial changes are in order.

Significant changes also must be made in network production practices. ABC currently mixes audio in production to a mono copy, which is assigned to the designated "A" audio channel. The "B" channel is used for any one of several functions: it may carry a second language, special effects, "nat" (natural or ambient) sound, or crowd noise.

The assignment of these channels to the VTR's audio channels varies. In production recording, the A (commentary) channel is recorded on the VTR's left channel, and the B (nat sound) channel is recorded on the right. The standard is reversed in news recording, however, with the A

recorded on the right, and B on the left. (The C-Channel in all cases carries timecode.) This variance again reflects "mono thinking," and clearly cannot work for stereo production. But changing the standard methods that have been in use for years will take some doing, Brown concedes, and personnel will have to be retrained.

None of the major networks has adopted anything approaching the comprehensive, satellite-based DATE system used by PBS; consequently, distribution of stereo programming to local stations is the subject of ardent debate within each of the networks. The discussion centers on how the signal will be transmitted: as two discrete channels, or matrix-encoded. The NBC network, which is expected to be the first of the three majors to convert to stereo, is one of the most vocal proponents of the encoded system, which is matrixed in the form of L+R and L-R.

There are advantages to both systems. The matrixed transmission system exhibits good immunity to phase errors, but is quite sensitive to amplitude differences; unless the gain and bandwidth of the two channels are matched, the stereo image starts doing very strange things when decoded. On the other hand, the discrete system is quite prone to phase problems if the two audio paths are not the same length. When transmitting over wire lines, severe path-length problems can develop.

"Ultimately, we'll probably see discrete in the plant, and matrix going down the line," Brown predicts. "The one *big* advantage of matrix is that it doesn't require any further processing for mono broadcasting. I think the affiliates are going to favor matrix, because they simply take the L+R signal, stick it on the transmitter, and away they go. If they get discrete L and R, then they're going to have to

Production areas at KCET, the Los Angeles PBS affiliate, include Master Control (left), which features stereo JBL Model 4311 monitor loudspeakers. The Production Control Room (right) includes a Audiotronics console, UREI 813 Time-Aligned monitors, Ampex MM-1200 24-track, 3M M79 half-inch four-track, Sony/MCI JH-110 two-tracks, an Adams-Smith 2500 synchronizer, and a Sony BVU-200 U-Matic.

Mitzi Trumbo





Studio 64, the Audio Integration Room at ABC Los Angeles, features a stereo McCurdy production console. This area, which also serves to back up the facility's main network commercial break studio, is used to route audio to air during sports remotes, and to provide network commercials that are added along with regional rollovers.

sum the two channels to get mono. Even though it's a simple problem, it's one more gadget to get built."

It is entirely possible that no consensus on this issue will emerge. And there need not necessarily be one: as long as a single standard is applied uniformly within each individual network, the system will work regardless of what the other networks do. The issue is of vital importance to each network, however, and the standard upon which each settles will have far-reaching implications for both the network and its affiliates.

As important as the question of distribution standards is, however, it's overshadowed by the potential ratings implications of stereo audio. The American Broadcasting Company recently slipped to third place in the prime-time ratings — falling behind NBC, which had held the position for the previous nine years. In the coming season, the rivalry between the two is expected to be strong. Stereo audio is widely thought to be a potentially effective tool for garnering increased ratings, and will likely be one of the decisive factors in the coming ratings battle.

NBC is regarded as the network most likely to go on-line first with stereo audio. Its distribution system is mostly satellite-based, and thus will be easiest to convert. Furthermore, NBC has been experimenting with stereo for some time: episodes of *Quincy*, *Night Rider*, and *Miami Vice* have been made with stereo sound, and the *Tonight* show starring Johnny Carson has been recorded in stereo for some time.

CBS is not currently far along in

stereo conversion, since it relies heavily on the use of Telco lines for audio distribution. While CBS currently holds the ratings lead, stereo audio could tip the balance, since in its case a system-wide conversion is required. Of the three major networks, ABC sits

squarely in the middle in terms of conversion to stereo: its Western, Mountain, and Central time zone systems are largely satellite-based, while the rest is Telco lines; these are the zones that will be converted first.

ABC is said to be more interested in SAP (bilingual) programming than in stereo *per se*, and is not yet originating any stereo programming. Asked when they will begin doing so, Brown responded, "It wouldn't surprise me to see it as early as this season. I don't know anything that makes me say that, but I would expect that you'll see at least one show in stereo on each network in coming seasons. You're also going to see a lot of specials transmitted in stereo."

Many suppliers now have access to the market through the satellite transmission system, however, and an increasing number of affiliates and independents are accessing satellite links. Will not some pressure come to bear on ABC from independent suppliers eager for a new marketing edge? "If I were an independent, I would really be pushing multichannel sound as something that I could provide that the other guys don't have yet," Brown concedes. "That will spur the rest of us along."

One production area that seems ripe for stereo, and an area that bears

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A TECHNICAL OVERVIEW OF THE ZENITH/dbx STEREO TELEVISION TRANSMISSION SYSTEM

To ensure compatibility with mono receivers, the Zenith multichannel TV-sound system transmits the sum of the left and right stereo signals (L+R) in the spectrum space now occupied by the mono audio signal. The stereo information is encoded by subtracting the left audio signal from the right (L-R) and transmitted it over a subcarrier, which will be received only by new, Stereo TV receivers. While an existing mono set will ignore this subcarrier, a stereo set will use the L-R to reconstruct the original left and right audio signals by adding and subtracting the L+R and L-R signals.

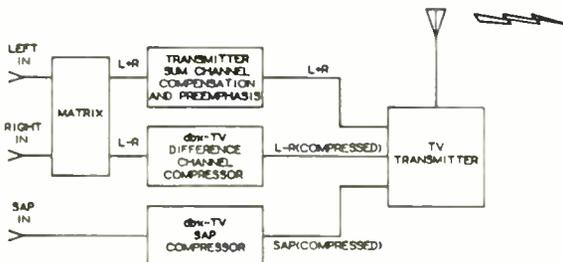
The L-R signal is transmitted via an AM subcarrier located at 31.468 kHz (twice the video horizontal-scanning frequency of 15.734 kHz), superimposed on the present FM audio carrier. (Except for the subcarrier frequency, the system is essentially the same as that used for transmitting stereo FM in the U.S.) However, FM transmission systems like these have a parabolic noise characteristic, which means that they have relatively more noise at higher frequencies. Because the AM subcarrier is at a higher frequency than the L+R signal (the L+R signal contains only frequencies up to 15 kHz, while the modulated subcarrier bandwidth extends from about 17 kHz to 46 kHz), the L-R signal contains much more noise when demodulated, assuming equal modulation levels.

One way to improve this situation is to increase the modulation level of the L-R subcarrier, but this technique is limited by the introduction of interference with too much modulation. In the Zenith system, 6 dB more L-R modulation is allowed than for L+R. The result is that the subcarrier adds approximately 15 dB of noise to stereo reception as compared with mono, even under ideal reception conditions. To make matters worse, when transmission and/or reception conditions are impaired (transmitter ICPM, multipath, etc.,) buzz or hum can be introduced into the audio. This would further degrade the stereo signal-to-noise ratio as compared with mono, if no noise-reduction system was used.

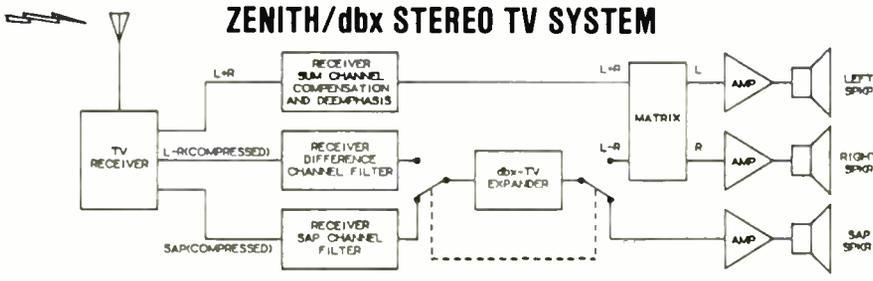
The significance of this added noise can be appreciated by calculating the expected signal-to-noise under typical, less-than-ideal reception conditions. Grade-B reception describes a condition where the picture is somewhat snowy, but still acceptable to most viewers. The mono SNR in this case is about 65 dB, which means that most mono listeners are not bothered by the noise. In stereo, however, the situation is 15 dB worse, for an SNR ratio of 50 dB. (These figures refer to the difference between peak-sinewave-signal levels and unweighted noise floors after 75microsecond de-emphasis; without 75microsecond de-emphasis, the SNR is about 43 dB.)

The situation is worse for the Second Audio Program (SAP) channel. Because of the location of the SAP subcarrier, at a frequency of 78.67 kHz, even more noise is introduced because of the FM parabolic noise curve. Owing to the potential for interference at this frequency, the SAP signal modulation level may not be allowed to be as large as that of the L+R signal. The SAP SNR with 75-microsecond de-emphasis is about 33 dB in grade-B reception, and reaches only about 43 dB in grade A.

... continued overleaf —



BLOCK DIAGRAM OF ZENITH/dbx STEREO TV SYSTEM



STEREO TELEVISION

directly on network broadcast, is commercials. A major problem of commercial producers is the "zap" phenomenon — viewers killing the audio on commercials. To combat zapping, it is in the interest of the commercial producer to come up with a product that will grab the audience and hold them, so that they want to watch it for its entertainment value. Stereo audio promises to be a potent tool for doing this, and ABC is not blind to the advantages of stereo audio for commercials.

"Commercials are the bottom line for the broadcaster," Brown explains. "When we say, 'I will deliver X amount of audience,' if 10% of that audience is dumping the commercials, it's a significant drop in what the customer is paying for. We don't sell time; we sell *people*. The customer pays for X number of people viewing his commercial. Stereo will give us an added advantage."

Stereo sound will have a limited effect, however, if quality is not maintained throughout the program distribution process. Stereo is spurring consumer product manufacturers to upgrade the quality of the audio reproduction chain in television receivers, and given that those receivers will be more susceptible to noise (since stereo requires greater sensitivity), the generation loss that network programming encounters in distribution is the subject of much discussion and concern.

By the time a show originating with ABC leaves post-production, for example, the original audio has gone through at least three tape generations. The resulting master videotape is copied (since the master is never aired), and the program is then transmitted to the affiliate stations.

ABC's Studio 55 control room features a Ward-Beck console and Ampex ATR-104 four-track tape machines.



Douglas Howland



Louis Brown of ABC at the Ward-Beck production console in Studio 55, which features Electro-Voice Sentry 500 monitoring.

The affiliates record the program (usually received via satellite) and integrate it with commercials — a process which takes it through yet another generation. In the case of daytime programming, the program is transmitted to New York, integrated, aired in New York and sent out over satellite, taped again by affiliates, and aired at the proper local time. Noise build-up and signal degradation are, not surprisingly, a continual problem. To solve this one, some advances in the technology of audio recording are required.

"I would really like to see somebody develop an audio system for professional use that would match the quality of Beta Hi-Fi, and perhaps take that same approach," Brown offers. "We're recording on linear [audio] tracks because we've always recorded on linear tracks. Yet, we have this magnificent broadband device sitting there. And the sound of Beta Hi-Fi will just knock your socks off. Its use would solve an immense number of problems, particularly with generation loss.

"People know what good audio sounds like, and they're going to want to hear that off the television. In Stereo TV, the system ought to be able to get over 65 dB signal-to-noise, even at the transmission end. You're going to have to maintain the a 70-dB+ level at least in the mastering process."

"Stereo is *not* a trivial problem," Brown concludes. "Perhaps it is not quite the problem that [converting from monochrome to] color was, but it certainly approaches that. The problem of picture degradation doesn't exist anymore. We can artificially enhance the video so that, even after four or five generations, you can test it and tell there is a difference, but sit and look at the picture . . . even with NTSC, we can hold Diff Gain, Diff

Phase, and Color Phase right on the money. We've got to build an audio system that will do the same thing."

EFX Systems, Burbank

EFX Systems, a complete audio-for-visual house, handles commercials, film post-production, and video post for broadcast and non-broadcast projects. High audio quality is clearly a priority at EFX: the studio boasts two Studer A-800 24-tracks, an MCI JH-110 half-inch four-track, and a JH-110 two-track. A Cipher Digital (BTX) Softouch synchronizer controls audio and video transports via SMPTE timecode custom software developed at EFX, allowing the unit to work directly in feet and frames, to facili-

tate sprocketed film post production. The system is capable of locking up to six transports; two more transports can be located via an Adams-Smith Model 605, if necessary.

The console is an AMEK 2500 with 36 inputs and 24 channels of monitoring, expandable to 48 monitor channels. The monitors are custom, tri-amplified units, designed with Altec Model 604s and JBL Model 2235 subwoofers. A Lexicon 224X digital reverberation unit forms the centerpiece of an extensive collection of effects devices. In short, EFX — like many of the newer post houses *R-e/p* has visited in recent months — resembles a music recording studio.

... continued overleaf —



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ZENITH/dbx STEREO TV SYSTEM — continued . . .

(Without 75-microsecond de-emphasis, these SNRs are 26 and 36 dB.)

Another factor that must be considered is that the modulation level of the composite signal (L+R audio plus L-R modulated subcarrier) is dependent on the sum of the L+R and L-R signals. Not only must the individual signal levels be limited in order to prevent overmodulation, but the sum of the two must also be limited. If full modulation of the L-R subcarrier is achieved, the L+R signal cannot simultaneously reach its full modulation level. If the noise-reduction system used with the Zenith transmission system reduces the possibility of the L-R subcarrier's reaching full modulation, the L+R signal need not be constrained as much.

Additional Noise Reduction on L-R Channel

The dbx-TV noise-reduction system was designed to assist the Zenith multichannel sound transmission system in delivering a clean, noise-free audio signal into the home. Specifically, the system was designed to:

- Provide significant amounts of noise reduction even in poor reception areas (grade B or worse).
- Preserve input-signal dynamic range without headroom loss or other anomalies.
- Prevent the stereo subcarrier from interfering with overall transmitted power levels (AM-interleave effects).
- Ensure reliable and effective performance even in the face of severe man-made noise and transmission/reception-system impairments.
- Provide this noise reduction at reasonable cost and simplicity.

It was clear that the noise in the Zenith transmission system comes from the subcarriers, and not from the main (L+R) audio channel. Therefore, the system was designed to work only on the L-R and SAP channels, and to transmit the L+R signal without companding. This decision also answered the question of the compander's compatibility with the TV sets now in use: If no changes were made to the mono signal before transmission, and the new subcarriers would not interfere with present receivers, then compatibility would be guaranteed.

Another decision that was made early on in the dbx-TV design program was to use the same compander for both the L-R and SAP channels if at all possible. This would allow TV-receiver manufacturers to produce sets at the lowest possible cost, because a single noise-reduction circuit could be switched between the L-R and SAP channel, as shown in the accompanying system block diagram.

In essence, the newly designed dbx compansion circuits, as with all audio-noise-reduction systems, works on the principle of masking by encoding (compressing) the signal in such a way that it will consistently mask the noise of the channel during transmission, and then decoding (expanding) the transmitted signal to recover the original audio. During the decoding process, all the audible noise should be eliminated, which requires that the level of the transmitted audio be high relative to the background noise; and that the spectrum be conducive to masking. The background-noise spectrum of the Zenith stereo subcarrier is white, having a 3 dB per octave rising characteristic, while the SAP subcarrier has a 9 dB per octave rising characteristic. Proper masking of the noise in the presence of signal will therefore take place only if the transmitted-signal spectrum contains substantial HF content, especially in the case of the SAP channel. If the program material itself could be relied upon to have sufficient high frequencies, then the compander would only have to keep amplitude levels high through the transmission channel. Most program material, however, has its dominant energy at low frequencies.

The simplest way to transform such program material into a signal conducive to masking is to apply fixed pre-emphasis to the signal before transmission; this is done in present mono TV audio and in FM broadcasting by the use of 75-microsecond pre-emphasis. A pair of fixed pre- and de-emphasis circuits is also used in the dbx-TV system: one essentially the same as 75 microseconds (actually 72.7 microseconds); and the other 390 microseconds, but for which the rising frequency response is curtailed at 30 microseconds. (The frequency-response curve of the complete pre-emphasis has a very steep section between about 2 kHz and 5.5 kHz, which helps dbx-TV overcome the large amounts of noise present in grade-B reception.)

Unfortunately, audio program material is inconsistent in its spectral balance and its level. With fixed pre-emphasis alone, two problems would remain: Some audio signals contain predominantly high frequencies and the pre-emphasis would boost them too much, causing overmodulation; and some audio signals would be too low in level and too lacking in HF to properly mask the channel noise, even with the strong pre-emphasis used in dbx-TV. In order to help make the audio more consistent in its spectral balance before transmission, dbx-TV uses a second Spectral Companding

STEREO TELEVISION

Commercials account for approximately 15% of EFX Systems' business, with the balance split almost exactly between film and video post-production sessions. Among other accounts, EFX does *Rock In America* for Picture Music International, and has earned a reputation as one of the top post-production facilities for stereo work.

Given that reputation, and the categories of work done at EFX, owner George Johnson has certainly thought about the creative use of stereo audio in television work.

"Where a character is walking left to right on picture," Johnson maintains, "the sound need not pan with that person. If you have a 25-inch monitor and you see somebody move across the screen, they cover a two-foot distance. If the loudspeakers are six to eight feet apart, the center image is bigger than the monitor!"

The point is well taken. Dialog that follows the singer or narrator could be merely distracting in television, whereas for film (which is a much more controlled and consistent medium, utilizing loudspeakers *behind* the screen), it is an established technique.

However, once such issues settle, television professionals will have the opportunity to develop specific, tailored techniques for stereo mixing, consequently giving ample room for artistry. Creative use of sound effects — to give a feeling of motion, for example — seems a promising possibility. And the stereo production of score and ambient tracks undoubtedly will lend productions a feeling of extra "space."

George Johnson agrees: "Once you can't see past the edge of the screen," he offers, "you can't really see how big a room is, but you can define it with the sound effects. That will be one of the big functions of sound effects now: room definition."

EFX has found the Sony PCM-F1

Production equipment at EFX Systems includes a Sony/MCI JH-114 and Studer A800 multitracks, and a Cipher Digital Softtouch timecode synchronizer system.





EFX Systems' 36-input/24-bus AMEK 2500 console, custom tri-amplified Altec 604 monitor speakers, JBL Model 2235 subwoofers, and Studer A800 remote control.

digital processor to be an excellent tool for sound effects production, and they maintain an entire effects library stored on F1-format videocassettes. This policy not only provides some measure of freedom from the quality problems associated with a quarter-inch tape or mag film library, but also affords the ability to print timecoded rolls directly from the sound-effects library without any generation loss.

Johnson is enthusiastic about the impact that stereo is having on the quality of television sound. "When shows are produced in stereo, our clients are already thinking audio. Since quality is more of an issue, they start spending more time on tracks. Dialog matching gets to be more critical. If lines are looped, they'll go back and put ambience on the track, because they're listening more closely."

One common solution to achieving high quality stereo sound for broadcast involves the use of a half-inch audio "follower": a four-track audio tape with audio left and right channels on tracks A and B, a 59.94 Hz or 60 Hz sync resolve signal on track C, and SMPTE timecode (matching that on the video master) on track D. As is well-known by now, the audio quality obtained with this technique far surpasses that of the best one-inch VTRs, since the tape speed is higher, and the tracks wider. MTV is one major programming source that is currently requesting audio recorded in this format, and EFX has been asked by several of its clients to produce four-track followers.

As a supplier to the networks and other broadcast entities, Johnson constantly has to contend with format confusions during the current changeover. "There is a lot of dual-format product being tracked," he notes. "For clients producing shows for feed to a network, we're doing the standard A/B format for whatever category the show falls into — there's a different format for each different category — along with a mono mix,

ZENITH/dbx STEREO TV SYSTEM — continued . . .

stage, in which the pre-emphasis adapts its characteristics to suit the amount of HF information present.

When strong high frequencies are present, and overload is most likely, the spectral compressor actually provides deemphasis, thereby reducing the potential for HF overload. The resulting encoded signal is therefore dynamically adjusted to consistently contain a substantial proportion of high frequencies before transmission, providing masking of the channel noise. The range of variation in the frequency-response curves that the spectral compressor can produce is substantial: from +27 dB to -27 dB at 15 kHz. During reception, the spectral expander (in the decoder) will restore the high frequencies to their proper amplitude.

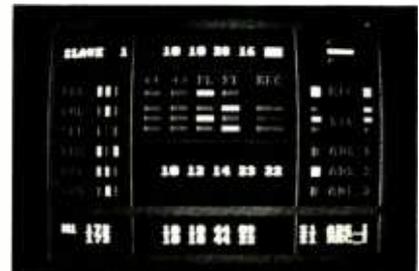
Neither the spectral compander nor the fixed pre-/de-emphasis, however, will help reduce noise when the signal is very low in level, especially if the signal has little HF content. This is where the third stage of dbx-TV becomes important: an HF wideband compander that reduces the dynamic range of input signals by a factor of 2:1.

Another important aspect of the design was to protect against very large transients causing excessive modulation of the transmission system. In a peak-limited medium, such as the Zenith system, the peak excursion of the compressor output is an important parameter to control. This requirement can most easily be met by a clipper or limiter, incorporated into the noise-reduction compressor and set to operate at 100% modulation. (In the system submitted to the EIA for testing, a clipper was used to control peak modulation; in actual practice, this clipper may be very sophisticated — such as the "smart clipper" designs used in the broadcast industry.) By including a clipper of known characteristics within the noise-reduction circuitry, dbx-TV is said to ensure compliance with FCC rules while maintaining transparent compander operation.

Editorial note: The information included in the above sidebar was abstracted, with permission, from an article titled "The dbx-TV System for Multichannel TV Sound," written by Leslie B. Tyler, Mark F. Davis and William A. Allen, of dbx, Inc., and presented at the NAB Convention, Las Vegas, April 1984. □□□

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and a stereo mix. So, we make three masters: an A/B master, a mono master, and a stereo master. The hardest problem that stereo will raise is trafficking!"

Among his commercial clients, Johnson tells us, there is a lot of inter-

est in stereo. "Those people always jump on trends as quickly as they can; they need an extra sales tool. Stereo is a big one. Places like ours, that can do stereo effects, will have a lot of work. It will be something different that commercial producers can throw at the public." (Some very effective commercials already have been produced in stereo. Notable among these

is the recent innovative campaign for the Chevrolet Cavalier automobile: the series of spots exploited complex, layered synthesizer tracks, and was heralded as the first digital stereo commercial.)

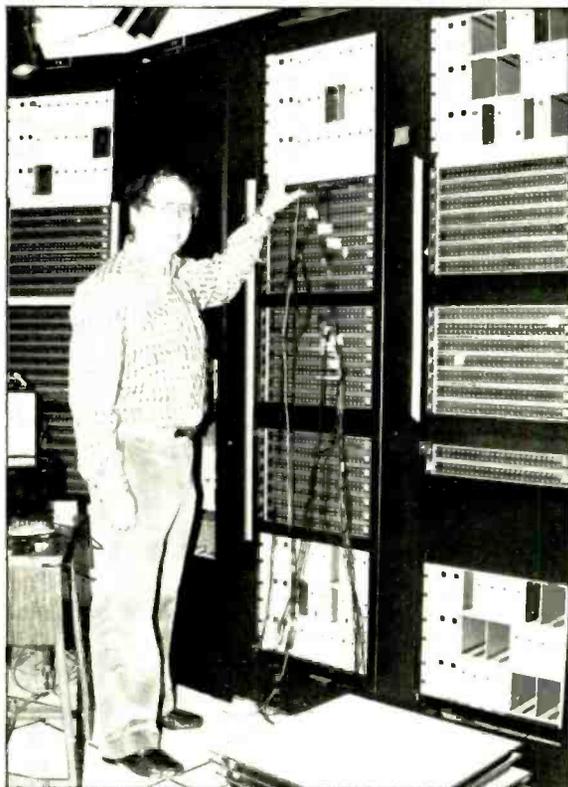
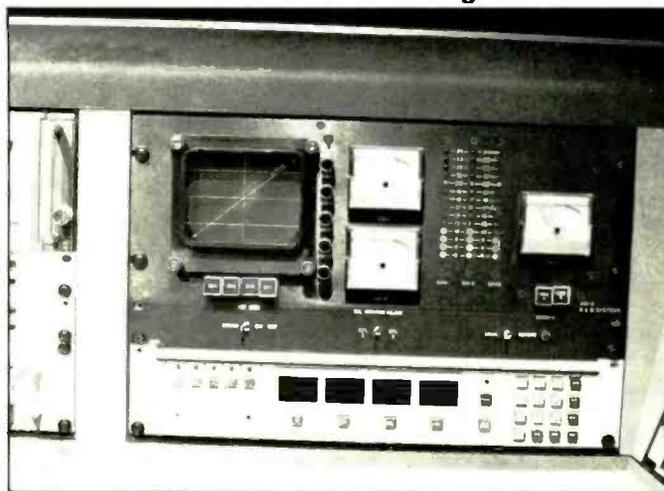
We guessed that George Johnson might have some ideas for signal processor manufacturers interested in the new markets that stereo television

STEREO TV FACILITY SPOTLIGHT: KTLA CHANNEL 5 LOS ANGELES

The first West Coast Television Station to Broadcast Stereo Audio on a Regular Basis



In KTLA's Master Control, a custom Grass Valley video and audio-follow-video switcher routes program sources to air. Shown above right is a B&B Systems AM-3 Audio Scope for checking audio levels mono/stereo compatibility.



KTLA chief engineer Ira Goldstone in the recently rebuilt central signal routing and termination room, which houses a complex system of mono and stereo DAs designed to provide access to mono, left, right and SAP audio channels throughout the facility.



Editt Suite #1 for preparing stereo air tapes.

KTLA, which began carrying regular stereo broadcasts at the beginning of this year, has adopted a standard auxiliary-track assignment for the one-inch video tapes used to replay the majority of aired material: track #1 holds discrete left-channel audio, track #2 right-channel audio, and track #3 the SAP (Second Audio Program, usually a second-language version) — VITC timecode is recorded in the video vertical interval. Current stereo programming comprises between five and 10% of the films broadcast by the station; various Music Videos; the recent *Rose Bowl Parade* from Pasadena (using multiple AKG C34 stereo mikes); several Angels' home baseball games; the *American Video Awards* ceremony; plus the *10 o'clock News* and *The Love Boat* with a Spanish-dialog version carried on the SAP channel.



EFX Systems owner George Johnson (left) and chief engineer Randy Paul in the facility's AMEK/MCI/Studer-equipped production studio. The pair put a special emphasis on high-quality audio recording and post production for video.

promises to open up. Posing the question, we found our suspicion to be well-founded. "I'd like to see a localization processor that would allow me to get depth front-to-back, as well as side-to-side," Johnson replies. "For stereo television, such a device would be very helpful. The other type of device that would be very useful is a digital

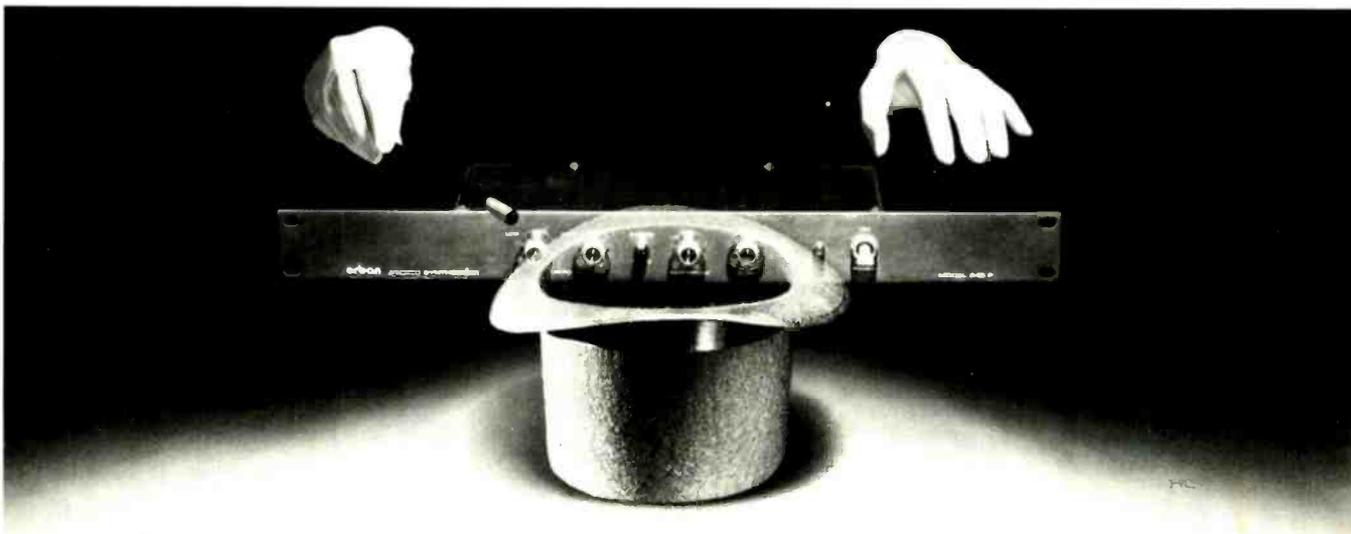
reverb specifically designed for room ambience generation. It would be nice to be able to deal with the effect in terms of 'room size,' instead of reverberation time: I'd love to be able to tell the processor that the room has couches in it.

"I'd also like to see a timecode-keyed equalizer. Any signal processor

with five or six stored memory functions that could be selected by an external timecode reader would be *extremely* useful. Right now, we have to back up and make an edit for each new setting. If I could load in a series of 16 cuts, and have an equalizer execute them automatically, it would be enormously handy."

The Near Future

The advent of stereo audio for television is now stimulating the industry as a whole to contemplate extensive changes, not only in operational procedures but also in basic philosophies. As the professionals quoted here make clear, a host of far-reaching decisions must be made. The next few years will bear watching as the issues of transmission methods, bilingual channels, mixing techniques, and so on come to a head. Perhaps the biggest challenge to broadcasters will be not that of designing appropriate systems, but of learning to *think* in stereo. For an industry founded on monophonic sound with the primary emphasis on the visual image, this will be no simple task—but it promises nonetheless to bear fruit in ways that we may not yet foresee. Certainly, the coming years will be an exciting time for television professionals and viewers alike. ■■■



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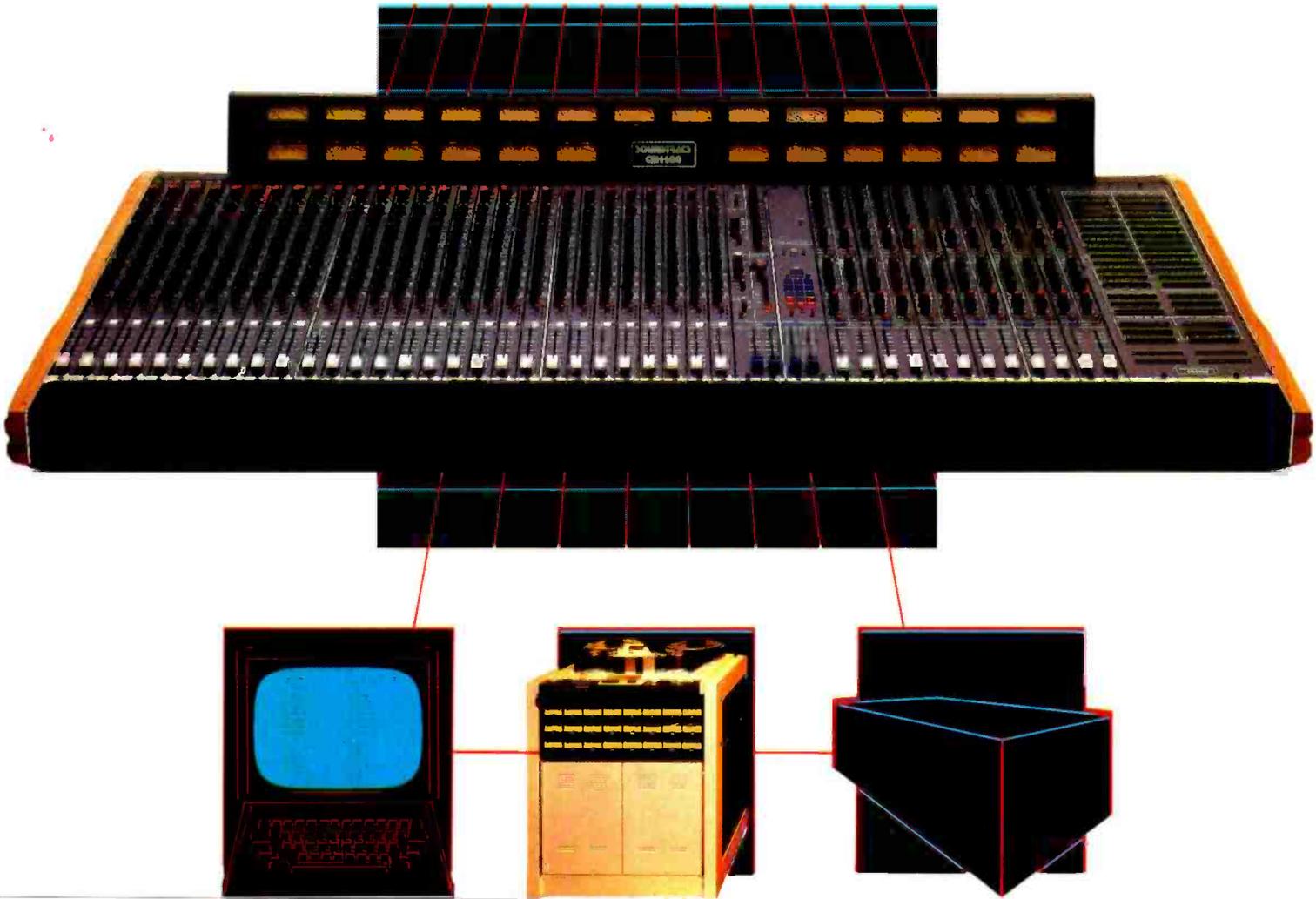
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EQ Section: Plug-in; four-band, four-frequency switchable.
Metering: VU, one meter per channel.
Automation Capability: Any standard automation.
Frequency Response: 20 Hz to 20 kHz, ± 0.5 dB.
Distortion: 0.05% IM at +28 dBm.
Signal-to-Noise Ratio: EIN -129 dBm.
Selected Standard Features: Choice of three plug-in EQs; choice of four plug-in pre amps; choice of audio or VCA faders; console can be built in any size from eight module increments; field expandable.
Price Range: From \$40,00 to \$120,000

*The Superstar

Inputs: Up to 96.
Bus Outs: 64.
Monitor Selection: In-line.
Auxiliary Sends: 10.
EQ Section: Parametric or single-octave, 10-band.
Metering: Information unavailable at press time.
Automation Capability: As above.
Frequency Response: As above.
Distortion: As above.
Signal-to-Noise Ratio: As above.
Selected Standard Features: Production or custom built; field expandable.
Price Range: From \$285,00 for 72-in/64-out configuration

* This listing is for a new product that will be unveiled sometimes within the following months.

PANASONIC/RAMSA
One Panasonic Way
Secaucus, NJ 07094
Phone: (201) 348-7470

WR-8112/8118

Inputs: 12 or 18, respectively.
Bus Outs: Four.
Monitor Selection: 12 or 18, respectively.
Auxiliary Sends: Three.
EQ Section: Three-band, sweep mid.
Metering: LED.
Automation Capability: N/A.
Frequency Response: Mike: 20 Hz to 20 kHz, ± 1 dB.
Distortion: 0.03% at 1 kHz, 20 Hz to 20 kHz.
Signal-to-Noise Ratio: EIN -128 dB.
Selected Standard Features: Recording or

sound reinforcement; peak/dip midrange on EQ; phantom power.
Price Range: 8112: \$2,500; 8118: \$3,150

WR-8210A

Inputs: 10.
Bus Outs: Four on each channel.
Monitor Selection: Four on each channel.
Auxiliary Sends: Two.
EQ Section: Three-band, switchable frequencies.
Metering: LED.
Automation Capability: N/A.
Frequency Response: Mike: 20 Hz to 20 kHz, 24 dB gain; +4 dB at group output.
Distortion: 0.03% at 1 kHz.
Signal-to-Noise Ratio: EIN -128 dB.
Selected Standard Features: Sub-in control; solo; direct outs; insertion points on all channels.
Price Range: \$1,195

WR-S208/-212/-216

Inputs: Eight, 12, or 16, respectively.
Bus Outs: Eight \times two; 12 \times two; or 16 \times two, respectively.
Monitor Selection: N/A.



Auxiliary Sends: Three.
EQ Section: Three-band, sweepable mid.
Metering: LED.
Automation Capability: N/A.
Frequency Response: 20 Hz to 20 kHz, +0.5 dB/-1 dB.
Distortion: THD 0.03% at 50 Hz to 15 kHz, 18 dB, with 84 dB gain.
Signal-to-Noise Ratio: EIN -128 dB.
Selected Standard Features: Two stereo inputs; phono pre-amps and line signals; phantom power; solos on input channels; semi-modular construction; balanced main output; main post- or pre-switch for main send.
Price Range: WR-S208: \$1,295; -212: \$1,795; -216: \$2,095

WR-T812/820

Inputs: 12 or 20, respectively.
Bus Outs: Eight.
Monitor Selection: All channels.
Auxiliary Sends: Four sends in remix.
EQ Section: Three-band sweep.
Metering: Optional LED or LED/VU combination.
Automation Capability: N/A.
Frequency Response: 20 Hz to 20 kHz, ± 0.5 dB/-0.8 dB.
Distortion: THD 0.08% at 20 Hz to 20 kHz, +18 dB, with 84 dB gain.

Signal-to-Noise Ratio: EIN -128 dB.
Selected Standard Features: Solo in place; paralleled bus output (for 16-channel on T820); individual tape inputs; phantom power; phase reversal; high-pass filter.



Price Range: WR-T820: \$5,060; -T812: \$4,040 (both without metering)

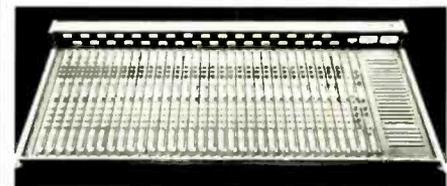
WR-8616

Inputs: 16.
Bus Outs: Mono or stereo, up to 16.
Monitor Selection: Four
Auxiliary Sends: Two stereo.
EQ Section: Three-band sweep.
Metering: VU and LED.
Automation Capability: N/A.
Frequency Response: 20 Hz to 20 kHz, 74 dB gain at trim maximum; plus 4 dB at group output.
Signal-to-Noise Ratio: EIN -128 dB.
Selected Standard Features: Totally modular construction; balanced inputs and outputs; remote control start/stop; switches for six transports; choice of two group modules.
Price Range: \$9,000

PULSAR LABS
3200 Gilchrist Road
Mogadore, OH 44260
Phone: (216) 784-8022

On-Track Series

Inputs: 16 to 32.
Bus Outs: Eight.
Monitor Selection: 32-track, stereo.



Auxiliary Sends: Four.
EQ Section: Three-band sweep.
Metering: VU.
Automation Capability: Semi-automated; VCA controlled.
Frequency Response: ± 0.5 dB, 20 Hz to 20 kHz.
Distortion: Less than 0.01%, 20 Hz to 20 kHz.
Signal-to-Noise Ratio: EIN -129 dB.
Selected Standard Features: Balanced

The Directory

inputs; fully balanced patchbay; VU meter bridge; P&G faders; leg kit; eight VCA subgroups and eight programmable mutes; 34 stereo/effects send returns; "built to order."

Price Range: \$17,800 to \$27,000

RANE CORP.
6510 216th S.W.
Mountlake Terrace, WA 98043
Phone: (206) 774-7309

Model MM 12 Matrix Mixer

Inputs: 12.
Bus Outs: Six.
Monitor Selection: N/A.
Auxiliary Sends: Six.
EQ Section: Three-way input x 12; two-band parametric output x six.
Metering: LED overload inputs and outputs.
Automation Capability: N/A.
Frequency Response: 20 Hz to 20 kHz, +0/-3 dB.
Signal-to-Noise Ratio: N/A.
Distortion: Less than 0.03% at 4 dBm, EIN -120 dBm.
Selected Standard Features: Built-in mike splitters; input submixing; input/output cue system; input/output send/receive loops; expand inputs; rack mountable.
Price: \$1,399

Model SM 26 Splitter/Mixer

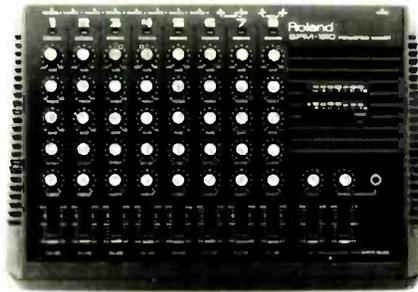
Inputs: Eight.
Bus Outs: Six.
Monitor Selection: Two outputs.
Auxiliary Sends: Six.
EQ Section: N/A.
Metering: N/A.
Automation Capability: N/A.
Frequency Response: 10 Hz to 20 kHz, +0/-3 dB.
Distortion: Less than 0.009% at 4 dBm, EIN -120 dBm.
Signal-to-Noise Ratio: Better than -90 dB at unity gain.
Selected Standard Features: Stereo inputs; stereo outputs; six mix/pan controls; 12 dB gain; expand outputs; auto balanced/unbalanced/floating inputs/outputs; single rack space.
Price: \$329

ROLAND CORP.
7200 Dominion Circle
Los Angeles, CA 90040
Phone: (213) 685-5141

Models BX 800/SPM-120

Inputs: Eight.
Bus Outs: L/R; pre L/R, line L/R, respectively.
Monitor Selection: N/A.
Auxiliary Sends: One.
EQ Section: Treble, bass, pan for L and R.
Metering: LED L/R; peak indicators LED.
Automation Capability: N/A.
Frequency Response: 20 Hz to 40 kHz; N/A for SPM 120.
Distortion: N/A.
Signal-to-Noise Ratio: N/A.

Selected Standard Features: Stereo mixer; color coded controls; individual effect-send controls; individual EQ for each channel.



Price Range: BX 800: \$360; SPM-120: \$675

PA 150/150C and 250/250C

Inputs: Eight.
Bus Outs: N/A.
Monitor Selection: L and R.
Auxiliary Sends: One.
EQ Section: Nine-band x two.
Metering: LED x two overload indicators.
Automation Capability: N/A.
Frequency Response: N/A.
Distortion: N/A.
Signal-to-Noise Ratio: N/A.
Selected Standard Features: 150/150C: Stereo powered mixer; 75 watts per side at 4 ohms; 150C has XLR outputs; 250/250C: Powered mixer; 125 watts per side at 4 ohms; 250C has XLR outputs.
Price Range: 150/150C: \$1,095; 250/250C: \$1,295.

ROSS SYSTEM
1316 East Lancaster
Fort Worth, TX 76102
Phone: (817) 336-5114

SMC 803

Inputs: Eight.
Bus Outs: Two x one.
Monitor Selection: Yes.
Auxiliary Sends: One.
EQ Section: Three-band.
Metering: FLD.
Frequency Response: 20 Hz to 20 kHz.
Automation Capability: N/A.
Distortion: 0.1%.
Signal-to-Noise Ratio: Better than -80 dB.
Selected Standard Features: Two- to eight-band EQ; built-in reverb; phantom power; patchbay.
Price Range: \$699.95

PC 4100CP/5100/6130/8300/8500/-12
Inputs: Four, five, six, eight, eight, or 12, respectively.
Bus Outs: 4100, 5100, 6130: one; 8500: two; 8300: two x one; -12: two.
Monitor Selection: Available on the 6130, 8300, 8500, and -12.
Auxiliary Sends: One.
EQ Section: 4100 and 5100: two-band; 6130, 8300, 8500, and -12: three-band.
Metering: 8300: FLD; 8500 and -12: LED; others: N/A.
Frequency Response: 20 Hz to 20 kHz.
Automation Capability: N/A.
Distortion: 0.1%; 8500 and -12: 0.02%.
Signal-to-Noise Ratio: Better than -80 dB; 8300 -90 dB.
Selected Standard Features: Various

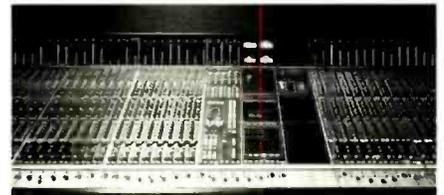
options on all consoles include: built-in cassette player; built-in reverb; patching; and phantom power.

Price Range: 4100: \$449.95; 5100: \$350; 6130: \$529; 8300: \$1,199.95; 8500: \$799.95; -12: \$999.95.

SOLID STATE LOGIC
Chruchfields, Stonesfield
Oxford OX72PQ, England
Phone: 01144-99389-8282

SSL 4000 Series Master Studio System

Inputs: 32 to 64 I/O modules in groups of eight.
Bus Outs: 32 groups plus direct out from each channel; four mix buses.
Monitor Selection: In-line.
Auxiliary Sends: One stereo, four mono, each with individual on/off and pre/post.
EQ Section: Four-band parametric, ±15 dB gain in each band, switchable shelf/peak on HF and LF, continuously variable "Q" on HF and LMF.
Metering: VU, PPM, or SSL plasma display with peak hold, switchable VU/Peak scales and stereo one-third octave spectrum analysis.
Automation Capability: Dual floppy SSL

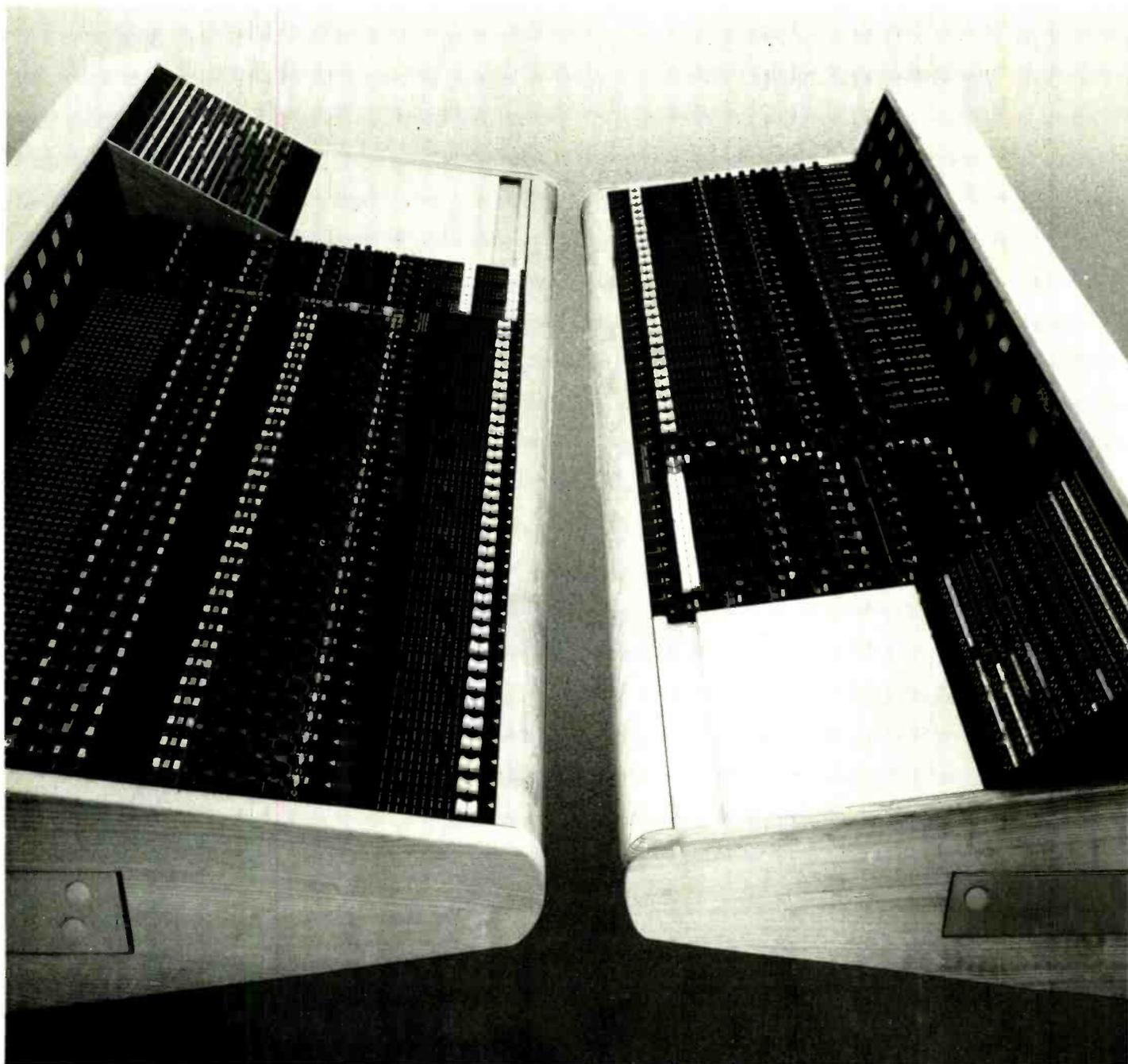


Studio Computer requires one track for SMPTE/EBU timecode; also reads tach and bi-phase; provides dynamic mix automation with join insert and track selective mix auto assembly. Total Recall option store all I/O module pot and switch settings within 0.25 dB accuracy. Programmable EQ option provides two channels of fully parametric, EQ dynamically programmable EQ and stereo panning. Master Transport Selector option allows instant changeover between any three machines. Integral Synchronizer option extends machine control to five transports with search-to-cue by tach pulse, timecode, foot/frames or key words with complete list management. Events Controller option provides up to 32 multi-repeatable contact closures.
Frequency Response: "The company will supply detailed test condition and specifications upon request."
Distortion: As above.

Signal-to-Noise Ratio: As above.
Selected Standard Features: Patch-free audio subgrouping and eight dedicated VCA control group faders with solo and mute functions; full feature compressor-limiter/expander/gate; built-in multitrack electronics remotes in each I/O; pushbutton signal processor routing; extensive patch bay. Stereo modules available with dynamics section; three-band parametric EQ; image width; balance and pan controls; manual and fader activated remote start controls for carts and turntables; AFL and PFL.

Price Range: \$32-channel: \$105k; with SSL Studio Computer: 130k; with Total Recall: \$150k.

..... tried, trusted, TRIDENT



The Series 80B is a 32 input, 24 group/monitor console, and the Series 70 is a 28 input, 16 group 24 monitor console. Both desks are fitted with a fully professional patchbay, 4 echo returns with EQ, and have the facility to use the monitor section as further inputs on remix.

Your limit isn't 32 inputs, Trident's engineers will design you an individual 56 input console at a price which will impress your bank manager.

So don't mince words - say Trident.

Everything Audio
Southern California
(818) 995-4175

Leo's Professional Audio
Northern California
(415) 652-1553

RMS Sound
Northwest
(503) 239-0352

Comcast
Indiana
(317) 849-7050

Southwest Pro Audio
Texas
(512) 443-4567

Trackside Engineering
Southeast
(404) 436-3024

Ear Pro Audio
Arizona
(602) 267-0600

Audio Techniques
New York City
(212) 586-5989



TRIDENT U.S.A. INC.
308 Stanley Avenue, Los Angeles, CA, 90036
Tel: (213) 933-7555

See Us at AES in booth number 341-343



The Directory

SL 5000 Series Audio Production System
Inputs: The console architecture employs modular mainframe elements fitted with 40mm x 150mm Eurocard "cassettes" housing all active electronics. Mainframes are available in lengths accepting from 12 to 64 input channels in blocks of four, and in depths accepting faders plus three, four, five, or six cassettes. Various master electronics configurations are available. More than 100 mainframe sizes are available as standard.



Bus Outs: Live production and edit suite versions are fitted with stereo program outputs and up to 12 additional stereo mix busses, configurable as either four or eight stereo audio subgroups, plus four or eight independent main outputs. All input channels provide an additional direct output with gain control. Post-production and multitrack version may be fitted with additional 24 group outputs for multitrack recording and pre-delays.

Monitor Selection: In-line or separate monitor sections.

Auxiliary Sends: Either two or 10 sends may be fitted. The last eight sends may be switched in pairs to provide up to four stereo sends with level and pan. All sends have pre/post switching and are switchable foldback or PA configurations.

EQ Section: Mono channels may be fitted with four-band parametrics, ± 15 dB gain in each band, switchable shelf/peak on HF and LF, switchable "Q" on HMF and LMF. Stereo channels may be fitted with three-band stereo parametrics with similar switching.

Metering: SSL backlit LCD displays with switchable VU/peak scales. Standard VU and PPM metering to all international broadcast standards available on main outputs.

Automation Capability: SSL Instant Reset Computer provides 48 stores of complete console switching network for instantaneous reset to user defined setups; optional micro-floppy drive provides unlimited instant reset storage; systems equipped with dual floppy drive SSL Studio Computer provide complete Instant Reset List Management as well as all other standard SSL computer features. (See listing for SL 4000 and SL 6000 E Series systems.)

Frequency Response: See above listing.

Distortion: As above.

Signal-to-Noise Ratio: As above.

Selected Standard Features: The initial release includes 50 Eurocard cassettes, all with fully electronic switching and Total Recall interface. Live, post-production and

multitrack configurations are available with stereo and mono channels with or without EQ and full dynamics control. A system of horizontal and vertical audio, control and data busses allows the user to specify almost unlimited panel layout variations while maintaining full central control and computer network integrity.

Price Range: N/A

SL 6000 Series Video System

Inputs: 32 to 64 I/O modules in groups of eight.

Bus Outs: 32 groups plus direct out from each channel; eight mix busses, configured as three stereo pairs folding down to a stereo program mix.

Monitor Selection: In-line.

Auxiliary Sends: One stereo, four mono, each with individual on/off and pre/post. **EQ Section:** Four-band parametric, ± 15 dB gain in each band, switchable shelf/peak on HF and LF, continuously variable "Q" on HMF and LMF.

Metering: VU, PPM, or SSL plasma display with peak hold, switchable VU/Peak scales and stereo one-third octave spectrum analysis.

Automation Capability: Dual floppy SSL Studio Computer, Total Recall, Programmable EQ, Master Transport Selector, Integral Synchronizer, Events Controller — see SL 4000.

Frequency Response: As above.

Distortion: As above.

Signal-to-Noise Ratio: As above.



Selected Standard Features: Substantially similar to SL 4000 console with patchfree audio subgrouping; eight dedicated VCA control group faders with solo and mute functions; full feature compressor/limiter/expander/gate; built-in multitrack electronics remotes in each I/O; pushbutton signal processor routing; extensive patchbay. Stereo modules available with dynamics section; three-band parametric EQ; image width; balance and pan controls; manual and fader activated remote. **Price Range:** 32-channel: \$116k; with SSL Studio Computer: 141k; with Total Recall: \$161k.

SONY CORPORATION

Sony Drive

Park Ridge, NJ 07656

Phone: (201) 930-7006

MCI JH-600

Inputs: 18 to 52.

Bus Outs: 16 to 24.

Monitor Selection: 18 to 52 in-line design.

Auxiliary Sends: Two stereo pairs, one mono pair.

EQ Section: Three-bandwidth-type, optional variable Q, semi-parametric with

sweepable mid-band Q.

Metering: VU or 100 segment bargraph.

Automation Capability: Optional JH-50 automation.

Frequency Response: 20 Hz to 18 kHz.

Distortion: Less than 0.05% SMPTE IM 3 dB below clipping.

Signal-to-Noise Ratio: JH-636 typical, one-channel assigned. Better than -82 dBv reference 775 dB.

Selected Standard Features: Full function communications system module and monitor standard; five echo returns (none automated).

Price Range: \$24,000 to \$100,000

MX-P3000

Inputs: 20 to 36.

Bus Outs: 24.

Monitor Selection: In-line design.



Auxiliary Sends: Six.

EQ Section: Four-band.

Metering: VU or PPM.

Automation Capability: Hard-disk storage, frame accurate.

Frequency Response: N/A.

Distortion: Mike pre-amp: 0 dBm, +20 out, 0.002%.

Signal-to-Noise Ratio: Mike pre-amp: -28 dBu.

Selected Standard Features: Five-modular plug-in EQ; four modular plug-in mike pre-amps; VCAs; two stage peak indicators; variable high-pass, fixed low-pass filters; phantom power.

Price Range: \$40,800 to \$85,000

SOUNDCRAFT ELECTRONICS

1517 20th Street

Santa Monica, CA 90404

Phone: (213) 453-4591

Series 200

Inputs: Eight, 16, and 24.

Bus Outs: Four.

Monitor Selection: Eight monitor returns.

Auxiliary Sends: Four.

EQ Section: Four-band fixed frequency.

Metering: VU.

Automation Capability: N/A.

Frequency Response: At 20 Hz, -1 dB; at 1 kHz, 0 dB.

Distortion: THD 0.015%.

Signal-to-Noise Ratio: -90 dB.

Selected Standard Features: N/A.

Price Range: \$1,195 to \$4,500.

Series 400B

Inputs: Six, 24, and 32.

Bus Outs: Four.

Monitor Selection: Eight monitor returns.

Auxiliary Sends: Four.

EQ Section: Four-band, semi-parametric.

Metering: VU.

Automation Capability: N/A.

Frequency Response: At 20 Hz, -1 dB; at 1 kHz, 0 dB; 20 kHz, -1 dB.

Distortion: 0.015% THD.
Signal-to-Noise Ratio: -90 dB.
Selected Standard Features: N/A.
Price Range: \$4,995 to \$8,495.

Series 500

Inputs: 16, 24, and 32.
Bus Outs: Eight.
Monitor Selection: Eight monitor returns.



Auxiliary Sends: Six.
EQ Section: Four-band.
Metering: VU.
Automation Capability: N/A.
Frequency Response: At 20 Hz, -0.5%; at 20 kHz, -1 dB.
Distortion: Not to exceed at 1 kHz, 0.005%; at 10 kHz, 0.015%.
Signal-to-Noise Ratio: -90 dB.
Selected Standard Features: N/A.
Price Range: \$6,250 to \$9,950.

Series 600

Inputs: 16, 24, and 32.
Bus Outs: Eight.
Monitor Selection: 16 monitor returns.
Auxiliary Sends: Six.
EQ Section: Four-band.
Metering: LED bargraph.
Automation Capability: N/A.
Frequency Response: At 20 Hz, -0.5%; at 20 kHz, -1 dB.
Distortion: Not to exceed at 1 kHz, 0.005%; at 10 kHz, 0.015%.
Signal-to-Noise Ratio: -90 dB.
Selected Standard Features: N/A.
Price Range: \$6,950 to \$10,950

Series 800B

Inputs: 16, 24, 32, and 40.
Bus Outs: Eight.
Monitor Selection: Available stage monitor.
Auxiliary Sends: Eight.
EQ Section: Semi-parametric, three-band.
Metering: VU.
Automation Capability: N/A.
Frequency Response: At 20 Hz, -1.5 dB; at 1 kHz, 0 dB; at 20 kHz, -0.5 dB
Distortion: Not to exceed at 40 Hz 0.01%; at 1 kHz, 0.01%; at 18 kHz, 0.05%.
Signal-to-Noise Ratio: -90 dB.
Selected Standard Features: N/A.
Price Range: \$12,950 to \$22,500.

Series 1600

Inputs: 16, 24, and 32.
Bus Outs: Eight.
Monitor Selection: 24-track monitoring.
Auxiliary Sends: Eight.
EQ Section: Four-band.
Metering: VU.
Automation Capability: N/A.
Frequency Response: At 20 Hz, -2 dB; at 1 kHz, 0 dB; at 20 kHz, -0.5 dB
Distortion: Not to exceed at 40 Hz, 0.01%; at 1 kHz, 0.01%; at 18 kHz, 0.05%.
Signal-to-Noise Ratio: -90 dB.
Selected Standard Features: Producer series console available with patchbay.

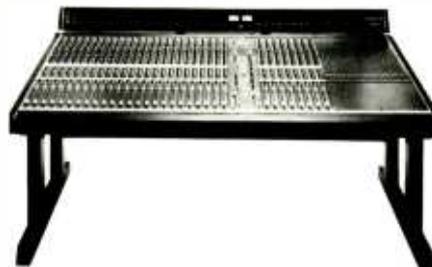
Price Range: \$12,950 to \$22,500.

Series 2400

Inputs: 28.
Bus Outs: 24.
Monitor Selection: 24 equalized returns.
Auxiliary Sends: Six.
EQ Section: Four-band, semi-parametric.
Metering: VU or LED option.
Automation Capability: Tape or disk based.
Frequency Response: At 20 Hz, -0.8 dB; at 1 kHz, 0 dB; at 20 kHz, -0.2 dB.
Distortion: 0.015% THD.
Signal-to-Noise Ratio: -90 dB.
Selected Standard Features: LED bargraph and spectrum analyzer.
Price Range: \$25,000 to \$40,000.

Model TS-24

Inputs: 24, 32, 40, and 48.
Bus Outs: N/A.
Monitor Selection: Effects return module available.



Auxiliary Sends: Six.
EQ Section: Four-band, parametric.
Metering: Bargraph.
Automation Capability: Tape or disk based.

Frequency Response: At 20 Hz, -0.8 dB; at 20 kHz, -0.2 dB
Distortion: 0.015% THD.
Signal-to-Noise Ratio: -90 dB.
Selected Standard Features: N/A
Price Range: \$43,000 to \$75,000.

SOUNDTRACS

U.S. Distributor:
MCI/Intertek, Inc.
745 109th Street
Arlington, TX 76011
Phone: (817) 469-1600

CM-4400

Inputs: One to 40+.
Bus Outs: Two to 12.
Monitor Selection: Four to 24.



Auxiliary Sends: Six.
EQ Section: Four-band.
Metering: 18 to 26.
Automation Capability: Digital routing system.
Frequency Response: 25 Hz to 25 kHz, -2 dBm into 50 ohms.
Distortion: 0.015% IM and THD.
Signal-to-Noise Ratio: 28 inputs with 16 monitors: -78 dBm reference 0 = 0.775 mV.
Selected Standard Features: Two mid-

ATTENTION MCI 600 OWNERS:

Your mic-inputs will sound much better with the MPC-600 Mic-preamp card!

990 DISCRETE OP-AMP: Faster, quieter, more powerful and better sounding than the stock 5534. Performance that monolithic op-amps can't approach. The 990 is the best op-amp.

JENSEN JE-16-B MIC-INPUT TRANSFORMER: Better than transformerless because it eliminates input capacitors that degrade sound quality. Ultra-low distortion, ultra-high linearity and signal levels. If you thought transformers were a compromise, you haven't heard the JE-16-B! It significantly outperforms all other transformers.

SERVO CONTROL OF DC OFFSET ELIMINATES CAPACITORS: Coupling and gain-pot capacitors are eliminated along with their signal degradation, resulting in much better sound.



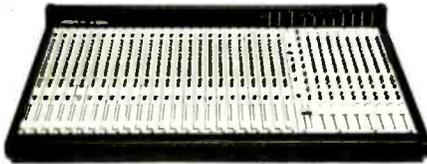
THE HARDY CO. □ P.O. BOX AA631 □ EVANSTON, IL 60204 USA

The Directory

band parametric EQ; discrete mike pre-amp; inputs electronically-balanced.
Price Range: \$9,000 to \$30,000

M-Series

Inputs: 24 to 32.
Bus Outs: Eight.
Monitor Selection: Eight.
Auxiliary Sends: 10.
EQ Section: Four-band, plus high-pass filter.
Metering: L/R, solo, busses, and auxiliaries.



Automation Capability: N/A.
Frequency Response: 25 Hz to 25 kHz, -2 dBm.
Distortion: 0.015% IM and THD.
Signal-to-Noise Ratio: 24-in plus eight returns: -70 dBm at unity gain.
Selected Standard Features: Six auxiliary sends plus four matrixes; four-band EQ; separate meter solo; eight returns.
Price Range: \$8,900 to \$10,950.

8-16 Series

Inputs: 16 to 24.
Bus Outs: Eight.

Monitor Selection: 16.
Auxiliary Sends: Three.
EQ Section: Three-band.
Metering: 18.
Automation Capability: N/A.
Frequency Response: 20 Hz to 20 kHz, -2 dBm.
Distortion: 1 kHz at 4 dBm is less than 0.015%.
Signal-to-Noise Ratio: 16 plus 10 monitors plus two returns: -74 dBm.
Selected Standard Features: 16-track monitoring, phantom power, eight extra returns on remix with EQ.
Price Range: \$5,900 to \$7,900.

S-Series

Inputs: 16 to 24.
Bus Outs: Four.
Monitor Selection: N/A.
Auxiliary Sends: Three.
EQ Section: Three-band.
Metering: Available.
Automation Capability: N/A.
Frequency Response: 20 Hz to 20 kHz, -2 dBm.
Distortion: 1 kHz at +18 dBm, 0.02%.
Signal-to-Noise Ratio: At unity gain -74 dBm.
Selected Standard Features: Mid-band sweep EQ, flight case; PEM, talkback to auxiliary three; eight tape returns.
Price Range: \$2,995 to \$3,995.

Monitor

Inputs: 16 to 24.
Bus Outs: Six.
Monitor Selection: N/A.
Auxiliary Sends: N/A.

EQ Section: Three-band.
Metering: Six LED.
Automation Capability: N/A.
Frequency Response: 20 Hz to 20 kHz, -2 dBm.
Distortion: At 1 kHz, 0.015%; at 10 kHz 0.02%.
Signal-to-Noise Ratio: N/A.
Selected Standard Features: XLR and multipin inputs; XLR outputs; built-in mike split; EQ on each send; flight case.
Price Range: \$3,495 to \$5,495.

Omni Series

Inputs: 10/16/24.
Bus Outs: Four.
Monitor Selection: N/A.
Auxiliary Sends: Three.
EQ Section: Three-band.
Metering: LED.
Automation Capability: N/A.



Frequency Response: 20 Hz to 20 kHz, -2 dBm.
Distortion: At 1 kHz, 0.015%; at 10 kHz, 0.03%.
Signal-to-Noise Ratio: -70 dBm inputs open at unity gain.
Selected Standard Features: Mike/line switch; insert points; three auxiliary sends; studio or flight case versions; multipin inputs; multipin console link.
Price Range: \$3,395 to \$5,795.



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With its patented anechoic foam wedge, SONEX absorbs and diffuses unwanted sound in your studio. And it can effectively replace traditional acoustic materials at a fraction of the cost. SONEX blends with almost any pro audio decor and looks clean, sharp, professional. Check into this attractive alternative for sound control. Call or write us for all the facts and prices.

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Alpha Audio

2049 West Broad Street
Richmond, Virginia 23220 (804) 358-3852

Acoustic Products for the Audio Industry



SOUND WORKSHOP, INC.
1324 Motor Parkway
Hauppauge, NY 11782
Phone: (516) 582-6210

Series 34

Inputs: 24 to 50.
Bus Outs: 24.
Monitor Selection: In-line.
Auxiliary Sends: Six to one, four mono.



EQ Section: Four-band sweep.
Metering: Mechanical VU or optional 40-segment hi-resolution.
Automation Capability: ARMS console computer available.

Frequency Response: 20 Hz to 20 kHz, +0/-0.25 dB.
 Distortion: THD/IM less than 0.03% typical.
 Signal-to-Noise Ratio: Better than -82 dB.
 Selected Standard Features: Totally transformerless; active balanced electronics; unitized/welded steel mainframe; integral patchbay.
 Price Range: \$24,900 to \$61,500

Series 30

Inputs: 12 to 32.
 Bus Outs: Eight to 24.
 Monitor Selection: Three-band sweep.
 Auxiliary Sends: Four to one stereo, two mono.
 EQ Section: Three-band sweep.
 Metering: Mechanical VU or optional 40-segment hi-resolution.
 Automation Capability: ARMS console computer available.
 Frequency Response: 20 Hz to 20 kHz, +0/-0.25 dB.
 Distortion: THD/IM less than 0.03% typical.
 Signal-to-Noise Ratio: Better than -82 dB.
 Selected Standard Features: Totally transformerless; active balanced electronics; unitized/welded steel mainframe; integral patchbay.
 Price Range: \$13,100 to \$25,000

Logex 8

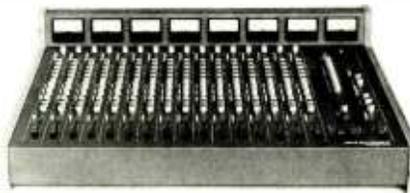
Inputs: 12 or 20.
 Bus Outs: Eight to 16.
 Monitor Selection: Three-band, mid-band sweep.
 Auxiliary Sends: Two.
 EQ Section: N/A.
 Metering: Seven-segment LED on each

I/O.
 Automation Capability: N/A.
 Frequency Response: 20 Hz to 20 kHz, +0/-0.5 dB.
 Distortion: THD/IM less than 0.05% typical.
 Signal-to-Noise Ratio: Better than -80 dB.
 Selected Standard Features: Totally transformerless; active balanced electronics; unitized/welded steel mainframe; integral patchbay.
 Price Range: 12-in: \$4,250; 20-in: \$7,185.

SPECK ELECTRONICS
 12455 Brandford Street Suite #2
 Arleta, CA 91331
 Phone: (818) 897-4188

SPECKMIX MkII

Inputs: 16.
 Bus Outs: Eight.
 Monitor Selection: 16 track.



Auxiliary Sends: Two.
 EQ Section: Three-band, quasi-parametric.
 Metering: VU type.
 Automation Capability: N/A.
 Frequency Response: Mike to buss out 15

Hz to 20 kHz; line to program feed 18 Hz to 140 Hz.
 Distortion: Less than 0.05%, +4 dBv.
 Signal-to-Noise Ratio: Line in to PGM feed better than -80 dBv.
 Selected Standard Features: Dual line feed select per input for electronic musical instruments or digital drums.
 Price Range: \$4,875

SPECTRA SONICS
 3750 Airport Road
 Ogden, UT 84405
 Phone: (801) 392-7531

Model 1100

Inputs: Six.
 Bus Outs: One.
 Monitor Selection: One, variable gain.
 Auxiliary Sends: One monitor.
 EQ Section: High and low frequency \pm 15 dB.
 Metering: One.
 Automation Capability: No.
 Frequency Response: 20 Hz to 20 kHz, \pm 0.75.
 Distortion: 0.01% typical, THD 1 kHz to +18 dB.
 Signal-to-Noise Ratio: -80 dB minimum line input.
 Selected Standard Features: N/A.
 Price Range: \$815 to \$910.

Model 1024B

Inputs: Modular to 24.
 Bus Outs: Modular to 24.
 Monitor Selection: Mono two-, four-,

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In other words, the harmonics arrive at the same time as the fundamental frequency.

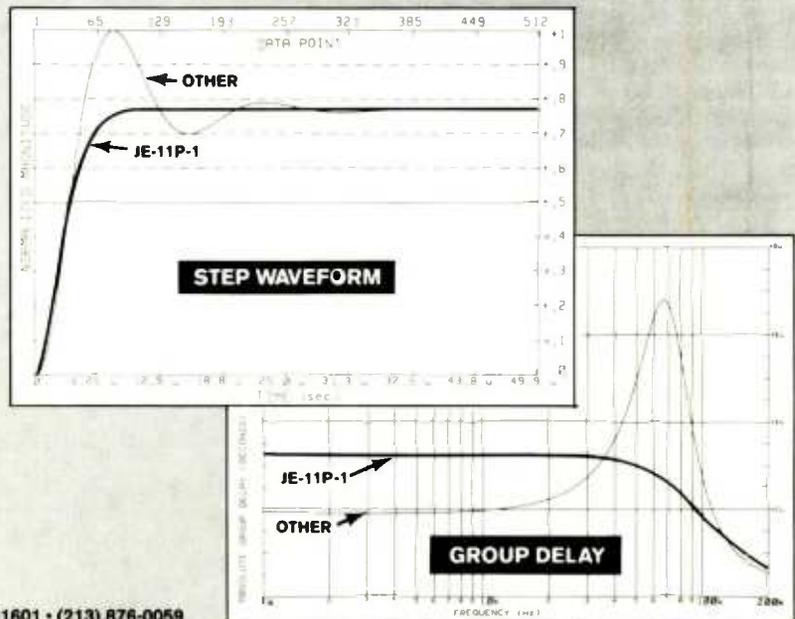
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jensen transformers
 INCORPORATED

The Directory

eight-, 24-track switchable.
Auxiliary Sends: Four echo, four monitor, three cue, and four pan.
EQ Section: 15 frequency, three-band shelving.
Metering: 24 VU.
Automation Capability: Automation ready.
Frequency Response: 20 Hz to 20 kHz, ± 0.2 dB.
Distortion: Less than 0.01% at +18 dBm, (1 kHz) THD.
Signal-to-Noise Ratio: Better than -87 dB below +4 dBm output for a +4 dBm input.
Selected Standard Features: Complete patchbay; built-in signal generator; choice of finish; tape remotes.
Price Range: \$28,750 to \$42,005

Model 1026

Inputs: Modular to 26.
Bus Outs: Modular to 26.
Monitor Selection: Mono two-, four-, eight-, 24-track switchable.
Auxiliary Sends: Four echo, four monitor, three cue, and four pan.
EQ Section: 15 frequency, three-band shelving.
Metering: 26 VU.
Automation Capability: Automation ready.
Frequency Response: 20 Hz to 20 kHz, ± 0.2 dB.
Distortion: Less than 0.01% at +18 dBm, (1 kHz) THD.
Signal-to-Noise Ratio: Better than -87 dB below +4 dBm output for a +4 dBm input.
Selected Standard Features: Complete patchbay; built-in signal generator; choice of finish; tape remotes.
Price Range: \$41,260 to \$51,750

Model 1032

Inputs: Modular to 32.
Bus Outs: Modular to 32.
Monitor Selection: Mono two-, four-, eight-, 24-track switchable.
Auxiliary Sends: Four echo, four monitor, three cue, and four pan.
EQ Section: 15 frequency, three-band shelving.
Metering: 32 VU.
Automation Capability: Automation ready.
Frequency Response: 20 Hz to 20 kHz, ± 0.2 dB.
Distortion: Less than 0.01% at +18 dBm, (1 kHz) THD.
Signal-to-Noise Ratio: Better than -87 dB below +4 dBm output for a +4 dBm input.
Selected Standard Features: Complete patchbay; built-in signal generator; choice of finish; tape remotes.
Price Range: \$64,215 to \$74,710

STUDER REVOX AMERICA, INC.
 1425 Elm Hill Pike
 Nashville, TN 37201
Phone: (615) 254-5651

900 Series

Inputs: 12 and 56.
Bus Outs: Two to 24.
Monitor Selection: Three options, including own EQ.
Auxiliary Sends: Four.
EQ Section: Three- or four-band par-

ametric.
Metering: Moving coil or bargraph, PPM or VU.
Automation Capability: VCA fader option for automation.
Frequency Response: +0.5/-1 dB, 20 Hz to 20 kHz.



Distortion: 0.1% maximum, 31.5 Hz to 16 kHz at 10 dBm.
Signal-to-Noise Ratio: -100 dB.
Selected Standard Features: Fully modular design for custom configurability; wide range of mono and stereo modules; 10 metering options; compressor/limiter.
Price Range: From \$30,500

169/269 Series

Inputs: Eight to 17.
Bus Outs: One to four.
Monitor Selection: N/A.
Auxiliary Sends: Two.
EQ Section: Shelving/peak/high-pass.
Metering: VU or PPM.
Automation Capability: N/A.
Frequency Response: +0.5/-1 dB, 20 Hz to 20 kHz.
Distortion: 0.1% maximum at 1 kHz, +6 dBu input and output.
Signal-to-Noise Ratio: -86 dB.
Selected Standard Features: Portable; AC/DC power supply; phantom power; test oscillator; detachable tilt meter panel; limiter on master; module options.
Price Range: \$9,950 to \$17,800.

STUDIOMASTER

U.S. Distributor:

International Music Company
 1316 East Lancaster
 Fort Worth, TX 76102
Phone: (817) 336-5114

Models 16 x 4 x 2/16 x 8 x 2/16 x 16 x 2
Inputs: 16.
Bus Outs: Four x two, eight x two, and 16 x two, respectively.
Monitor Selection: One send/stereo.
Auxiliary Sends: Two.
EQ Section: Semi-parametric mids/lows-fixed hi.
Metering: LED.
Automation Capability: N/A.
Frequency Response: 20 Hz to 20 kHz, ± 0.5 dB.
Distortion: 0.015%.
Signal-to-Noise Ratio: -90 dB.
Selected Standard Features: Independent buss assigns; three-band output EQ; channel patching; three foldbacks.
Price Range: 16 x 4 x 2: \$2,200; 16 x 8 x 2: N/A; 16 x 16 x 2: \$4,200.

Model 6 x 2 x 1

Inputs: Six.
Bus Outs: Two x one.

Monitor Selection: One send.
Auxiliary Sends: One.
EQ Section: Three-band.
Metering: LED.
Automation Capability: N/A.
Frequency Response: 20 Hz to 20 kHz, ± 0.5 dB.
Distortion: 0.015%.
Signal-to-Noise Ratio: -90 dB.
Selected Standard Features: Channel patching; rack-mount ears; independent subgroup effect returns.
Price Range: \$629

8 x 2/12 x 2

Inputs: Eight/12, respectively.
Bus Outs: Two.
Monitor Selection: Yes.
Auxiliary Sends: One.
EQ Section: Three-band.
Metering: LED.
Frequency Response: 20 Hz to 20 kHz.
Automation Capability: N/A.
Distortion: 0.015%.
Signal-to-Noise Ratio: Greater than -85 dB.
Selected Standard Features: Channel patching; headphone level; effects bussing; phantom power; rack mount bracket.
Price Range: 12 x 2: \$599.95; 12 x 2: \$799.95.

Model 8 x 4

Inputs: Eight.
Bus Outs: Four.
Monitor Selection: One.
Auxiliary Sends: One.
EQ Section: Semi-parametric.
Metering: LED.
Automation Capability: N/A.
Frequency Response: 15 Hz to 20 kHz, -1.5 dB.
Distortion: 0.015%.
Signal-to-Noise Ratio: -85 dB.
Selected Standard Features: Independent buss assigns; solo; headphone level; channel patch.
Price Range: \$1,299.95

Model 12 x 2C

Inputs: 12.
Bus Outs: Two.
Monitor Selection: One send/stereo.
Auxiliary Sends: Two.
EQ Section: Semi-parametric mids/lows fixed hi.
Metering: LED.
Automation Capability: N/A.
Frequency Response: 15 Hz to 20 kHz, ± 0.5 dB.
Distortion: 0.015%.
Signal-to-Noise Ratio: -90 dB.
Selected Standard Features: Independent buss assigns; solo; headphone level; channel patch; three foldbacks.
Price Range: \$1,549.95

TANGENT

8206 North Dreamy Draw
Phoenix, AZ 85020
Phone: (602) 997-4308

Models PHX-8/-20/-32

Inputs: Eight, 20, and 32, respectively.
Bus Outs: Eight.
Monitor Selection: 16, 40, and 64, respectively.
Auxiliary Sends: Six.
EQ Section: Four-band sweep mids.
Metering: LED.
Automation Capability: N/A.

Frequency Response: ± 0.5 dB, 20 Hz to 20 kHz.
Distortion: Less than 0.05%.
Signal-to-Noise Ratio: EIN -127 dBv.
Selected Standard Features: Respective configurations regarding multitrack monitoring and mixdown capabilities.
Price Range: PHX-80: \$2,800; PHX-20: \$4,450; PHX-32: \$6,400

Models SX-8/-12/-16/-24

Inputs: Eight, 12, 16, or 24, respectively.
Bus Outs: Two.
Monitor Selection: Eight \times one; 12 \times one; 16 \times one; and 24 \times one, respectively.
Auxiliary Sends: Three.
EQ Section: Three-band.
Metering: -8 and -12: VU; -16 and -24: LED.

Automation Capability: N/A.
Frequency Response: ± 0.5 dB, 20 Hz to 20 kHz.
Distortion: Less than 0.05%, 20 Hz to 20 kHz.
Signal-to-Noise Ratio: EIN -127 dBv.
Selected Standard Features: Gain, peak LED; separate monitor, effects, and reverb sends; 48-volt phantom power.
Price Range: SX-8: \$1,150; SX-12: \$1,300; SX-16: \$1,600; SX-24: \$2,500

Models PC-8/-12/-16

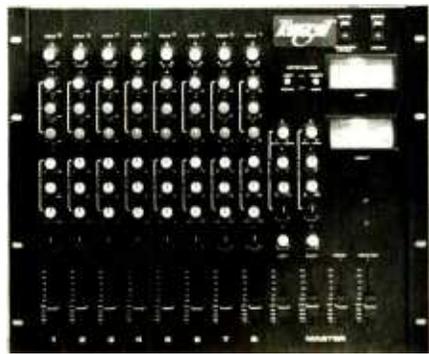
Inputs: Eight, 12, and 16 respectively.
Bus Outs: Two.
Monitor Selection: Eight \times one; 12 \times one; 16 \times one; and 24 \times one, respectively.



Auxiliary Sends: Two.
EQ Section: Three-band sweep.
Metering: VU.
Automation Capability: N/A.
Frequency Response: ± 0.5 dB, 20 Hz to 20 kHz.
Distortion: Less than 0.05%.
Signal-to-Noise Ratio: EIN -127 dB.
Selected Standard Features: Rack mount; solo; 48-volt phantom power; two-built-in amps; monitor, reverb, and effects sends.
Price Range: PC-8: \$1,600; PC-12: \$2,000; PC-16: \$2,400

Model PCM-8

Inputs: Eight.
Bus Outs: Five.



Monitor Selection: Eight \times five.
Auxiliary Sends: Reverb send.
EQ Section: Three-band, mid-sweep.
Metering: Four VU.
Automation Capability: N/A.
Frequency Response: ± 0.5 dB, 20 Hz to 20 kHz.
Distortion: Less than 0.05%.
Signal-to-Noise Ratio: EIN -127 dB.
Selected Standard Features: Powered monitor mixer with four built-in amplifiers; solo; built-in mike splitter.
Price Range: \$2,000

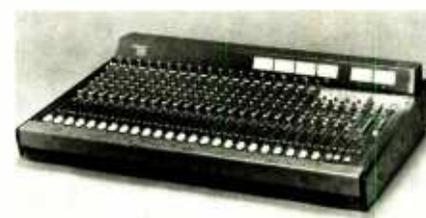
Sidecar

Inputs: Eight.
Bus Outs: Eight.
Monitor Selection: Eight.
Auxiliary Sends: Two stereo sends, one mono.
EQ Section: N/A.
Metering: N/A.
Automation Capability: N/A.
Frequency Response: ± 0.5 dB, 20 Hz to 20 kHz.
Distortion: Less than 0.05%.
Signal-to-Noise Ratio: EIN -127 dB.
Selected Standard Features: Built-in talk-back mike and oscillator; stereo control room send; stereo cue send; "converts any stereo or four-buss reinforcement mixer into a recording system."
Price Range: \$590

TASCAM
 7733 Telegraph Road
 Montebello, CA 90640
 Phone: (213) 726-0303

M-106

Inputs: Six.
Bus Outs: Four.
Monitor Selection: Two-channel, stereo-mono out, plus phonos.
Auxiliary Sends: Two.
EQ Section: Two-bands, fixed.
Metering: Two, VU plus peak LED, switchable.



Automation Capability: N/A.
Frequency Response: 20 Hz to 30 kHz, ± 1 dB, any mike or line to bus.
Distortion: Line to program 0.01%.
Signal-to-Noise Ratio: Line to program -89 dB; EIN is -132 dB.
Selected Standard Features: Auxiliary #1 can be accessed direct by line input; phono pre-amps on channels #3 through #6; jumper connection for pre/post fader auxiliary send; insert on each input and bus; small compact size.
Price Range: \$595.

Model 308

Inputs: Eight.
Bus Outs: Four program, one stereo, one mono.
Monitor Selection: Eight \times two.
Auxiliary Sends: Three.

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Introducing Prolink™ High Performance Studio Cables by Monster Cable®

Many people in the recording business used to think that cables were just cables. And in fact, many of us still do.

A Sound of their Own. Many engineers have found that the opposite is true. They are discovering that ordinary cables have "a sound of their own" and distort music recording and reproduction in ways that we were never even aware of. Critical areas such as clarity, depth of bass response, quickness

of transients, and the "naturalness" and "presence" of voices and instruments, are all lost through conventional cables.

A Monster New Technology in Cable Design. Monster Cable has shown music listeners worldwide that the sound of their playback systems could be significantly improved simply by changing their cables to the Monster. Now you can obtain an improvement in the sound of both recording and playback that will sur-

prise the most critical and skeptical of engineers, simply by switching from your current connecting cables to Prolink by Monster Cable.

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Monster Cable® Products, Inc.
 101 Townsend, San Francisco CA 94107
 415 777-1856 Telex: 470684 MCSYU1

MONSTER CABLE®

The Directory

EQ Section: Three-band, two sweep, hi fixed.

Metering: Four, VU plus peak LED for bus; two VU plus peak LED for auxiliaries.

Automation Capability: N/A.

Frequency Response: 20 Hz to 30 kHz, ± 1 dB any input to any output.

Distortion: 0.025% nominal level, 20 Hz to 20 kHz.

Signal-to-Noise Ratio: Eight mike to bus, -62 dB eight line to program, -82 A weighted.

Selected Standard Features: Channel mute; PFL and AFL; EQ defeat; line inputs can be paralleled on each channel; full balanced +4 dBm level in and out; dedicated stereo plus mono busses; talkback; light socket.

Price Range: \$1,695

Model 312

Inputs: 12.

Bus Outs: Four program, one stereo, one mono.

Monitor Selection: Eight \times two.

Auxiliary Sends: Five.

EQ Section: Three-band, two sweep, hi fixed.

Metering: Four, VU plus peak LED for bus; two VU plus peak LED for auxiliaries.

Automation Capability: N/A.

Frequency Response: 20 Hz to 30 kHz, ± 1 dB any input to any output.

Distortion: 0.025% nominal level, 20 Hz to 20 kHz.

Signal-to-Noise Ratio: 12 mike to bus, -58

dB; 12 line to bus -80 dB A weighted.

Selected Standard Features: Channel mute; PFL and AFL; EQ defeat; line inputs can be paralleled on each channel; full balanced +4 dBm level in and out; dedicated stereo plus mono busses; talkback; light socket.

Price Range: \$2,395

Model 320

Inputs: 20.

Bus Outs: Four program, one stereo, one mono.

Monitor Selection: Eight \times two.

Auxiliary Sends: Five.



EQ Section: Three-bands, two sweep, hi fixed.

Metering: Four, VU plus peak LED for bus; two VU plus peak LED for auxiliaries.

Automation Capability: N/A.

Frequency Response: 20 Hz to 30 kHz, ± 1 dB any input to any output.

Distortion: 0.025% nominal level, 20 Hz to 20 kHz.

Signal-to-Noise Ratio: 20 mike to program -55 dB; 20 line to program -75 dB A

weighted.

Selected Standard Features: Channel mute; PFL and AFL; EQ defeat; line inputs can be paralleled on each channel; full balanced +4 dBm level in and out; dedicated stereo plus mono busses; talkback; light socket.

Price Range: \$3,395

M-512

Inputs: Two.

Bus Outs: Eight.

Monitor Selection: Eight \times two.

Auxiliary Sends: Four.

EQ Section: Three-band sweep.

Metering: Eight, VU plus peak LED for bus; four are switchable to auxiliary input.

Automation Capability: N/A.

Frequency Response: 20 Hz to 30 kHz, ± 1 dB any input to any output.

Distortion: 0.025% nominal level, 0.06% IMD.

Signal-to-Noise Ratio: 12 mike to bus: -58 dB; eight line to bus: -80 dB A weighted.



Selected Standard Features: Fully balanced +4/8 XLR on inputs plus busses; stereo solo; talkback; mutes for EQ; auxiliary and channel in; test tones oscillator; phantom power.

Price Range: \$3,495.

M-520

Inputs: 20.

Bus Outs: Eight.

Monitor Selection: 16 \times two.

Auxiliary Sends: Four.

EQ Section: Three-band sweep.

Metering: 12 VU plus peak LED, eight bus, four auxiliary.

Automation Capability: N/A.

Frequency Response: 20 Hz to 30 kHz, ± 1 dB line to bus out.

Distortion: 0.025% nominal level, 0.06% IMD.

Signal-to-Noise Ratio: 16 line to bus -75 dB; 20 mike to bus -55 dB A weighted.

Selected Standard Features: Fully balanced +4/8 XLR on inputs plus busses; stereo solo; talkback; mutes for EQ; auxiliary and channel in; test tones oscillator; phantom power.

Price Range: \$5,495.

TOA ELECTRONICS, INC.

480 Carlton Street

S. San Francisco, CA 99080

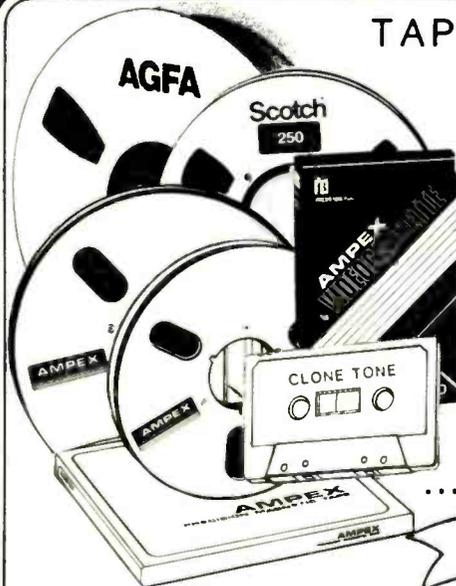
Phone: (415) 588-2538

MCX-106

Inputs: Six.

Bus Outs: Two: main and monitor.

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IN WISCONSIN

1 (800) 362-5445

LOCAL (608) 271-1100

Monitor Selection: N/A.
 Auxiliary Sends: N/A.
 EQ Section: Nine-band graphic.
 Metering: Bar graph.
 Automation Capability: N/A.
 Frequency Response: -3 dB, 30 Hz to 20 kHz (high two input trim at 0 position).
 Distortion: Less than 0.05% +4 dBm at 1 kHz.
 Signal-to-Noise Ratio: N/A.
 Selected Standard Features: Self-powered; 300 watts RMS at 2 ohms; features built-in cassette with dbx noise reduction.
 Price Range: \$1,199.

MX-104

Inputs: Four.
 Bus Outs: Two: main and monitor.
 Monitor Selection: Independent stage monitor mix.
 Auxiliary Sends: N/A.
 EQ Section: Two-band graphic.
 Metering: N/A.
 Automation Capability: N/A.
 Frequency Response: +0/-3 dB, 60 Hz to 20 kHz (input level at 5 position).
 Distortion: Less than 0.05% +4 dBm at 1 kHz.
 Signal-to-Noise Ratio: N/A.
 Selected Standard Features: Built-in power amp; 150 watts RMS at 4 ohms.
 Price Range: \$429.

MX-106R

Inputs: Six.
 Bus Outs: Two: main and monitor.
 Monitor Selection: N/A.
 Auxiliary Sends: N/A.
 EQ Section: Nine-band graphic.

Metering: Bargraph.
 Automation Capability: N/A.
 Frequency Response: -3 dB, 30 Hz to 20 kHz (high 2 input trim at 0 position).
 Distortion: Typically below 0.05%.
 Signal-to-Noise Ratio: N/A.
 Selected Standard Features: Self-powered, 300 watts RMS at 2 ohms.
 Price Range: N/A.

D-4 and D-4E

Inputs: 10 (with D-4E; D-4 alone: 4 x 2 x 1).
 Bus Outs: N/A.
 Monitor Selection: N/A.
 Auxiliary Sends: Three.
 EQ Section: Two-band.
 Metering: Bargraph.
 Automation Capability: N/A.
 Frequency Response: N/A.
 Distortion: N/A.
 Signal-to-Noise Ratio: N/A.
 Selected Standard Features: First generation MIDI-capable.
 Price Range: \$400 to \$500

TRIDENT U.S.A., INC.
 308 North Stanley Avenue,
 Los Angeles, CA 90036
 Phone: (213) 933-7555

Model 75

Inputs: 28.
 Bus Outs: 24.
 Monitor Selection: 24.
 Auxiliary Sends: Eight.
 EQ Section: Five-band.
 Metering: VU.

Automation Capability: Optimix automation.
 Frequency Response: N/A.
 Distortion: THD: better than 0.05% at 1 kHz.
 Signal-to-Noise Ratio: -75 dBu, 20 Hz to 20 kHz.
 Selected Standard Features: 24 group, electronically balanced mike and line inputs; auto mute RTC; three-band EQ on monitor with sweepable mid.
 Price Range: \$25,800

Series 65

Inputs: 16 to 40.
 Bus Outs: Stereo out.
 Monitor Selection: Eight to 16.
 Auxiliary Sends: Eight.
 EQ Section: Four-band sweepable mid.
 Metering: VU.
 Automation Capability: Automation ready.
 Frequency Response: N/A.
 Distortion: 0.05% at 1 kHz, +20 dBu.
 Signal-to-Noise Ratio: At 20 Hz to 20 kHz, -75 dBu.
 Selected Standard Features: Channel and auto mute; stereo solo; monitor EQ; phase revers; on mike and line inputs.
 Price Range: \$6,800 to \$14,500

Series 80/80B

Inputs: 32.
 Bus Outs: 24.
 Monitor Selection: 24.
 Auxiliary Sends: Five.
 EQ Section: Five-band sweep.
 Metering: VU or PPM.
 Automation Capability: N/A.
 Frequency Response: Line: -0.2 dB, 20 Hz to 20 kHz.

MX1688 Recording Mixer

16 x 8 x 2 with control room mixing

The Carvin MX1688 recording console offers the professional quality features and signal performance you've grown to expect from Carvin! Use of the finest components and professional audio design enable the MX1688 to interface with any professional tape deck. For additional info on this console and Carvin's complete product line send \$1 to Carvin, Dept. RP62, 1155 Industrial Ave., Escondido, CA 92025. A similar 16 x 4 x 2 MX1644 mixer is available for \$1995.

Recording Features

- Eight Track Studio Control Center
- Input/Output Channel Organization
- Independent 8 Into 2 Monitor Mixer
- Four Auxiliary Busses w/ Pre/Post
- Three Band Parametric EQ w/ Defeat Switch
- Mute and Solo on all Input and Output Channels
- Two Effects Returns w/ Pan and Solo
- Talkback w/ Built-in Mic and Monitor Dimming
- Peak Warning Indicators w/ Peak Stretching
- Patch Points on all Channels
- Microphone Phantom Power
- Cue and Effects Sends from Output Channels
- Alternate Metering of Cue and Two-Track
- Quick Tape Playback Through Monitors
- Independent Mic and Line Preamps
- Studio Feed w/ Source Selection
- Totally Modular Internal Construction
- Input Noise of -127 dBv, THD less than .05%
- 20 dB headroom at All Stages

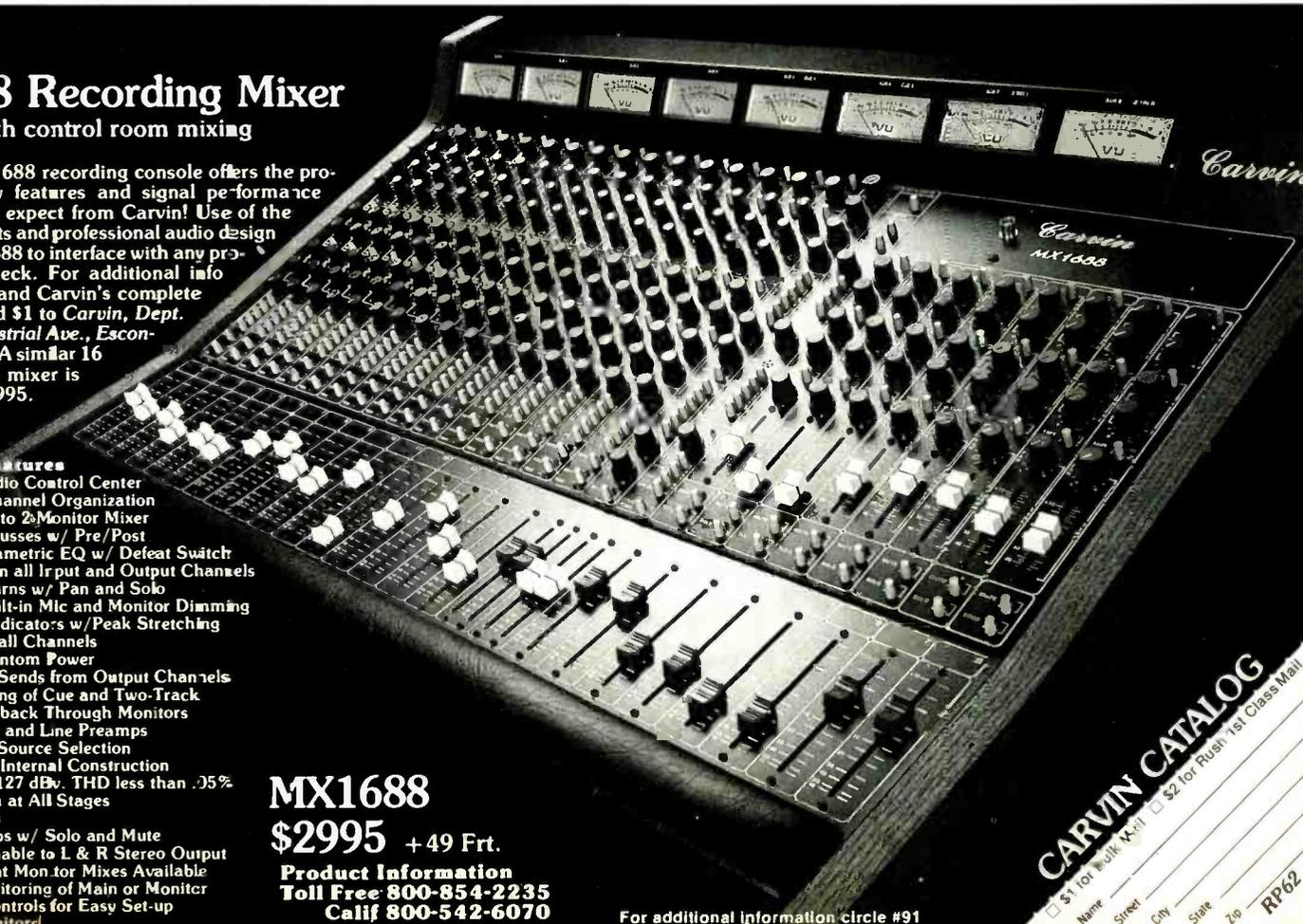
P.A. Features

- Eight Sub-Groups w/ Solo and Mute
- Channels Assignable to L & R Stereo Output
- Four Independent Monitor Mixes Available
- Headphone Monitoring of Main or Monitor
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- Talkback to Monitors

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The Directory

Distortion: Line: 0.01% at +20 dBv, 40 Hz.
Signal-to-Noise Ratio: Typical -80 dBm at 20 Hz to 20 kHz.

Selected Standard Features: EQ on monitors; solo; auto mute; 80 mike patching; aluminum frame construction for expandable modular construction; "any module to any place."

Price Range: Series 80: \$45,800 to \$70,000; Series 80B: \$36,000 to \$45,000

Model TSM

Inputs: 32.

Bus Outs: 24.

Monitor Selection: 24.

Auxiliary Sends: Six.

EQ Section: Five-band sweep.

Metering: VU.

Automation Capability: N/A.

Frequency Response: +0.5 dB, 20 Hz to 20 kHz.

Distortion: Line: 0.01% at +20 dBm, 40 Hz.

Signal-to-Noise Ratio: -75 dBm A weighted.

Selected Standard Features: Individual modular construction; separate EQ on each section; fully expandable.

Price Range: \$88,000 to \$102,000

WHEATSTONE BROADCAST GROUP

5 Collins Road

Bethany, CT 05611

Phone: (203) 393-0887

Model SP-5

Inputs: Eight to 40.

Bus Outs: Four buss mono, eight buss mono, and four buss stereo.

Monitor Selection: N/A.

Auxiliary Sends: Four.

EQ Section: Three band, and three-band sweep.



Metering: Busses, masters, sends, and solos.

Automation Capability: N/A.

Frequency Response: Line: ± 0.5 dB, 20 Hz to 20 kHz; mike: ± 0.5 dB, 30 Hz to 20 kHz.

Distortion: Line: less than 0.003%, 20 Hz to 20 kHz at +18 dBm; mike: less than 0.005%, 20 Hz to 20 kHz at +18 dBm.

Signal-to-Noise Ratio: Line: -90 dB below +4 dBm; mike: EIN -129 dB.

Selected Standard Features: Totally modular; selection of dual stereo line; input module; mono mike/line input; dual mono line-input; stereo and mono groups; control module with studio and control room controls, communications and oscillator.

Price Range: \$8,100 to \$31,300.

YAMAHA INTERNATIONAL, CORP.

6600 Orangethorpe

Buena Park, CA 90620

Phone: (714) 522-9011

PM 180

Inputs: Six.

Bus Outs: Two.

Monitor Selection: N/A.

Auxiliary Sends: N/A.

EQ Section: Two-band.

Metering: Two VU.

Automation Capability: N/A.

Frequency Response: +0.5/-3 dB, 20 Hz to 20 kHz.

Distortion: Less than 0.3% THD.

Signal-to-Noise Ratio: -123 dBm, EIN -69 output.

Selected Standard Features: Transformer balanced XLR inputs; rack mountable; headphone jack with volume.

Price Range: \$725

MC1204/1604/2404

Inputs: 12 or 16/24, respectively.

Bus Outs: Six.

Monitor Selection: Two.

Auxiliary Sends: Two.

EQ Section: Three-band.

Metering: Six peak VU/10 peak VU.

Automation Capability: N/A.

Frequency Response: 20 Hz to 20 kHz.

Distortion: Less than 0.1% THD.

Signal-to-Noise Ratio: -128 dBm EIN, -95 residual noise output.

Selected Standard Features: Modular balanced; electronically balanced XLR inputs; phantom power.

Price Range: 1204: \$2,095; 1604: \$2,695; 2404: \$3,795

RM602/804

Inputs: Six/eight, respectively.

Bus Outs: Four.

Monitor Selection: 602 has one channel.

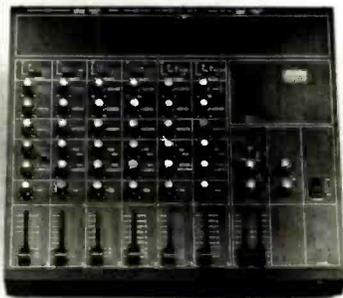
Auxiliary Sends: One.

EQ Section: 602: Two-band; 804: three-band.

Metering: 602: stereo peak level; 804: six peak level; peak VU.

Automation Capability: N/A.

Frequency Response: 20 Hz to 20 kHz.



Distortion: Less than 0.05%.

Signal-to-Noise Ratio: EIN -122 dB.

Selected Standard Features: Phono inputs; live signal/tape switching; 804 includes inserts for each channel; XLR and RCA inputs.

Price Range: 602: \$395; 804: \$1,195

MC1608/2408

Inputs: 16/24.

Bus Outs: Eight.

Monitor Selection: N/A.

Auxiliary Sends: Two.

EQ Section: 602: Three-band.

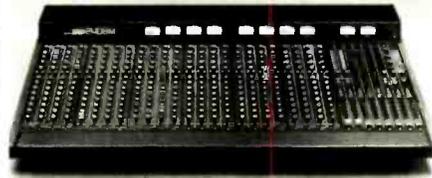
Metering: Six/10 peak VU.

Automation Capability: N/A.

Frequency Response: 20 Hz to 20 kHz.

Distortion: Less than 0.05%.

Signal-to-Noise Ratio: EIN -128 dB; -95 dB residual noise.



Selected Standard Features: Electronically balanced XLR inputs; modular construction; phantom power.

Price Range: 1608: \$2,895; 2408: \$3,995

MQ Series

Inputs: Eight, 12, and 16.

Bus Outs: Four.

Monitor Selection: One-channel.

Auxiliary Sends: Two.

EQ Section: 602: Four-band graphic.

Metering: Two peak-level.

Automation Capability: N/A.

Frequency Response: +1/-3 dB, 20 Hz to 20 kHz.

Distortion: Less than 0.5%.

Signal-to-Noise Ratio: EIN -126 dB.

Selected Standard Features: Two sets of inputs, built-in power supply.

Price Range: 802: \$1,295; 1202: \$1,595; 1602: \$1,895

RM1608/2408

Inputs: 16/24.

Bus Outs: Eight.

Monitor Selection: Two echo sends.

Auxiliary Sends: Two.

EQ Section: 602: Three-band parametric.

Metering: 12 peak reading.

Automation Capability: N/A.

Frequency Response: 20 Hz to 20 kHz.

Distortion: Less than 0.1%.

Signal-to-Noise Ratio: EIN -128 dB.

Selected Standard Features: Talkback with microphone.

Price Range: 1608: \$6,600; 2408: \$9,900.

EMX150/200/300

Inputs: Six, eight, or 12 respectively.

Bus Outs: Four.

Monitor Selection: Two-channel.

Auxiliary Sends: Three.

EQ Section: 602: Three-band graphic.

Metering: Two VU/four VU.

Automation Capability: N/A.

Frequency Response: +1/-3 dB, 20 Hz to 20 kHz.

Distortion: Less than 0.5%.

Signal-to-Noise Ratio: EIN -126 dB.

Selected Standard Features: 150: 150 watts per channel; power amp; built-in analog delay. 200/300: 250 watts per channel; power amp; built-in delay.

Price Range: 150: \$1,195; 200: \$1,595; 300: \$1,995

M406/508/512/916

Inputs: Six/eight/12/16, respectively.

Bus Outs: Six/four(508 and 512)/eight.

Monitor Selection: 508 and 512: one chan-

nel; 916: two-channel.
 Auxiliary Sends: One; 916 has two echo.
 EQ Section: Three-band; 916 N/A.
 Metering: Two VU; five VU on 916.
 Automation Capability: N/A.
 Frequency Response: +1/-3 dB, 20 Hz to 20 kHz.
 Distortion: Less than 0.5%.
 Signal-to-Noise Ratio: EIN -127 dB, -95 residual noise.



Selected Standard Features: Various features include phantom power; XLR connectors; effects and subgroups.
Price Range: 406: \$995; 508: \$1,650; 512: \$2,300; 916: \$5,700

M1516A/1524/1532

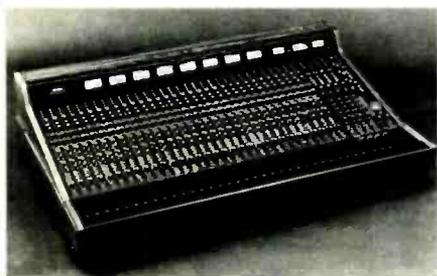
Inputs: Six, 24, or 32, respectively.

Bus Outs: 12.

Monitor Selection: Two.

Auxiliary Sends: Two.

EQ Section: Four-band, selectable frequency range.



Metering: Eight/10/24 VU.
Automation Capability: N/A.
Frequency Response: -3 dB, 20 Hz to 20 kHz.

Distortion: Less than 0.5%.
Signal-to-Noise Ratio: EIN -128 dB, -95 residual noise.

Selected Standard Features: Modular construction; pre and post switching on sends; four effects/returns; mixing matrix.

Price Range: 1516A: \$11,000; 1524: 16,500; 1532: 19,800

PM2000

Inputs: 24 or 32.

Bus Outs: 16.

Monitor Selection: Four channel.

Auxiliary Sends: Two echo.

EQ Section: Four-band, selectable frequency range.

Metering: 12 VU.

Automation Capability: N/A.

Frequency Response: -3 dB, 20 Hz to 20 kHz.

Distortion: Less than 0.5%.

Signal-to-Noise Ratio: EIN -128 dB, at +19 output.

Selected Standard Features: Modular construction; 14x eight mixing matrix; remote power supply; transformer isolated XLR inputs.

Price Range: 2000-24: \$29,500; 2000-32: \$34,500



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The Yamaha REV-1 Digital Reverb comprises two sections: the rack-mount mono-in/stereo-out processor and the RCR-1 remote control unit. Front panel adjustments on the processor comprise input-level controls; headphone monitor jack and level adjust of a 16-LED input level display; RT60 and Early Reflection time displays; memory-select display and keyboard; and various Function and Memory select buttons. On the rear panel are the XLR input and output jacks; remote-control and RS232C computer interface (plus a REM-Comp select switch); a BNC connector for external word-clock input (plus INT/EXT selection); and a third switch that selects between analog and optional 16-bit digital input. Although basic functions can be controlled from the processor's front panel, there is little doubt that the RCR-1 remote opens up a whole new world of capabilities.

At first glance, the remote control layout looks quite complex, with about 90 controls and displays. After a little study, however, the unit reveals itself to be laid out simply, consisting of four basic sections that control the reverberation quality, early reflection, reverb delays, and memory functions.

While the main processor contains 90 memories — 30 in ROM and 60 in RAM — nine more are stored in the remote's own internal RAM — a useful feature that allows favorite setups to be carried from studio to studio. The first 30 permanent memories are labelled as Large Hall, Vocal Plate, Percussion Plate, and so on. In addition, the ROM presets include special effects such as Stereo Echo, Stereo Flange, Tremelo, Chorusing, and Constant-density plates. All of these presets can be moved over into the unit's RAM memory, modified, and then stored.

With the exception of the keypad, which is used for entering data, literally every button and knob on the remote is provided with some sort of self-illuminated indicator. Controls are provided for adjusting delay time, levels, and low, mid-high and high-frequency RT60, as well as center frequencies for the low- and mid-high reverb times.

Early Reflections are controlled via an on/off switch and an individual level control, which allows the user to adjust the proportion between early reflections and reverb. Also provided is a "Liveness" control (Dead to Live in eight steps); an Early-Reflection



YAMAHA REV-1 DIGITAL REVERB

Reviewed by Bobby Nathan

Number control (eight different echo-time patterns); and a Room-Size control (small to large in eight steps). These functions basically deal with the amount, length of time and loudness of early reflections — up to 40 — all totally independent from the reverb pattern. A separate control sets the amount of time required for the reverberation to begin — in effect, an initial delay before you actually hear reverberation — and variable from zero to 600 milliseconds. It's even possible to set up some early reflection, followed by a moment of silence, and then have reverberation pattern take over.

Also featured on the remote is a level indicator for input (direct) and output levels, four switched high-pass (50, 100, 200, and 400 Hz) and low-pass (4, 6, 8, and 10 kHz) filters, and a backlit Liquid Crystal Display window. The LCD provides graphic displays of reverberation time, filter and crossover points, early reflection levels, room adjustment size, reverberation mode, time ratio, reverb waveform, and a list of the 30 ROM presets.

Operator Convenience

After about five minutes of working with this unit, I found it incredibly hard to get lost since the LCD provides you some visual feedback of the parameters being adjusted. Changing the various parameters is basically a snap; there's even a function on the early reflection and reverberation mode called "Auto" that provides an average of what the unit's computer "thinks" the relationships between parameters should be as you adjust perhaps one of them.

The software program is straightforward — a regular keypad with the ability to change numbers up or down, and enter them into displays. Storing a new sound is also simple: just modify a preset; call up an unused memory; press Store; and it's stored. Recalling it is just as simple: input the memory location; press Recall; and it's there.

The Display section to the left of the remote's panel provides control over the selection of one of eight different display modes:

- *Waveform (W/F)* — which allows

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YAMAHA REV-1

you, through a graphic representation, to analyze the relationship between the direct sound, the early reflection, and the subsequent reverberation decay pattern;

- **Filter and Crossover (F/C)** — the high and lowpass filter frequencies and crossover points;
- **Reverb Time (R/T)** — a display of the reverb times for the four bands of frequencies (low, mid-low, mid-high, and high);
- **Reverb Time Ratio (Ratio)** — a simplified display showing reverberation time characteristics of the four frequencies bands;
- **Early Reflection Mode (E/R)** — this display enables you to view the composition of early reflections, room-size change and the E/R mode under selection.

There are three controls included in the Early Reflection affecting what is

observed on this display: room size control (1/8 to 8), the E/R Number control (1 to 40), and Liveness control (1 to 8).

- **Reverb Mode (REV)** — depress this key and the LCD provides a graphic representation of the reverb sound density;
- **Preset Title (P/S)** — depress this key and the memory numbers and titles of the corresponding data assigned to presets #1 through #4 is displayed; depress it again and it shows the titles for presets #5 through #8;
- **Memory Title (M)** — when pressed, this key shows all the presets Yamaha has supplied.

In addition, a pair of 16-segment LED meters are provided for input and output level monitoring, plus HPF and LPF frequency select switch, and an R/T display showing the primary reverberation time ranging from 0.1 to 99.9 seconds in increments of 0.1 seconds for the mid-low frequency RT60 centered at 1 kHz. The

Direct Sound Level control is located at the bottom of this panel and controls the amount of direct signal mixed with early reflected and subsequent reverberation.

After you've modified a sound's early reflections, you can now move to the Reverberation section of the remote control, which is responsible for setting actual reverb time and quality after the first initial reflections. Located at the top of this section are the Reverb Mode settings (REV. MODE) — eight keys that are responsible for setting the diffusion characteristics of the reverb, and are labelled internally:

- 1) *Super High Density (SDH)*;
- 2) *High Density/High Initial Diffusion (HD/LID)*;
- 3) *High Density/Low Initial Diffusion (HD/LID)*;
- 4) *Medium Density (MD)*;
- 5) *Medium Low Density (MLD)*;
- 6) *Low Density (LD)*;
- 7) *Super Low Density (SLD)*; and
- 8) *Equally Spaced Diffusion (ESD)*.

Again pressing the "Edit" button at the right will enable you to make your chosen selection.

Below these eight mode keys are three knobs with respective LED indicators above them labelled High, Mid-high, and Low that allow you to adjust through the different reverb times. For the High RT60, there is a range of 11 settings from -5 to +5 times the Low-Mid (1 kHz) reverb time; for the Mid-High RT60 the range is from 0.2 to 1.2 seconds times the Low-Mid reverb time, in 0.1-second steps; for the Low RT60 the range is from 0.4 to 2.4 seconds times the Low-Mid reverb time, in increments of 0.2 seconds.

To the left of the RT60 selection knobs are two sets of three keys. The first set, labelled 4K, 2K, and 1K, selects the crossover point between the Mid-High and Low-Mid RT60 ranges; the other set chooses a crossover point of 500, 250, or 125 Hz between the Low-Mid and Low RT60 ranges.

Next down this panel is a three-digit LED labelled REV DELAY 2 (D2), which displays the time difference between the initial direct sound, and the reverberation to follow. Delay time can be set in 1-millisecond steps from zero to 0.6 seconds.

Two Auto keys — REV. DELAY and REV. LEVEL — set the respective parameters to standard preset values. A Reverberation On key allows this part of the reverb chain to be turned on and off while the Reverb Level Indicator and Reverberation

USER COMMENTS: Hands-On Experience with the REV-1

Engineer Frank Heller: Of the 30 factory-provided presets, the first 18 are various forms of reverb settings, and have titles such as Large Hall, Percussions, etc. The last 12 are effects presets, and include Phasing, FLanging, Echo, Chorus, Tremelo, and Constant-Density Plates. Unlike the reverb and echo settings, for which you can modify most parameters, these little gems are a "take-it or leave-it" situation.

Calling up an effect like "Chorus A" provides you with a very pleasant sounding chorus, but not the ability to modify the modulation amount, frequency or feedback, as found on most stand-alone chorus units. The same is true for the other special effects, with the exception of the Echo and Constant-Density plates.

Upon first encountering this quirk, I figured that Yamaha felt that if you bought the REV-1, you were buying it for the reverberation facilities and, since as most studios usually have those other kinds of effects boxes, the special effects were just an added bonus. But, upon practical application of the unit, I found the lack of these control parameters disappointing.

In most cases, this unit will wind up hard-wired into a console's effect send-return chain, and thus become an instant "turn-it-on/hear-it" device. (Being able to quickly pull up an effect for a producer can work wonders in pressured situations! The ability to refine this form of instant gratification to everybody's satisfaction is always a plus in my book.)

I hope that Yamaha will provide a software update to correct what I consider a shortcoming in an already excellent digital reverb unit.

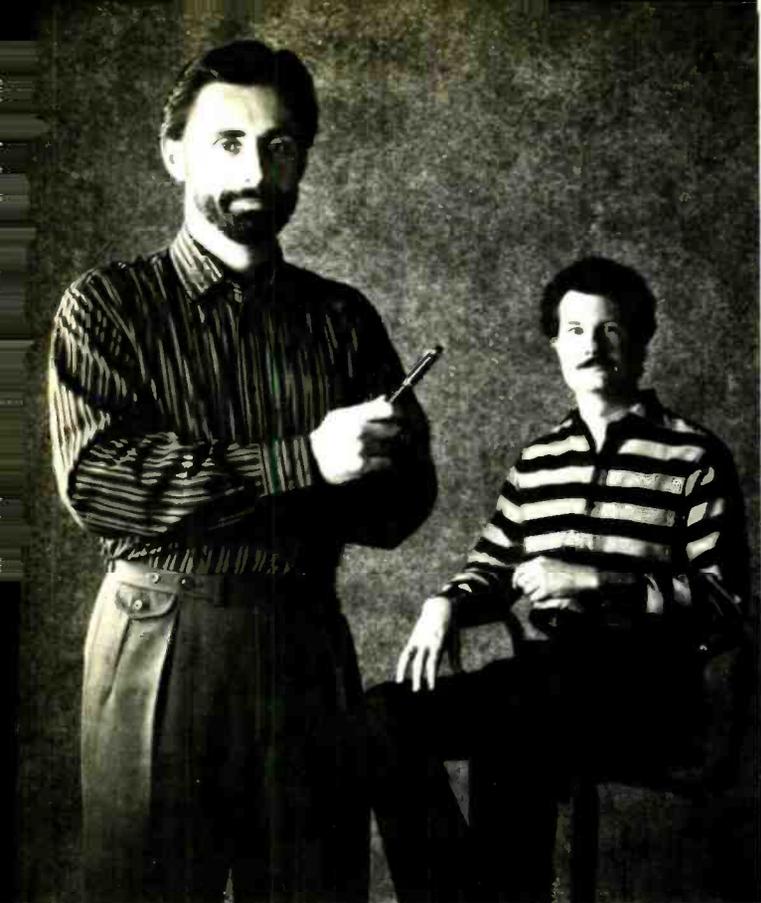
Chris Lord-Alge: In mixing and recording applications, I've found that the realism of ambience created is only natural with a few of the REV-1's presets, and that it takes a little work by editing and saving your own version of the initial presets parameters. In a quality comparison, the unit's top-end response is still a little "shifty" and electronic sounding (unnatural) but, by picking the resolution of the E/R Mode (1 to 8), natural ambience can be obtained. For example: with a lead vocal, solo the vocal track and start changing the E/R Mode and level, and then listen to it with the rest of the track in. You will find that there is a lot more control over the tone and delay than you're used to with other units.

It appears Yamaha realized that, since reverb is so complicated to begin with, when recreating it digitally, having a lot of edit parameters becomes the only way to create natural rooms and chambers.

The REV-1 is a standard piece of outboard gear in my mix room, especially for vocals and percussion.

Engineer Michael Finlayson: I think the Yamaha REV-1 is a great sounding unit. From long, smoothly decaying halls with a very natural sound, to a wide variety of effects — including Reverb Decay mode — this unit can sound as real or as unreal as you'd like.

□□□



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Works...”

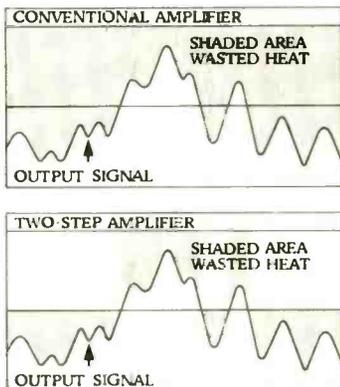
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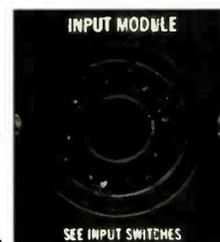
Barry Andrews
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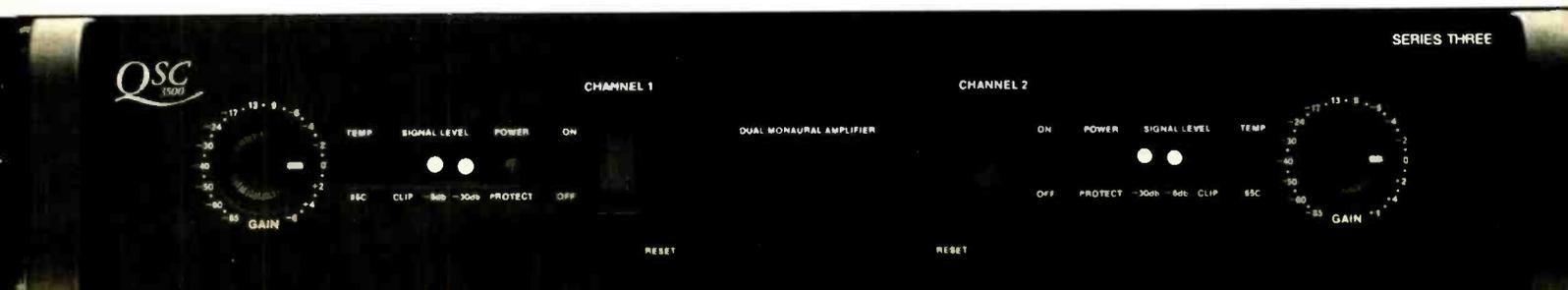


compact and reliable, and which delivers unmatched audio performance. The diligent research that went into our Series Three paid extra dividends in the development of our economical Series One amplifiers. Both series feature our patented Output Averaging™ short circuit protection, dual isolated power supplies, calibrated gain controls, premium components throughout, and complete rear panel connection facilities that include balanced XLR and 1/4" jacks, octal sockets for active and passive input modules and a full selection of output connectors. Our dedication to design excellence goes hand-in-hand with our commitment to providing full-service support on all our products. When you put it all together, QSC amplifiers reflect the commitment to leadership, service and design innovation that has guided us since we were established in 1968. For more information contact: QSC Audio Products, 1926 Placentia Avenue, Costa Mesa, CA 92627, (714) 645-2540.



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YAMAHA REV-1

Level control enable the amount of subsequent reverb created to be blended with the reflections and direct signal of the input sound source.

The remote's Master section provides selection of different presets available from the ROM and RAM data, and allows the storage and recall of any favorite settings. At the top of this panel, the Preset keys, numbered #1 through #8 for the ROM data, allow basic sounds to be changed to whatever you desire. In addition, the keys can be read instantly "at the push of a button," and can be particularly handy, for example when changing from plate reverb setting to a chorus or a flange on a vocal mix.

Below the presets are the Panel keys labelled P, EDIT, and AUTO. Like most other keys, they have LEDs mounted in the middle to show the current mode of operation. The P key is used to set parameters without utilizing any preset or memory data, while the AUTO key turns all other Auto keys on or off.

Located below these keys is the Memory Display, a two-digit LED that shows the selected memory numbers for 1 to 99. An M key (Memory) is used with the STR key to store new information, and with RCL key to recall specific data from memory, and is additionally used to change, store, or recall any memory number in conjunction with the 10-key numeric pad located below it.

Beneath the memory keys are four RT60 and delay-time function keys. Press the edit key followed by the R/T key (Reverb Time) — the reverberation time can now be adjusted. The D1 and D2 (Delay 1 and 2) keys work the same way except, that changes in the early-reflection and pre-reverb delay times will occur; values can be observed in the respective display windows. Clear, Up and Down Keys, and the Enter Key aid in changing parameters.

At the bottom of this section, the Master On/Off key, Master Level Indicator, and Master Level Control adjusts the overall level of the balances created with the Direct Signal (first section), the Early Reflection (second section), and the Reverberation (third section) outputs.

Session Applications

The unit comes standard with special presets that sound good, includ-



— CLOSE-UP DETAIL OF RCR-1 REMOTE CONTROLLER —

ing kick, snare, and handclaps. Other unique special effects include flanging, which is rather like tape flanging, except that it cannot be modified because the preset values are stored on ROM. A total of 69 user memories are provided, and can be utilized to save updates made from these basic sounds. For instance, you can take a plate platform, change the sound, add a pre-delay, and/or work on the reflections, and then store it with its own numerical identity into the unit's memory to be recalled at any time. These memories are non-volatile, and retained if the unit is powered down.

The LCD window shows what your E/R and RT60 waveform look like and how long the Low, Mid-Low, Mid-High and High are relative to the 1 kHz reverb time. By being able to view where the drop-off points are, and what the relative level is, this function becomes very effective when you want to tailor the reverb pattern to an individual sound. The reverb density is about 20,000 reflections per second, which means that there is a pretty clean drop off for the top end of a plate, for example, and then more of a "spring reverb" type sound when you get into the lower density, which has a lot of room between the reflections. You can also display the early reflections themselves, and move them around in many ways to create a personal reflection mode.

In general, the layout of the REV-1

is definitely representative of the new trends in equipment: older-generation reverb units are usually too big and too bulky, and their remotes tend to be very confusing. The RCR-1 remote is laid out very clearly, and is worth the extra space because of its enhanced capabilities within studio situations. Plenty of memory is provided for user presets, which enables the studio with a number of engineers to store their individual sounds. (Yamaha might have provided a way to download user presets to tape, although the R232C interface and an external PC could be used for this.)

In terms of sound, the REV-1 will compete with anything that's out there on the market and, for the price, it's definitely worth adding to your collection of reverbs. Also, because it is capable of producing special effects such as delay, chorus, and flanging, I feel it is more usable and user oriented. Once you achieve your desired sound and update it, saving the data in memory is easy.

The modes I find myself checking most often include "Reverb Waveform," which tells you almost everything on a level/time basis; "Reverb Time Ratio," and "Early Reflection Mode," which even includes a graphic "house" that shrinks and swells to indicate room size. These images can be very important for comparing sounds, and for experimentation purposes.

The unit's LCD window makes it much easier to make a quick mental note of your settings. So far, I've only referred to the LCD located at the top of the unit. Most of the information provided there is also displayed with LEDs — crossover points, rolloffs, etc. — or digitally — decay and delay times. These displays are helpful in monitoring the status of one group of parameters while displaying another on the LCD. (Some are just simpler to read numerically — decay time, for instance.) The bottom line is that you always have much more information available without paging through unneeded material, or having to lose one read-out to view the another.

Although it results in a larger remote, I do like being able to work on several parameters simultaneously. It may seem old fashioned — like working on an analog synth instead of a DX7, for example — but I find it much faster than calling up a parameter, adjusting it, calling up another, adjusting it, and then going back to the original parameter.

The REV-1 is very versatile; it can be used to achieve effects that would require two lesser units, and possibly two delay lines. With the "on-board mixer," it's possible to work on the room sound, number of reflections, room size, pre-delay, etc. Once the mix is accomplished, I suggest muting the direct portion, fine tune the reverb part of the program, including its own independent pre-delay, and then blend it with the direct signal. Quick and easy gated room sound with eighth-note slap reverb or vocal doubling and reverb in one unit... what more could you want? ■■■

SUMMARY OF YAMAHA REV-1 DIGITAL REVERBERATOR SPECIFICATIONS

Frequency Response: 20 Hz to 18 kHz, ± 1 dB.

Dynamic Range: Reverberation Mode 85 dB; Delay Mode 90 dB.

Input: Impedance is greater than or equal to 10 kohms; connector is balanced XLR-3-31 ($\times 2$); +4 dBu nominal (input level control provides 6 dB gain thru infinite attenuation).

Outputs: Impedance is for 600 ohms or higher Z loads; connector is balanced XLR-3-32 ($\times 2$); Level is +4 dB nominal.

Headroom: 14 dB above nominal level.

Monitor Output: Stereo headphone jack, 18 mW maximum into 8 ohms.

Harmonic Distortion: Less than or equal to 0.3% at 1 kHz, maximum level.

A/D and D/A Converters: 16 bit.

Sampling Frequency: Approximately 44.1 kHz, externally controllable.

Digital I/O: 16-bit serial format optional.

FRONT PANEL

Input Level Control: From 6 dB gain to infinite attenuation; recessed control.

Input Level Meter: 16 point LED display, 0 dB to +6 dB.

REMOTE CONTROL

Input Filters: LPF 6 dB/octave at 4, 6, 8, or 10 kHz; HPF 6 dB/octave 50, 100, 200, 400 Hz with in/out switches on both filters.

Early Reflections: Mode has eight basic echo time patterns; Room has "small" to "large" in eight steps; Liveness has "Dead" to "Live" in eight steps; Initial Delay (D1) 0 to 255 milliseconds; and Mixing Level 0 dB maximum to infinite attenuation.

Reverberation: Mode has eight different types; Reverberation Time of 0.1 to 99.9 seconds Low-Mid band at 1 kHz; Frequency Balance is adjustable in 11 steps reference to 1 kHz R/T — Low = 1 kHz R/T $\times 0.4$ to 2.4; Low-Mid = (the set R/T at 1 kHz); High-Mid = 1 kHz R/T $\times 0.2$ to 1.2; High = 11 steps -5 to +5; Crossover Frequency: Low-Mid = 125, 250, or 500 Hz and Mid-High = 1, 2, or 4 kHz; Delay from Input (D2) is 0 to 600 milliseconds; and Direct Signal is 0 dB maximum to infinite attenuation.

Direct Signal: Input signal ("direct") mixing level from 0 dB maximum to infinite attenuation, plus on/off switch.

Master Level: Output level from 0 dB maximum to infinite attenuation, plus on/off switch.

Memory: 30 memories are pre-programmed; 60 user programmable memories in main unit, with nine additional memories in the remote unit.

Graphic Display: High-resolution, backlit LCD dot matrix.

Dimensions: Processor is 5½ inches \times 19 inches \times 15 inches; Remote unit is 1¾ inches \times 7¼ inches \times 11¼ inches (H \times W \times D).

Price: \$11,900 for both remote and processor; additional remotes are \$2,100 retail.

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Tape Fluxivity Level re Value in Table (overleaf) [dB]

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IN-USE OPERATIONAL ASSESSMENT



MARSHALL ELECTRONIC AR-300 TAPE ELIMINATOR

Reviewed by Bob Hodas

Every once in a while when writing reviews such as these, you come across an undiscovered gem in the vast array of available outboard gear. Such as the case with the AR-300 Tape Eliminator from Marshall Electronic. I had a hard time believing that this unit has been available since January 1982; as far as I can tell, it has never been advertised, yet has sold on a word-of-mouth basis directly from the manufacturer or through a dealer.

The AR-300 was designed to fulfill one purpose only: to duplicate the sound of true tape echo. It can eliminate the need for a dedicated tape machine, along with overcoming many of the limitations associated with tape and tape transports. Typically, the dynamic range of an average studio tape machine is 60 to 70 dB, while the AR-300 has better than 105 dB, along with much higher headroom than tape — typically better than 25 dB. Tape machines normally exhibit a radical high-frequency EQ shift in varispeed mode, but the AR-300 limits this shift to ± 2 dB.

There is also a big advantage in the speed selection. While most tape machines provide only two speeds, and the VSO range of usually no more than $\pm 25\%$, the AR-300 offers three speed selections plus a VSO range that overlaps into the next speed. When operating in the VSO mode, tape-machine motors have a heavier duty cycle, parts and heads wear out more quickly, and maintenance is generally high. As an analog effect, the Tape Eliminator is virtually maintenance free, easily portable (one rack space), and has no heads to clean, or tape to rewind every half hour!

The unit may be run in the balanced or unbalanced configuration, and connections (including power) are made via an edge connector at the back. In a studio environment this connector made a good tight fit, but if the unit was rack mounted for use on

the road, it would be best to check the connection between shows.

Believe it or not, when I received this unit for review, I was told that it was set up to "simulate" Ampex 456 Grand Master on a Studer tape machine set at 0 VU = 420 nWb/m flux level. Marshall claims to have built into each unit the NAB EQ curve; high-frequency EQ trim for each tape speed; over-bias capability; and tape-overload characteristics — yet without the hard clipping found in digital delays. The unit may be ordered to simulate different tapes or tape machines, depending on your favorite; "simulated" curves are available for Studer, 3M, and MCI tape machines, and Ampex 456, Scotch 250, and Agfa PEM-468 tape.

Operational Features

Now that you know what the Tape Eliminator can do for you, let's look at its operation. The front panel consists of three rotary knobs. On the far left is the input-level control, with the 12 o'clock position representing unity gain. Just to its right are three LEDs that display available headroom: once you hit the red zero-dB indicator, the unit does not go into clipping. Instead, it exhibits the characteristics of tape compression, and can be utilized in that way as a special effect. The center control is a three-position pot indicating the speed ranges corresponding to 7.5, 15, and 30 ips with LED indicators. The third knob is a VSO control, the 12 o'clock position being the center of the speed range, while the settings between 40 and 70 cover most popular inter-head delay times. VSO ranges for each tape speed are as follows: 30 ips: 20 to 75 mS; 15 ips: 40 to 150 mS; and 7.5 ips: 80 to 300 mS. With this kind of overlap you can achieve tape-delay ranges that were previously unobtainable with tape machines. The clocking of the unit is so precise that if you select a delay

... continued overleaf —

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setting at 15 ips, and then decide to make it half as long, you can split the time exactly by switching to the 30 ips ranges. Or you can double it by switching to 7.5 ips. (Try that with your tape machine, and I'll bet the VSO drifts!)

Session Evaluation

Of course, the ears are the final, true

test in equipment evaluation. The perfect opportunity to use the Tape Eliminator came during the recording of the Dinosaurs, a group consisting of members of several famous bands from the Sixties. These guys didn't want to know about digital, and stated specifically: "There is nothing like tape echo." The AR-300 was used to create Elvis-style slaps for lead

vocals, to provide simple doubling, and to broaden background vocals by creating panned delay images. All these effects were handled well, and everyone involved on the project loved the warmth of the signal. Desired effects were obtained very quickly and, yes, this box sure does sound like tape, only without that ever-present tape hiss.

SUMMARY OF MARSHALL AR-300 TAPE ELIMINATOR SPECIFICATIONS

Frequency Response: 15 kHz.

Dynamic Range: 95 dB.

Headroom: +22 dB over "zero."

Delay Ranges: Three tape speeds, each with overlapping VSO (5:1 with dynamic EQ compensation); Range A: 20 to 75 milliseconds (30 ips); Range B: 40 to 150 milliseconds; (15 ips); Range C: 80 to 300 milliseconds (7½ ips).

Wow and Flutter: "Unmeasurable."

Speed Accuracy: 0.001% between speeds.

System Interface: Fully balanced input and output.

Dimensions: 1 U (1¼ inches) of 19-inch rack space, plus outboard power supply.

Each tape speed has the proper record-playback curves incorporating independent HF equalization trimmers to produce tape-recorder curves encompassing the slight LF head bump, to the typical 15 kHz bump that is often "tweaked in."

The machine may be over or under biased by as much as 10 dB, and tape compression artifacts may be weighted towards odd or even harmonics.

Tape compression (or "squeeze") is accomplished by the design of the delay elements themselves, which behave as ferrite crystals and not by compression, limiting or other artificial means.

Price: Suggested retail price: \$1,295

Manufacturer: Marshall Electronic, PO Box 438, Brooklandville, MD 21022. (301) 484-2220.

As this reviewer is prone to do, another opinion was solicited on the sonic qualities of the AR-300 from Terry Delsing, chief engineer at Studio D, in Sausalito, CA. Delsing was impressed with the "warmth and quality of the sound" and believed it to "sound very much like tape." He also liked the speed with which he was able to dial in the desired effect. As chief of maintenance at Sausalito Record Plant, Delsing was in charge of tweaking the tape machines for engineer Tom Flye. "Tom is a tape-echo freak," the engineer recalls. "Because the VSO always screws up the machine's pre-emphasis curve, I was constantly tuning it up with pink noise; it was a real pain. The Tape Eliminator eliminates that problem completely."

According to its manufacturer, the unit was designed over a period of several years, and is the product of interactive development and cooperation with A&R Studios in New York — hence the name AR-300. The years of development certainly paid off, since the Tape Eliminator is a fine sounding piece of gear, and lives up to Marshall's claims. Use it anywhere you would normally use tape echo for vocal slap, doubling, or as a pre-delay to plates and chambers. You may even find it interesting for smoothing out the sound of your digital reverbs, by running the reverb outputs through the AR-300 before returning them to the board. I also hear that some engineers have been using the unit to "warm up" the sound of digital recordings. It should be re-stated, however, that this is an *analog* effect; the manufacturer's goal of simulating the sound of conventional tape could not be achieved with digital technology in its present state.

Operation of the AR-300 takes virtually no time to learn. The owner's manual is simple, straight forward, and only three pages long, with one page dedicated to design concept and a history of its development. For less than the price of a low-end tape-machine that is usually dedicated to the tape echo chore, you could buy a very high-end product that will provide higher quality sound and more flexibility. If you like tape echo, I would not hesitate in recommending that you listen to the AR-300 Tape Eliminator. ■■■

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RE-JUNE

New Products

NEOTEK ELITE CONSOLE WITH DUAL-CHANNEL INPUT CONFIGURATION

Elite consoles are described as being unique among "in-line monitoring" multitrack consoles since the main signal path — called the fader channel — and the secondary path — called the monitor channel — have completely separate inputs, input selections and output assignments. Primary functions including highpass filter, patch point, auxiliary sends, and parametric equalizer can be independently assigned to either path. The main signal path can be split or Y-ed at five different points so that the main fader and monitor fader can simultaneously control different mixes on stereo or multitrack busses.



The many combinations of signal flow which these designs offer configure the Elite to dozens of applications that were once impossible, or required elaborate patching and extra channels. Careful layout and labeling is said to make this flexibility easy for the operator to exploit through front-panel functions. Also featured is an elaborate system for control of channel mutes, unique master section features, and provisions for many custom configurations.

As with all other Neotek consoles, the Elite is built to individual order. It is available in frame formats with up to 56 input positions, and it offers hybrid-circuit topologies designed to reduce noise and distortion to their theoretical minimums. Consoles are available with any popular automation interface and automation can easily be retrofitted in the field.

NEOTEK CORPORATION

For additional information circle #100

NEW SERIES OF LAVALIER MICROPHONES FROM SONY

The new lavalier series comprises three models, EMC-77, EMC-66 and EMC-55, each available in either black or satin nickel-plated finish. Engineered to blend miniaturization and attractive styling with the highest levels of audio performance, the new mikes are intended for a variety of applications in which unobtrusive or concealed pick-up is necessary, or for miking of dialog or musical instruments.

Careful attention has been paid to the capsule to make it resistant to external noise and ambient conditions, Sony says. The cabling

also has been strengthened to provide high resistance to breaking caused by over-flexing. The units can be powered by 48 volts DC or by AA-size batteries.



The fingernail-size ECM-77 offers the smallest capsule diameter of any Sony microphone: 5.6mm. The omnidirectional microphone has a quoted frequency-response range of 40 Hz to 20 kHz.

The ECM-66 features a newly developed wide-range, uni-directional back-electret capsule, to ensure clean, natural reproduction of musical instruments. Frequency range is a quoted 70 Hz to 14 kHz.

The new ECM-55 features an omnidirectional electret condenser design, and is intended for users requiring widest versatility in a lavalier model. It is designed for miking musical instruments and for voice pick-up, and has a quoted frequency-response range of 30 Hz to 18 kHz.

SONY CORPORATION OF AMERICA

For additional information circle #101

HARRISON SYSTEMS INTRODUCES ARS-9 AUDIO ROUTING SWITCHER

The ARS-9 is an intelligent, micro-processor-controlled multichannel audio routing switcher system available in sections of up to 256-by-256 crosspoints. Modular in construction, the system is composed of a 19-inch rackmount cardcage housing that is wired for 256 inputs by 256 outputs. External interface is by way of DIN-standard 30-pole Tuchel connectors.

The cardcage includes the central processing computer and system power supply. Active electronics are composed of three types of circuit cards: an input card that handles 64 inputs; a 64-by-32 crosspoint switch card; and an output card that handles 32 outputs.

Depending on the complement of processing cards, the ARS-9 may be configured starting at 64 inputs and 32 outputs up to the full 256-by-256 capacity. A variety of control interfaces will be available using SMPTE serial buss control.

HARRISON SYSTEMS, INC.

For additional information circle #102

IMPACT UNVEILS LINE OF MONITOR CABINETS

The new series of monitors range from single 12-inch mid-bass to double 18-inch

subwoofer enclosures. All enclosures are hand crafted of 14-ply Finland Birch to give greater structural rigidity, provide a higher strength to weight ratio and to yield a "tighter, more accurate" sound.

All joints are tongue-n-groove, including baffle and back, with all corners nylon interlocking (stacking type). All grills are perforated steel and round grills have a built-in gasket to keep the speaker from bottoming.

Each enclosure is precisely designed to guarantee the optimum performance from a specific speaker model. Options include soft cases, Colson wheels, session handles, nylon stacking corners, custom crossovers, Twist-Lok connectors, and skids.

IMPACT AUDIO

For additional information circle #103

SUMMIT AUDIO INTRODUCES TUBE COMPRESSOR/LIMITER

The single-channel Tube Compressor/Limiter is said to combine the desirable qualities of earlier vacuum-tube devices with modern circuitry for improved performance. The unit has a "warm sound," plus the option of a 990 balanced output stage for dependable operation.



"Soft-knee" characteristics, side-chain access, balanced input, stereo-coupling capability, and switchable attack/release settings are featured.

The Tube Compressor/Limiter is being offered at an introductory price of \$1,000.

SUMMIT AUDIO

For additional information circle #104

NEW JE-11-BM JENSEN OUTPUT TRANSFORMER

The new high-performance, 1:1 output transformer features a special 80% nickel-alloy core. While more costly than iron, the new core is said to vastly lower hysteresis distortion and allow use with source impedances from zero to 1000 ohms.

Typical performance, with 0-ohm source and 600-ohm load, is as follows:

- Distortion: 0.002% THD at 20 Hz (a worst-case frequency at any level below saturation);
- Saturation Level: +26 dBu at 20 Hz (1% THD);
- Frequency Response: -0.02 dB at 20 Hz, +0.00 dB at 20 kHz, referenced to 1 kHz;
- Bandwidth: -3 dB at 10 MHz;
- Phase Shift: 0 degrees at 20 kHz; and
- Overshoot: less than 1% with source amplifier rolled off 6 dB per octave at 200 kHz.

Although its sonic characteristics are "transformerless" (neutral), the JE-11-BM is said to offer the essential ground-loop isolation not possible with direct-coupled circuits

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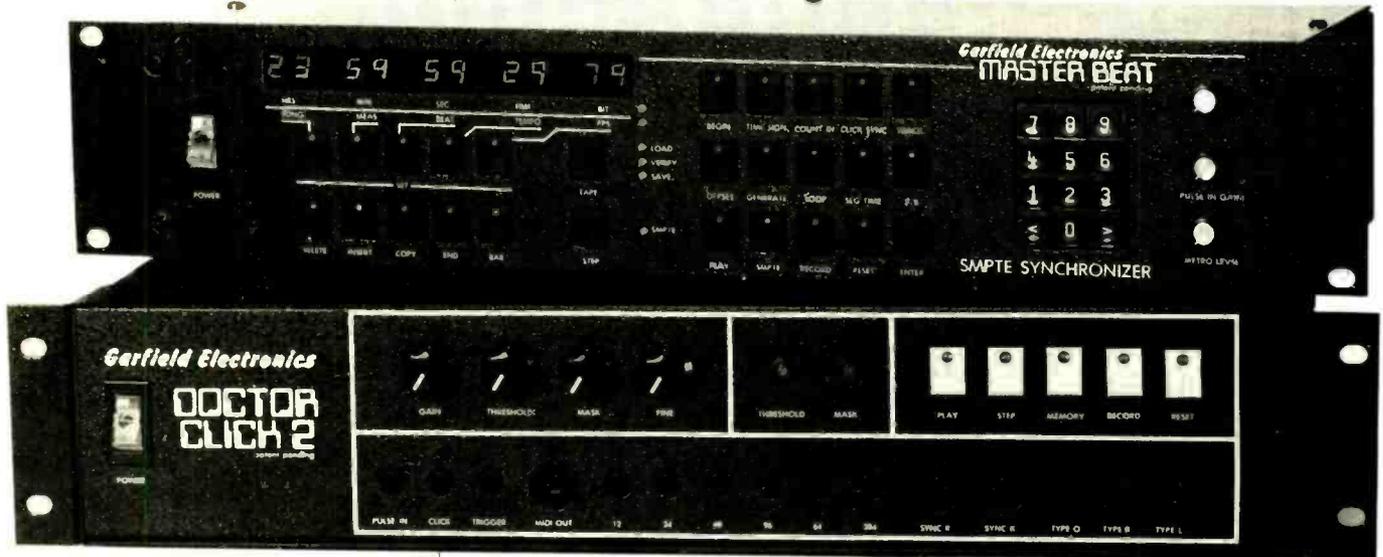
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Single-quantity price for the JE-11-BM is \$61.60.

JENSEN TRANSFORMERS, INC.

For additional information circle #106

NEW DH DRIVERS FROM ELECTRO-VOICE OFFER TWO-INCH EXITS

With the introduction of the new DH1 and DH2 high-frequency drivers, E-V says it is the first manufacturer to offer both large- and small-diaphragm designs with standard two-inch exits. Both units bolt directly on any HP Series horn, allowing the increasing use of small-diaphragm drivers in sound systems can be achieved without the inconvenience of purchasing and installing the traditional driver-to-horn adaptor.

The DH1 large-diaphragm driver has a quoted frequency response from 500 Hz to 16 kHz, and a 24-hour 500 Hz to 20 kHz pink-noise power capacity of 40 watts. During this test, peaks are set at 10 dB, which means that the DH1 sustains transient peaks of 400 watts. The DH2 small-diaphragm driver has a quoted frequency response of 800 Hz to 20 kHz and a 800 Hz to 20 kHz

pink-noise power capacity of 30 watts, sustaining peaks of 300 watts.

Also featured in the DH1 driver is a one-piece aluminum alloy dome and coil form drawn in a single operation. Advanced metal-forming technology developed at E-V allows use of usually thin, 0.002-inch-thick material, to provide a high stiffness-to-weight ratio for improved HF response and efficient heat transfer for high power handling. The dome and geometrically optimized suspension of the DH2 are formed from a single piece of pure titanium. A unique convex-drive phase plug is said to further contribute to the upper-octave response of the DH2.



The DH1 and DH2 are available at pro-user net prices of \$360 and \$280, respectively.

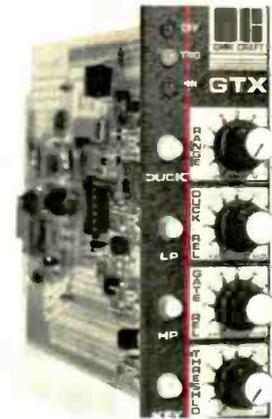
ELECTRO-VOICE, INC.

For additional information circle #107

TWO NEW GTX MODULAR NOISE GATES FROM OMNI CRAFT

Designed to fit into the two most common rack systems, the GTX(d) and GTX(K) are slightly different in layout, but identical in functions and performance. Extremely low

noise and distortion are said to have been retained by designing the new products around the company's optical control system.



In addition to pushbutton selection of Gate and Duck functions, and choosing either a Key signal or the primary source as gate activator, two more provide the ability to insert a high- or low-pass filter (or both) into the trigger-signal path, substantially reducing the chance of accidental triggering.

A layout of three LEDs provides indication of gate status: the yellow (triggered) light can be referred to the green (signal passing) light to determine suitability of both the threshold and the release settings.

Suggested retail price for both GTX units is \$275.

OMNI CRAFT, INC.

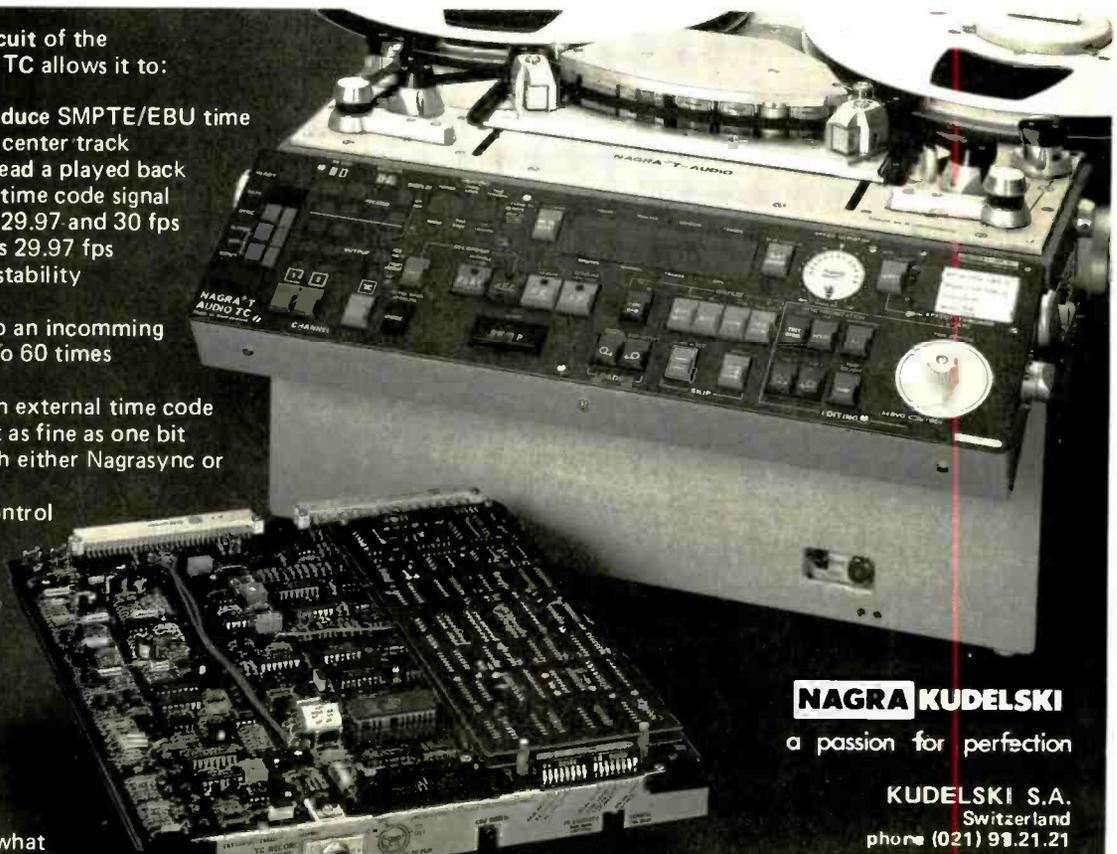
For additional information circle #108

The Time Code circuit of the NAGRA T-Audio TC allows it to:

- record and reproduce SMPTE/EBU time code on a 0.35mm center track
- simultaneously read a played back and an incoming time code signal
- generate 24, 25, 29.97 and 30 fps time code as well as 29.97 fps drop frame with a stability of ± 1 ppm
- chase and lock to an incoming time code at 0.25 to 60 times normal speed
- synchronise to an external time code with variable offset as fine as one bit
- resolve tapes with either Nagrasync or Neopilot sync
- interface with control systems through its RS 232C or RS 422 ports

of course the audio quality, versatility, and dependability, are what you have come to expect from NAGRA

... just this side of perfect.

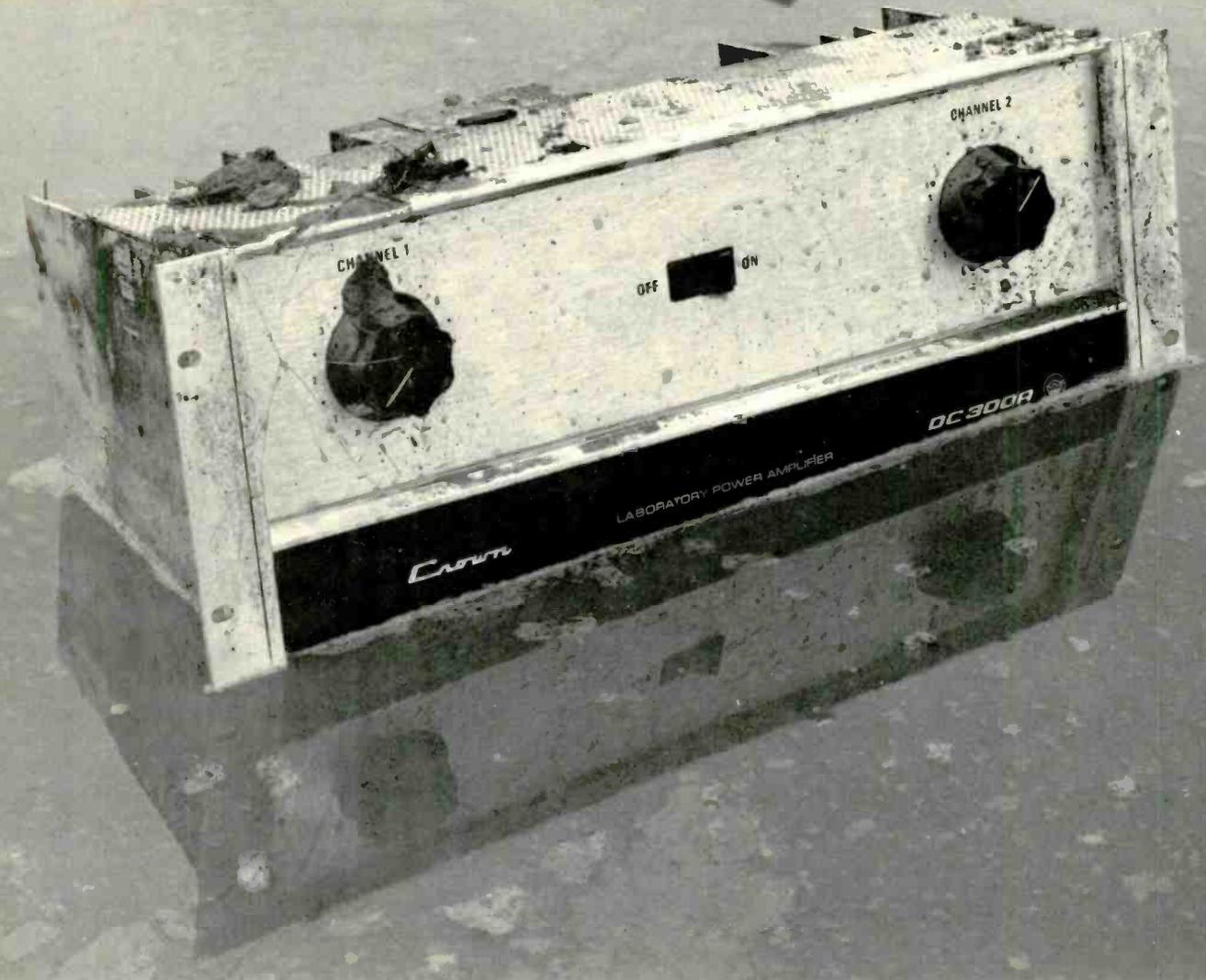


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a passion for perfection

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In the early evening of Sept. 17, 1973, Jay Barth was at the wheel of a 22 ft. utility truck that was loaded with sound equipment. Just south of Benton Harbor, MI an oncoming car crossed the center-line; fortunately Jay steered clear of the impending head-on collision. Unfortunately, a soft shoulder caused the truck to roll two and one half times. Exit several Crown DC-300A's through the metal roof of the truck's cargo area.

The airborne 300A's finally came to rest — scattered about in a muddy field, where they remained partially submerged for four and a half hours.

Jay miraculously escaped injury; the amplifiers apparently had not.

Unbelievably, after a short time under a blow-dryer all the amps worked perfectly and are still going strong.

The rest — and the truck, is history.



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4000	10	12	20
8000	15	20	30
16000	20	25	40
1000	10	12	20
31.5	10	12	20
40	10	12	20
63	10	12	20
100	10	12	20
125	10	12	20
250	10	12	20
500	10	12	20
1000	10	12	20
2000	10	12	20
4000	10	12	20
8000	10	12	20
10000	10	12	20
12500	12	15	25
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20000	12	15	25
1000	12	15	25

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New Products

QUPLAY QP1 TAPE MACHINE CONTROLLER AVAILABLE THRU KLARK-TEKNIK

The QP1 is a remote, hand-held package to be used in conjunction with a multitrack to allow the programming and memorizing of drop-in/out sequences, and to coordinate the triggering of external devices.

As well as providing full remote control of transport functions, the unit enables track cleaning using the rehearse/execute function with a spot-erase accuracy: rock the tape manually and then program by tapping a button. Drop-in and drop-out points can be programmed on the fly by tapping a button, or using an external footswitch.

Programmable trigger output function can activate external devices such as sequencers, additional tape machines, video recorders or trigger effects such as delays — in both record and play modes. A drop-in sequence can be rehearsed "off-line" with the aid of the cue indicator.



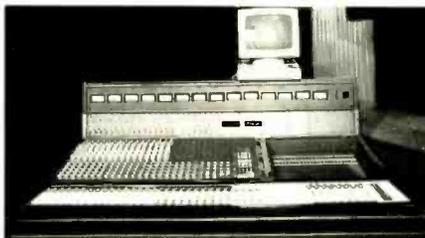
The QP1, which has a suggested list price of \$895, uses no timecodes or spare tracks to function. Omerface options are currently available for the Otari MTR-90, Otari MX-70, Studer A-800, Studer A80, Fostex B-16 and Tascam 50 Series multitracks.

**KLARK-TEKNIK
ELECTRONICS, INC.**

For additional information circle #113

AMEK UNVEILS BC01 SERIES 2 AND M1000 SERIES II BROADCAST PRODUCTION CONSOLES

Both of the new consoles are derivatives of existing products and have been improved and updated to accommodate both recent advances in technology, and feedback from users of our current models. Prototypes were displayed at the recent NAB convention and at the AES Show, Anaheim.



The new BC01 Series 2 offers a wider range of formats than was previously available, including subgrouping and an extendable

chassis system. The console is supplied with a D-Series connector to enable remote triggering of the channels for Audio-follow-Video applications.

The M1000 Series II features central assignment of all switch functions, including buss assignments, mute groups, subgroup and auxiliary mike pre-amp functions. All the assignment information can be stored and recalled when required; in later versions of the console it will be possible to recall settings and changes made in real time. The console is available with either VCA fader automation or the GML Moving Fader system.

AMEK CONSOLES, INC.

For additional information circle #114

SIMMONS SDS 9-ELECTRONIC DRUM SET

Designed to give players the facility and control of conventional, acoustic drums plus the creative possibilities of modern technology, the new SDS9 is said to feature improved playability, sound generation, programmability and MIDI interface. Along with rimshot capability on the snare drum pad, all pads have a soft-rubber surface that is mounted on a specially formulated synthetic surface to provide a more natural feel without any loss of sensitivity. The actual trigger signal is read by a microprocessor that logarithmically expands the signal before instructing the voice to sound. The result is described as a tremendous increase in playing comfort and dynamic control not previously associated with electronic drums.

Each drum voice has a separate, specific method of sound synthesis. The bass drum sound is a software-generated replica of a perfectly recorded bass drum, with fully adjustable controls for the pitch, click and "thump" components of the sound. The three tom-tom voices are analog synthesized with a unique "second skin" feature which, when used, modulates the drum pitch and emulates the harmonics created by the interaction of two vibrating drum heads. The toms also have individual controls for pitch, bend, decay, noise, click and filter pitch and sweep.



In addition to rim-shot and cross-stick features, the SDS9 snare drum utilizes three independent samples of a snare drum, rim-shot and cross-stick sound, which are studio-quality recordings digitally stored on EPROMs, which are user changeable.

Full program control over filter pitch and sweep, drum pitch and bend, rim pitch and bend, drum and rim decay, choice of rimshot or cross-stick sounds, balance between rim and drum, filter resonance and noise level also are provided.

The kit has 20 factory-programmed drum-kit memories and 20 user-programmable

ones with an "Auto Trigger" that can be activated to automatically trigger during programming. This facilitates programming without playing the pads, and also allows each program change to be monitored. An on-board digital delay can be programmed for a slapback effect or long repeat echo. A fully assignable MIDI interface function allows triggering voices of other MIDI synthesizers from the drum pads, or real-time recording via a MIDI recorder and computer.

The SDS9 has a suggested list price of under \$1,850.

SIMMONS GROUP CENTRE, INC.

For additional information circle #115

NEW AN-2 STEREO SIMULATOR FROM STUDIO TECHNOLOGIES

The new AN-2 Stereo Simulator is designed to create a wide range of effects, including convincing stereo from any mono source. The unit is said to have numerous applications within recording, live-performance, film and broadcast operations because of its ability to create simulated stereo from mono, as well as a number of audio effects centering on its ability to simulate stereo.



The stereo signal produced by the AN-2 is described as being *completely mono-compatible*. In addition, the device is equipped with a proprietary circuit that randomizes the non-recursive filtering process, thereby avoiding the harmonic harshness that often results from stereo simulation with delay lines.

STUDIO TECHNOLOGIES, INC.

For additional information circle #116

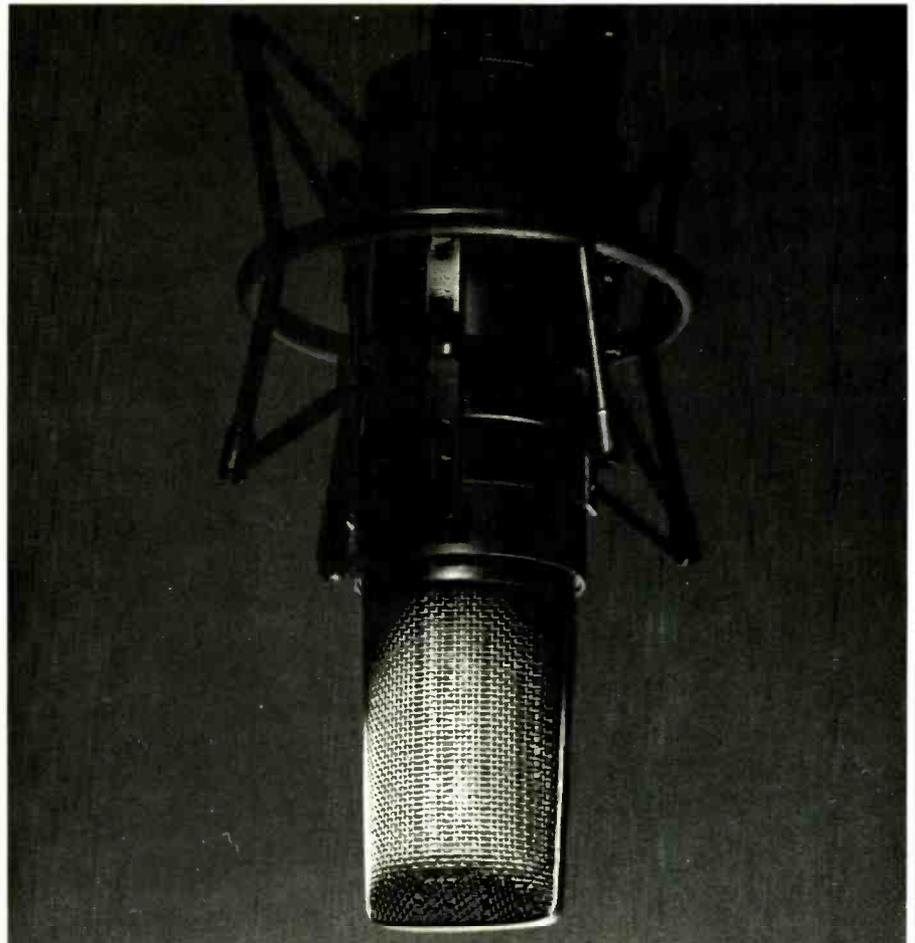
AMPEX INTRODUCES NEW 467 DIGITAL AUDIO MASTERING TAPE

Ampex 467 is designed to perform optimally on all digital multitracks without requiring individual tape-to-machine realignments. The new tape will be available in half- and one-inch configurations, and from 4,600- to 9,200-foot lengths.

Ampex 467 joins Ampex 466, described as the world's first high-energy digital audio mastering tape, which has established a performance standard for reliable operation on the Soundstream, 3M DMS and Mitsubishi X-80 recorders, according to the company.

"The demand for a reliable and consistent digital mastering tape that works optimally on all digital multitrack recorders increases each year, as more and more studios convert to digital equipment," says Ed Engberg, Ampex Magnetic Tape Division's audiotape marketing manager. "Ampex 467 is designed to match the electrical and mechanical requirements of multitrack stationary-head recording formats, and it does not require individual adjustments."

Ampex 467 is said to feature an exceptionally durable oxide and binder system that is processed in a super-clean manufacturing environment, to produce an extremely smooth, blemish-free surface, assuring low error correction activity by the recorder —



Is the Sanken CU-41 really worth the price?

The Sanken CU-41 is the most expensive microphone of its kind. Its breakthrough double-condenser design gives you textbook performance: a flat frequency response from 20Hz to 20kHz; an inherent noise level less than 15dB; and a dynamic range of 125dB.

But specs alone aren't reason enough to invest in the CU-41. Neither is the fact that leading sound engineers from LA to London, including Doug Perry, Eric Prestidge, Steve Levine and Tony Faulkner, are using the CU-41 to record the likes of Dolly Parton, Anne Murray, Culture Club, and the London Symphony Orchestra.

To really evaluate and appreciate one of the world's first microphones able to capture the full potential of digital recording, you must try the CU-41 yourself. **Call the Sanken dealer nearest you to arrange a free trial.**

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Discover the new standard.



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Audio Industries Corporation

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For additional information circle #112

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Each eliminates noise in main contacts under normal patching situations.

VERTIGO 1/4" TRS AND TT INJECTORS:
Each injects cleaning solvent to eliminate intermittents in breaking contacts (normals) when patch cord has been removed.

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For additional information circle #117

New Products

even after hundreds of passes. The company's new, and proprietary, total-surface cleaning process wipes and then vacuums all surface and free floating debris to eliminate transient data errors.

Furthermore, Engberg adds, every reel of Ampex 467 is 100% tested from end to end for dropout performance. Testing is done entirely on stationary-head transports, assuring that the tape has higher data reliability than any other product.

AMPEX CORPORATION

For additional information circle #119

B&B SYSTEMS AM-3 STEREO AUDIO PHASE DISPLAY UNIT

The new Stereo Television audio-phase verification system features a CRT display that shows the stereo phase relationship between multiple sound channels in an X, Y



mode. The AM-3 provides three channels of audio monitoring with the principal language in stereo, plus a second language, on the third (SAP) channel, all of which are monitored

and phase verified.

VU meters are provided for all three channels, as are peak-responding LED meters. The LED display is calibrated to read in decibels of available headroom, as referenced to a specified clip point.

The AM-3 is priced at \$3,200.

Also available is a new MP-4 audio-meter panel that incorporates four meters in a 3 1/2-inch panel that can be ordered with any combination of VU or peak-program metering. Separate input circuits for each meter include buffered, balanced, and active bridging electronics. The MP-4 is priced from \$995.

B&B SYSTEMS

For additional information circle #120

UHER 6000 REPORT PORTABLE OPEN-REEL RECORDER

With five-inch tape reels and utilizing the slowest of its four tape speeds, the Uher 6000 can record for up to 16 continuous hours on one tape. The unit features 3 3/4, 1 7/8, 15/16 and 15/32 IPS tape speeds — the slow speed being especially valuable for long-term monitoring, court reporting and surveillance work.

A built-in Akustomat (voice activated) recording control enables the 6000 to be programmed to begin recording when activated acoustically. Acoustic level sensitivity and spacing time controls are also included. The transport features full logic control, electronic tape tension control and four motors for constant tape speed and low wow and flutter.



Additional features include built-in DNR noise reduction; mark and find cueing on both rewind and fast-forward; switchable automatic level control; and solenoid-operated function controls. Also provided is a built-in switchable loudspeaker, mechanical tape counter and an AV input jack for use with sync sound and film work. The 6000 is prepared for timecode recording using optional equipment.

Suggested retail price for the Uher 6000 Report Universal is \$1,749.

UHER OF AMERICA

For additional information circle #121

DRAWMER MODEL 1960 TUBE COMPRESSOR AMPLIFIER

The Drawmer 1960 is a dual compressor-amplifier, using vacuum tubes in conjunction with semiconductors, to provide a compact unit with additional capabilities. Each channel comprises a tube compressor and pre-amplifier, feeding an electronically balanced output stage, giving a maximum output level of +26 dBm. The compressor has a soft-knee characteristic, with variable threshold and switchable attack and release. An output

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408/395-2448

For additional information circle #118

level control provides gain make-up of up to 20 dB.

In addition to a balanced line input, a low noise microphone input is provided with variable gain from 0 to 60 dB. Phantom power is available if required, with a LED showing phantom power on. A single auxiliary input on the front panel gives direct access for guitar or any other instrument.

Equalization is also provided, along with sufficient gain to overload the tube pre-amp for sustain effects. An insert point at the rear of each channel allows additional effects to be added before compression so that when using the mike pre-amp, EQ may be used, or flanging added when using guitar with the auxiliary input.



A second insert point provides for side-chain equalization. EQ applied in this way may be monitored via a "side-chain listen" facility. Stereo linking is accomplished by means of a front-panel switch.

Suggested retail price of the Drawmer 1960 is \$1,250.

HARRIS SOUND, INC.

For additional information circle #122

SOUND AND VISION ANNOUNCES SV-1000 "MINI-LOC"

The new unit features a programmable automatic punch-in/out capability, as well as preset tape loops. Also featured are full transport remote controls with a precision digital tape counter.



Other features include a jack for optional punch-out foot switching; LED function status; and Return to Zero. The Mini-Loc interfaces with Tascam, Otari, Fostex and many other tape decks. Repeat accuracy of tape locations is quoted to be within tape-tension variations of the controlled tape transport.

Suggested list price of the SV-1000 Mini-Loc is under \$250.

SOUND AND VISION

For additional information circle #123

NEW LOWER PRICE QUANTEC QRS/L FROM EUROPA TECHNOLOGY

Like its "big brother," the QRS, the new QRS/L is said to offer the same features in sound quality, programming, and ease of

operations. The major difference in the two units is in the number of inputs and outputs: the QRS/L has a mono input with stereo outputs, while the QRS features stereo inputs with four outs.

Specifications for the two units include: 64 user programmable memory locations, frequency response of 20 Hz to 8 kHz, and two special features: Enhance (simulation of rooms without perceptible reverberation) and Freeze (infinite decay time to add to any number of acoustical entries).



Retail price of the QRS/L is \$4,995. In addition, the price of the original QRS has been lowered from its \$10,000 to \$7,995.

EUROPA TECHNOLOGY, INC.

For additional information circle #124

QSC LAUNCHES OCTAL SERIES OF PLUG-IN AMP ACCESSORIES

The new Octal Accessories Series consists of six products, including two-way cross-overs, a compressor/limiter, input transformers, and precision attenuators. Each module plugs into active octal sockets on the rear panel of QSC power amplifiers.

The XL-1 (low-frequency range from 50 to 500 Hz) and the XH-1 (HF range from 500 Hz to kHz) are two-way active crossover networks with user-selectable frequencies. Both

QUIET . . . PROGRAM EQUALIZATION

L-C ACTIVE 2 Channel Octave Band Graphic Equalizer 4100A

The model 4100A features Active, Inductor-Capacitor (L-C) Tuned Filters. The resonant frequency of each filter is derived PASSIVELY by a Tuned L-C Pair. This drastically reduces the number of active devices necessary to build a Ten Band Graphic Equalizer. Only seven operational ampifiers are in each channel's signal path: THREE in the differential amplifier input; TWO for filter summat on; ONE for input level control; ONE for the output buffer. The result . . . the LOWEST "Worst Case" NOISE of any graphic equalizer in the industry . . . -90dBv or better.



THE WHITE INSTRUMENTS ADVANTAGE— CRAFTSMANSHIP

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White

instruments, inc.

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TELEX 776 409 WHITE INST ALS

New Products

units feature 24 dB per octave Linkwitz-Reilly alignment filter design, which allows a rapid cutoff and reduced overlap between drivers. Channel two's octal socket remains free to accept the PL-1 power limiter to protect the HF driver from overload, or an equalizer module that may be used to shape frequency response.

The PL-1 comp/limiter module is designed to prevent amplifier clipping, and protect a wide variety of drivers from excess power. Limiter threshold is fully adjustable, along with attack and release times; compression ratio is switched 4:1 or a 10:1 for extra protection.

The T-1 input transformer provides a passively balanced input for situations where long lines and strong interfering fields require the use of a transformer. The unit features double Mu-metal shields to provide protection against external electromagnetic fields, including those generated by the amplifier itself. For situations where ultimate audiophile performance is required, the company recommends the Jensen JE-11P-QN transformer, custom manufactured to interface with QSC amplifiers by Jensen Transformers.

The A-1 AT-1 octal attenuators (the latter with input transformer) allow exact 2-dB steps to maximum attenuation of 32 dB (total) via fixed, precision 1% metal film resistors.

QSC AUDIO PRODUCTS

For additional information circle #126

HIGH FIDELITY CONCEPTS UNVEILS DX-4000 ACTIVE CROSSOVER

The new DX-4000 is a single-channel, four/three/two-way electronic crossover network that utilizes filters whose crossover frequencies are digitally varied in 5 Hz steps (50 Hz steps for cross #3), with each crossover point displayed via a digital display.



Features include electrically balanced/unbalanced ins and outs; separate level control, phase switch, and peak indicator on each output; turn-on/off muting; and battery back-up.

The DX-4000 crossover retails for \$695.
HIGH FIDELITY CONCEPTS, INC.

For additional information circle #127

TWO NEW THIRD-OCTAVE SPECTRUM ANALYZERS FROM HIGH FIDELITY CONCEPTS

The new RT-3100 real-time spectrum analyzer features 31 third-octave bands on ISO centers from 20 Hz to 20 kHz; four-pole filters



on each band; 3 and 1 dB per step switchable resolution; fast and slow display modes; and internal pink-noise source.

Also available is the RT-3110 with all the

above features, as well as automatic display level control. Proper display level is maintained over a range of +6 to -20 dB from nominal. The action of the ADLC is displayed via three LED indicators.

The RT-3100 retails for \$1,095, and the RT-3110 for \$1,195.

HIGH FREQUENCY CONCEPTS, INC.

For additional information circle #129

AURA SYSTEMS UNVEILS CUSTOM MONITORING SYSTEMS AND DESIGN SERVICE

In the world of sound design, Aura claims, there are few firms that can blend science and art to create optimal or accurate audio systems. Although equalization often is used to make the reproduced sound an approximation of what is actually heard, EQ should be for creative pursuits, not compensation for inaccurate monitors. The monitors now being used, the company argues, need major improvement in the areas of bandwidth, spatial imaging, distortion, and the ability to trace complex waveforms.

Aura offers custom-designed systems that not only overcome present inadequacies, but meet the demands of each particular environment, so that the same accuracy is upheld from place to place. The result is described as greater control and the potential for more exciting music, with or without picture.

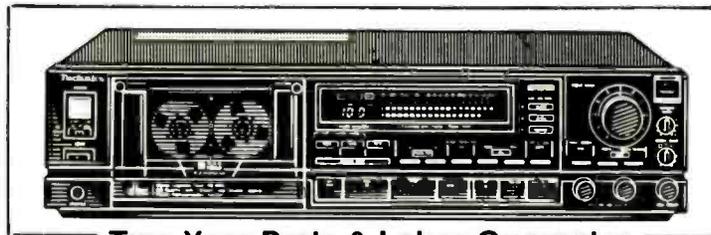
In designing monitoring systems, the company can hide, camouflage, or create sculptures in conformance with any environment. Materials that can be used include fabric,

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Technics

Cassette Deck Model RS-B100

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\$900.00



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RS-B100, Dolby B, Dolby C, dbx, Quartz DD, 3-Head Stereo Cassette Deck: Quartz direct drive closed-loop double capstan system. Phase compensation circuitry. AX (amorphous) 3-head system. Feather touch con-

trols. Wide-range 3-color FL meters with peak-hold. Automatic Tape selector, rec memory and rec mute. Music Select.

Specs: 20 Hz to 23 kHz ± 3 dB. 78 dB S/N Ratio with Metal Tape. Wow & Flutter: .022% WRMS.

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wood, glass, plastic, metal, plaster or any material appropriate to the interior or exterior design. (Shown here is the interior of David Hollman's personal-use studio.)



The Aura four-way active system comprises four, longitudinally-cut half cylinders incorporating a tuned-port/transmission-line design, with eight 12-inch woofers, four eight-inch dome MF units, and six one-inch HF domes. A modified Audire active stereo crossover unit connects to six stereo amplifiers rated at 1,900 watts into an eight ohm load. Overall frequency response is 20 Hz to 25 kHz, ± 3 dB.

AURA SYSTEMS, INC.

For additional information circle #131

**AUDIO-TECHNICA
AT-RMX64 SIX-INPUT
MIXER/RECORDER**

The AT-RMX64 is designed to accommodate any microphone or direct input, including low-impedance balanced mikes requiring 48V phantom power; a total of 60 dB of available input attenuation guards against overloading. Two-band parametric equalization is available on each input, with choice of shelving or peak/dip control and continuously-variable frequency and gain controls.



Two auxiliary sends are included, switchable from pre-EQ and fader, to post-EQ and fader. Returns have individual volume controls, and all inputs and returns can be assigned as desired. Each input can also be sent to any of four submasters. Solo switches permit monitoring any input or return regardless of fader settings. Separate monitor and house mixes are readily available to the user.

The unit is capable of making four-track tapes at 3 3/4 ips speed for use as demos, or 1 7/8 ips two-track tapes compatible with all standard cassette units. Also featured is punch-in/punch-out capability, variable pitch control, Dolby B- and C-type noise reduction and individual track recording.

Suggested pro-user price of the AT-RMX64 is \$1,495.

AUDIO-TECHNICA U.S., INC.

For additional information circle #132



**PROFESSIONAL DESIGNATION IN
Recording Engineering**

The Professional Designation in Recording Engineering provides participants with the perspective, knowledge, and training required of a professional in the field and leads to a certificated award of completion.

THE CURRICULUM

The curriculum consists of seven required and two elective courses covering the theory and practice of recording engineering technology, music, equipment, and interrelationships between engineers and their colleagues – in the production of records, commercials, film, and television. Students must complete each course applied to the program with a grade of "C" or better.

PROGRAM DESIGN

The program has been designed in consultation with industry leaders and professional associations and is in line with the criteria being established by the Society of Professional Audio Recording Studios (SPARS) for a national examination, to be administered by the Educational Testing Service.

The coordinator of the Professional Designation is *Van Webster*, recording engineer and owner of Digital Sound Recording, who is part of the team devising the national examination.

CANDIDACY

Prerequisites are Math XL 1A, Math XL 1B, and Basic Physics XL 10, or the equivalent. To become a candidate for the Professional Designation, students must submit a nonrefundable fee of \$50, paid once only, which entitles them to counseling and a certificated award. If candidates do not complete the program within two years, an additional fee of \$10 will be assessed yearly.

SUMMER SCHEDULE

Required Courses

- **Techniques of Multi-Track Mixing for Studio Recording** X 448.14B

Elective Courses

- ★ **Audio Equipment Maintenance** X 448.16
- **Introduction to Audio Engineering** X 448.23
- **Ear Training and Sightsinging** X 400A

Recommended Courses

- ★ **Professional Practices for the Recording Engineer** 849.2
- **Making Music: Careers in the Music Industry** 854.7
- ★ New this quarter

OFFERED THIS FALL –

- **Recording Engineering Theory** X 448.12

Prerequisite: Students should have a working knowledge of basic electronics, including schematic diagrams, and a knowledge of analog circuitry.

For more information please phone Ms. Reynolds (213) 825-9064 (8:30 am to 5 pm weekdays). Or fill out the coupon and mail to UCLA Extension, Dept. of The Arts, P.O. Box 24901, Los Angeles, CA 90024.

**SUMMER QUARTER BEGINS
JUNE 17.**

Please send me information about Summer Extension courses in recording engineering.

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For additional information circle #133

THE BEST SPECS COST LESS.



- Frequency response: 20 Hz to 20 kHz ± .5 dB
- .5mv to 6 volt RMS capacity without clipping or distortion
- .05% THD

Whirlwind TRSP-1 transformer for signal isolation and splitting with uniform response (single secondary).

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Whirlwind TRHL-M transformer for Hi to Lo signal conversions and signal isolation.

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RECORDING SERVICES ENGINEER

The Eastman School of Music Department of Recording Services is currently seeking a Maintenance Engineer with responsibilities to include: maintenance of professional analog and digital recording, sound reinforcement and tape duplication equipment; closed circuit television and tape-to-disc transfer systems; design of control systems and special audio circuitry requirements. Proficiency is required in the use of all types of test equipment. Digital technology is required. Prefer five years experience in professional studio maintenance operations. Send resume to: **University of Rochester, Personnel Department, Box 636M, 260 Crittenden Blvd., Rochester, NY 14642. EOE, M/F.**

MECHANICAL ENGINEER NEEDED

For drawing, design, assembly and installation of automation systems and related products. Familiarity with micro-computers & recording studios essential. Contact with resume:

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News

— continued from page 28 ...

successful use of digital audio in film and video projects." For a free copy of the new directory, contact your nearest Sony dealer.

• **AMEK SYSTEMS AND CONTROLS** has been awarded an English Queen's Award to Industry for Outstanding Export Achievement. Founded in 1975, the company has seen sales success in numerous markets around the world, the most consistent of which, Amek says, are Italy, the People's Republic of China, and the Soviet Union. Other territories into which the firm has sold include Canada, South America, Europe, Japan, Southeast Asia, Australia, New Zealand, and Africa, with the U.S. representing the largest single market for Amek products.

• **TELEVISION MATRIX**, a Hollywood-based post-production company specializing in Electronic Field Production (EFP), has created a special audio package to enable stereo recording using the Sony Betacam combined video camera and half-inch VCR system. The package consists of a Sony MX-P42 automatic stereo mixer, a portable stereo monitoring unit, and a series of Mid/Side (M/S) stereo microphones that have been specially configured for field use on fishpoles.

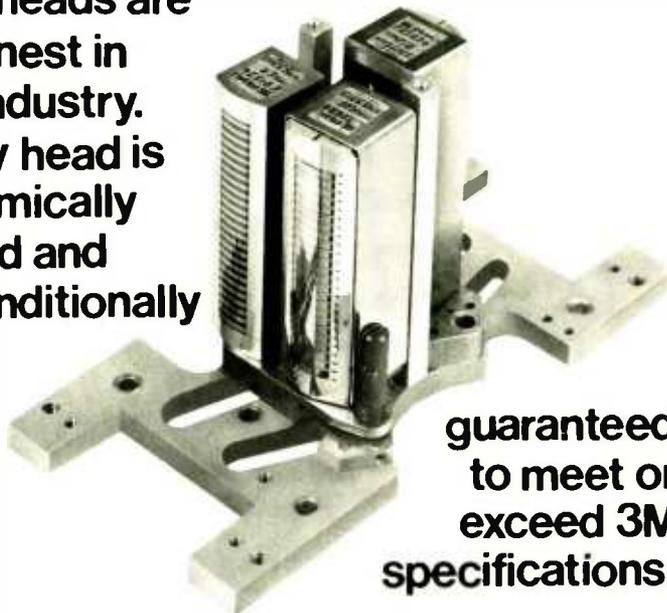
"Using the M/S stereo microphone technique in the field provides ambience recording that greatly enhances the realism of scenes in documentary/magazine production," says company president Frank Beacham. "Although there are well-established recording techniques for stereo music and multi-channel motion picture production, there has been little attention paid to documentary-style video production in the field. Since this is the type of production most television stations do in-house, we feel there is a great opportunity for new production techniques in sound recording in ENG/EFP-type production." More details are available from Frank Beacham at (213) 465-9616.

• **LAKE SYSTEMS CORPORATION**, Newton, MA, has been awarded a media equipment and design contract totaling more than \$3.5 million by the New York University to support the new **Tisch School of the Arts** now under construction in Manhattan. Included in the equipment package are three state-of-the-art television studios, film production and post-production facilities, audio recording studios, plus ancillary systems for teaching media production.

• **INOVONICS, INC.** has relocated its engineering and manufacturing facility to expanded quarters in Santa Cruz, CA. According to company president Jim Wood, the move is concurrent with the restructuring of the firm's marketing and product distribution policies that assigns these functions to Marcom, Inc., Scotts Valley, CA. Inovonics will continue and enlarge its operation in

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the areas of product development and manufacturing efficiencies, while Marcom will assume complete responsibility for the marketing, distribution and sales of the company's product line, as well as providing market-based input for product-line expansion.

- **BASF** recently was awarded the 1985 ITA/TIME magazine "Man of the Year" award, "in behalf of a grateful industry, to commemorate the 50th anniversary of the invention magnetic tape recording." The award was made at the International Tape/Disc Association's annual seminar to Professor Manfred Heckle, head of BASF's Information Systems Operating Division. Flanking Professor Heckle during the ceremony were historic examples of early BASF audio tape, and a Magnetophone — the world's first tape recorder/player.

- **THE VIDEOTAPE PRODUCTION ASSOCIATION's** Engineering Committee has awarded VPA Special Achievement in Engineering Monitor Awards to **AMPEX**, **MCI QUANTEL** and **STUDER REVOX AMERICA**. The Monitor Award to Ampex has been made in recognition of the VPR-3 one-inch videotape recorder; to MCI Quantel for its DPS-7000 Paint Box digital graphics system; and to Studer for its Model A810 tape machine with center-track timecode channel. The formal award presentations were made at the Monitor Gala held on June 10 at the New York State Theater, Lincoln Center.

- **EUROPA TECHNOLOGY**, Venice, CA, has been named as exclusive U.S. distributor for the **QUANTEC QRS** Room Simulator, a four-input/stereo digital reverb and special effects processor, and the **QRS/L**, a mono-in/stereo-out version of the QRS. The company already acts as distributor for several European manufacturers, including PPG and Oxford synthesizers, Dynacord digital drums, MDB Window Recorder, and WAL bass guitars. In addition, Europa has reduced the pro-user price of the Quantec Room Simulator from \$10,000 to \$7,995.

- **JBL, INC.** has formed a new company from its professional products division, according to **Ron Means**, the company's newly-elected president. **JBL PROFESSIONAL** is one of four units recently created as a result of market growth; the consumer division is now known as Harman-America, the exporting group as JBL International, and the manufacturing arm as Harman-Manufacturing. As a result of the company restructuring, **Mark Gander**, formerly product manager, has been promoted to VP/marketing of JBL Professional, while former sales manager **Ken Lopez** has been named VP/sales.

- **TRIDENT U.S.A., INC.** has relocated to new offices in Los Angeles. Assuming responsibilities as president of U.S. operations is **Lon LeMaster**, who has an extensive background in the recording industry, and a variety of experience in sales and marketing with Everything Audio. "The industry, as

well as Trident UK, will be better served with the Los Angeles location," LeMaster said during a transition meeting with **Jim Camacho**, former company president. The new company address is: 308 North Stanley Avenue, Los Angeles, CA 90036. (213) 933-7555.

- **ADA SIGNAL PROCESSORS, INC.** has moved to a larger sales, service and manufacturing facility at 7303D Edgewater Drive, Oakland, CA 94621. (415) 632-1323 and (800) 241-8888.

- **THE TIME CODE HANDBOOK**, written by **Walter A. Hickma**, president of Cipher Digital, Inc., and **Milan Merhar**, has been reprinted by **Bang Campbell Associates**. The booklet is considered by many pro-audio users to offer an exceptionally clear and concise description of SMPTE timecode operation and its audio and video applications. Contact **Nancy Marsh** at (617) 548-1309 for current prices and availability.

- **VALLEY AUDIO, INC.** and **DISCRETE RESEARCH, LTD.**, England, have joined forces to pursue mutual interests in the areas of audio/video facility design and consultation. Both companies have extensive experience in the electronic system and acoustical design and construction of studios and production facilities — Discrete recently completed two mix rooms for Utopia and Odyssey Studios, London, while Valley Audio handled a new LEDE room for Acorn Sound Studios, Nashville, and an LEDE facility for The Welk Music Group. Valley Audio also will be marketing an all-dome monitor system designed by **Neil Grant**, technical director of Discrete Research. Further details are available from Valley Audio's **Bob Todrank** at (615) 383-4732.

- **THE ASSOCIATION OF PROFESSIONAL RECORDING STUDIOS**, England, has organized a week-long **Studio Engineer's Course**, to be held at the University of Surrey, Guilford, from September 13 thru 20. Following a pair of optional revision sessions on the first two days, participants will be provided with seminars and tutorial sessions that cover the following subjects: Standards and Measurements; Mixer Design; Conventional and Ambisonic Surround-Sound Mix-down; Classical Recording; Acoustics of Musical Instruments; Monitoring, Listening and Metering; Noise Reduction; Studio Acoustics; Maintenance Practice; Digitizing Sound, Error Correction and Storage; Timecode and Synchronization; Digital Mixing; Recording and Microphone Techniques; Mastering for Compact Disc; Cassette Duplication; Disk Cutting; Sound Balancing for Stereo TV; Video Post Production; and "The Role of the Pop Producer." Evening workshop sessions will cover Digital Editing Techniques using the Sony PCM-1610 system, Test Equipment, Analog Mastering and Comparison with Digital, and hands-on remix techniques for rock and classical recordings.

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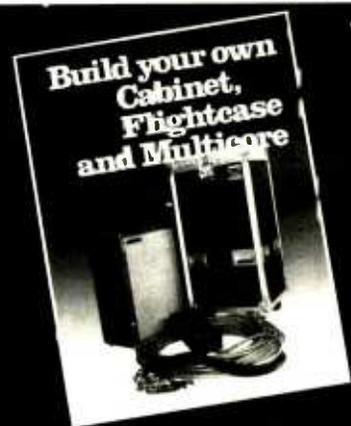


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News

Costs for the course, which will be limited to 45 participants, are UK pounds 455 for APRS member studios and organizations, and UK pounds 495 for non-members. Further details are available from the APRS Secretary, Edward Masek, 23 Chestnut Avenue, Chorleywood, WD3 4HA, England. Telephone: 01144923-772907 Telex: 24224, ref 258.

— People on the Move —

• **Steve Blake** has been named sales consultant for **Lake Systems Corporation**, the

Boston-based equipment supply and installation company, with responsibility for audio/video and acoustical system design. In addition, **Jim Cook** has joined the firm as audio sales consultant to the radio, television and recording-studio industries, while **Luke Furr** has been named sales engineer with responsibility for design and sales of turnkey systems to the pro-audio/video industry. All three individuals join **Lake Systems** from **Professional Recording and Sound**, Boston. **Lake Systems** recently acquired **Harrison Systems'** line of music recording and production consoles, and also has been appointed exclusive dealer for **Otari** tape machines in the New England area.

• **Larry Shank** has been appointed as a TEF

salesman at **Crown International**, where he will be responsible for the marketing of the TEF 10 Systems Analyzer/Computer, TEF technology, and coordinating TEF markets. Prior to joining **Crown**, **Shank** spent four and a half years with the **Burroughs Corporation**, selling mainframe computers and specializing in telecommunications and on-line terminals. Also, **Tim Kueppers** has joined the company as engineer in the company's Prototype Engineering Group, where he will be responsible for working on microphone and electronics prototypes, and preparing them for production.

• **David Post** has joined **Shelton Leigh Palmer & Company**, the New York-based commercials production and composition company, as executive producer and marketing representative. His prior experience includes marketing representation for several west-coast sound equipment manufacturers. A pianist, **Post** has played with **John Hardy** in San Francisco, and also led his own bands in the New York Area.

• **Ron Lagerlof** has been named vice-president and general manager of **Studio Services, Inc.**, the Dallas-based equipment supply, installation, acoustic design and custom special-product company. **Lagerlof** joins the company from **Otis Conner Companies**, where as chief engineer he was responsible for the construction of **Studio Center**, Otis' personal-use studio. Other credits include the installation of three studios for **The Dallas Sound Lab**. Also joining the company as service manager is **Wayne Kirkwood**.

• **Steve Lichtenauer**, of **Lichtenauer and Associates**, has been appointed by **Telex Communications** as representative for Northern California, following six years of sales and marketing with the company's Pro-Audio Division.

• **Bob Ringer**, formerly president of **Vidtronics, Inc.**, has been named president of **RTS Systems, Inc.** Also, **Shelley Brown**, former co-owner of **Sunwest Marketing**, has assumed the position of sales manager.

• **Philip M. Ritto** has been promoted from marketing manager of **Video Tape Products** to director of marketing at the **Ampex Magnetic Tape Division**, where he will assume responsibility for the development of all international and U.S. marketing programs.

• **Jeff Levison** has been appointed **Cinema Sound Consultant** at **Aphex Systems, Ltd.**, with responsibility for final development of the company's new range of **Cinema Matrix** and **SQ Surround Sound** decoders, and will act as a consultant to pro-user installations. **Levison**, who also will remain a principal in **Celluloid Services, Hollywood**, previously was responsible for planning sound installations at the **MCA Universal Studio Tours**, including the complex system used during the "Conan The Barbarian" presentation.

• **Gary Hall** has been named digital sales engineer of **Sony Corporation of America's Professional Audio Division**, with responsibility that includes customer consulting and training. Prior to joining **Sony**, he operated his own audio electronics service and consulting business based in Boston, and has also held design engineering and marketing positions at **Lexicon, Inc.** **Hall** will be based at **Sony's Paramas, New Jersey**, regional office.

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