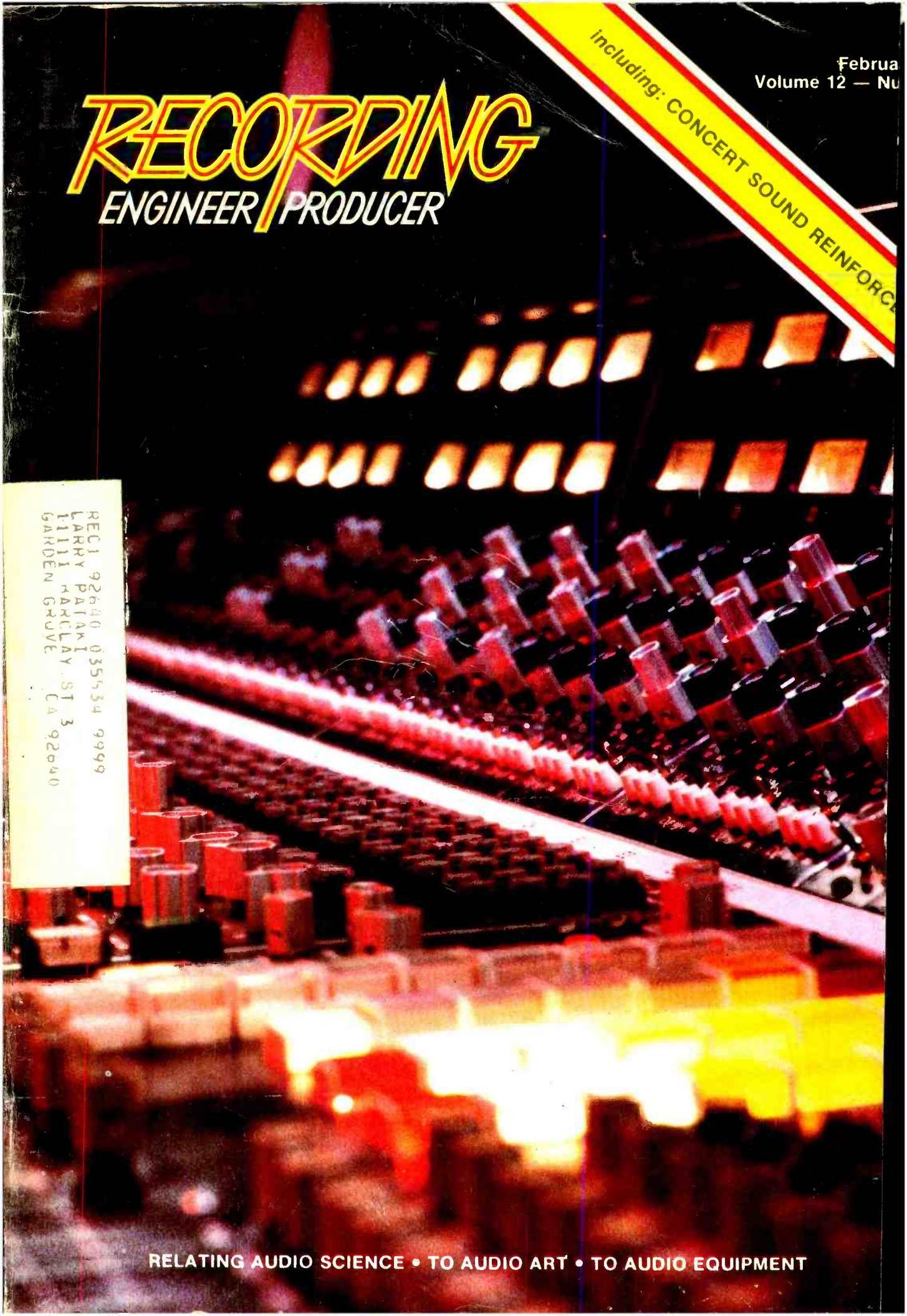
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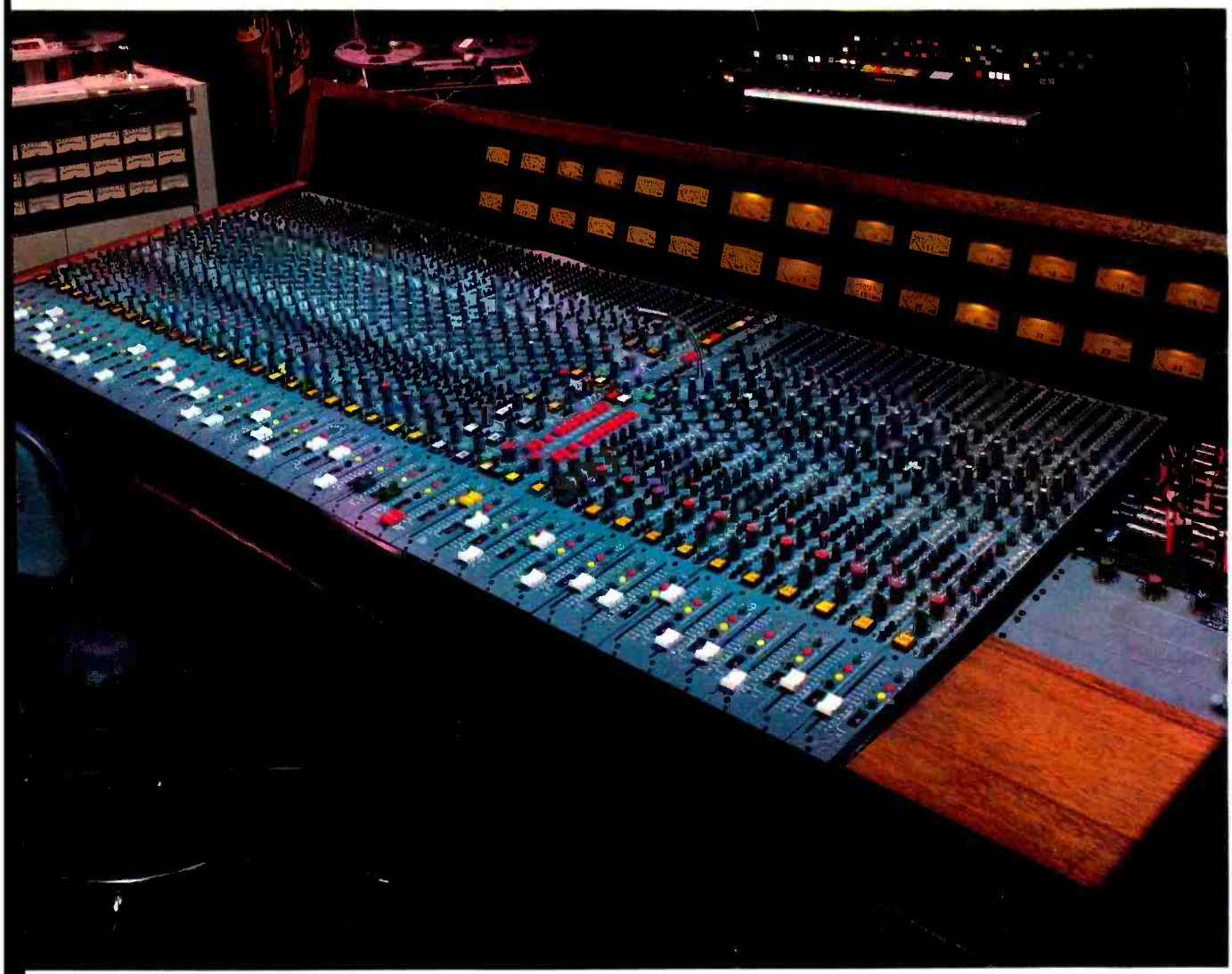

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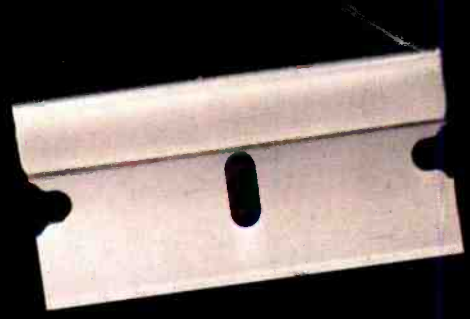

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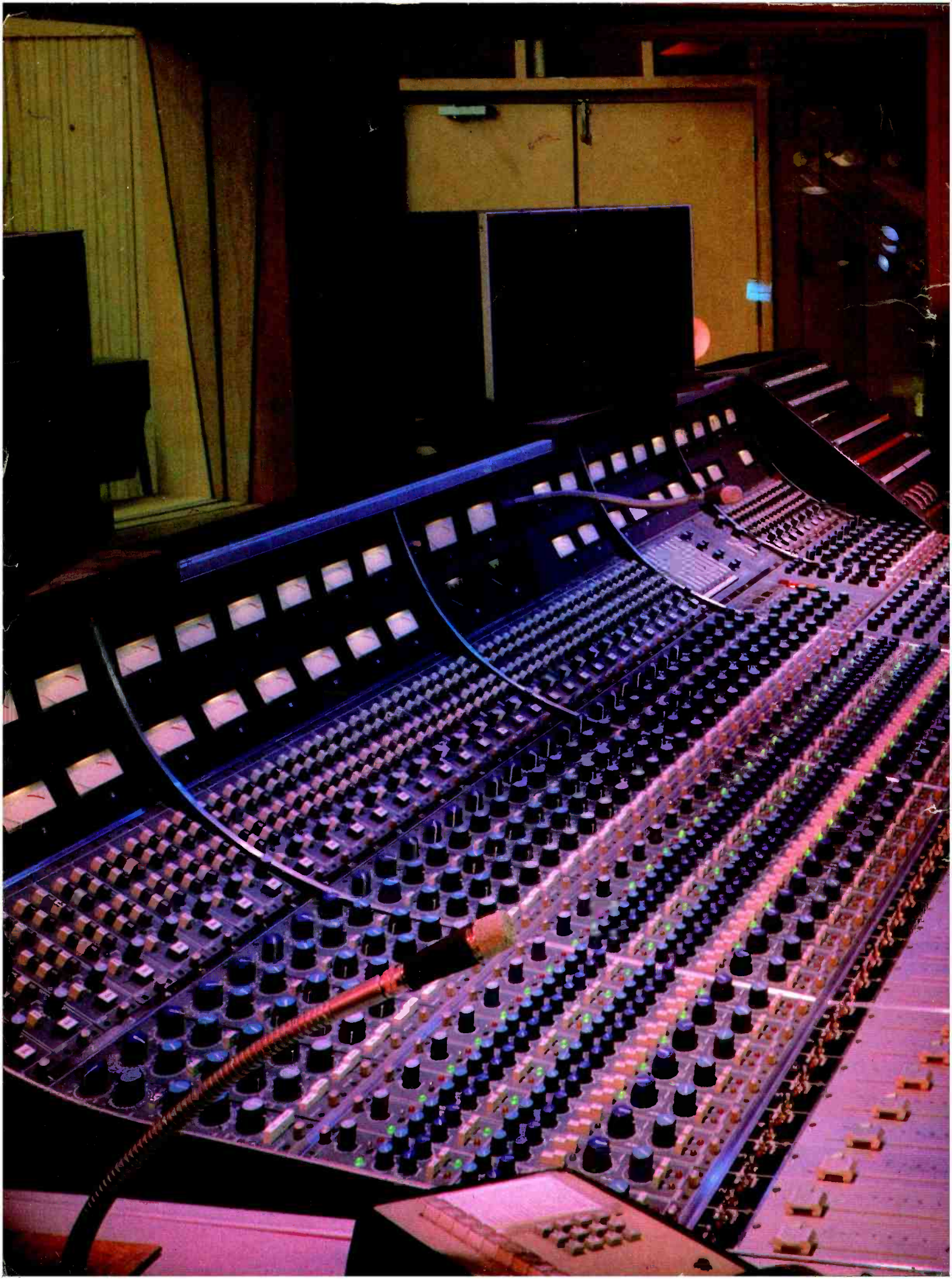

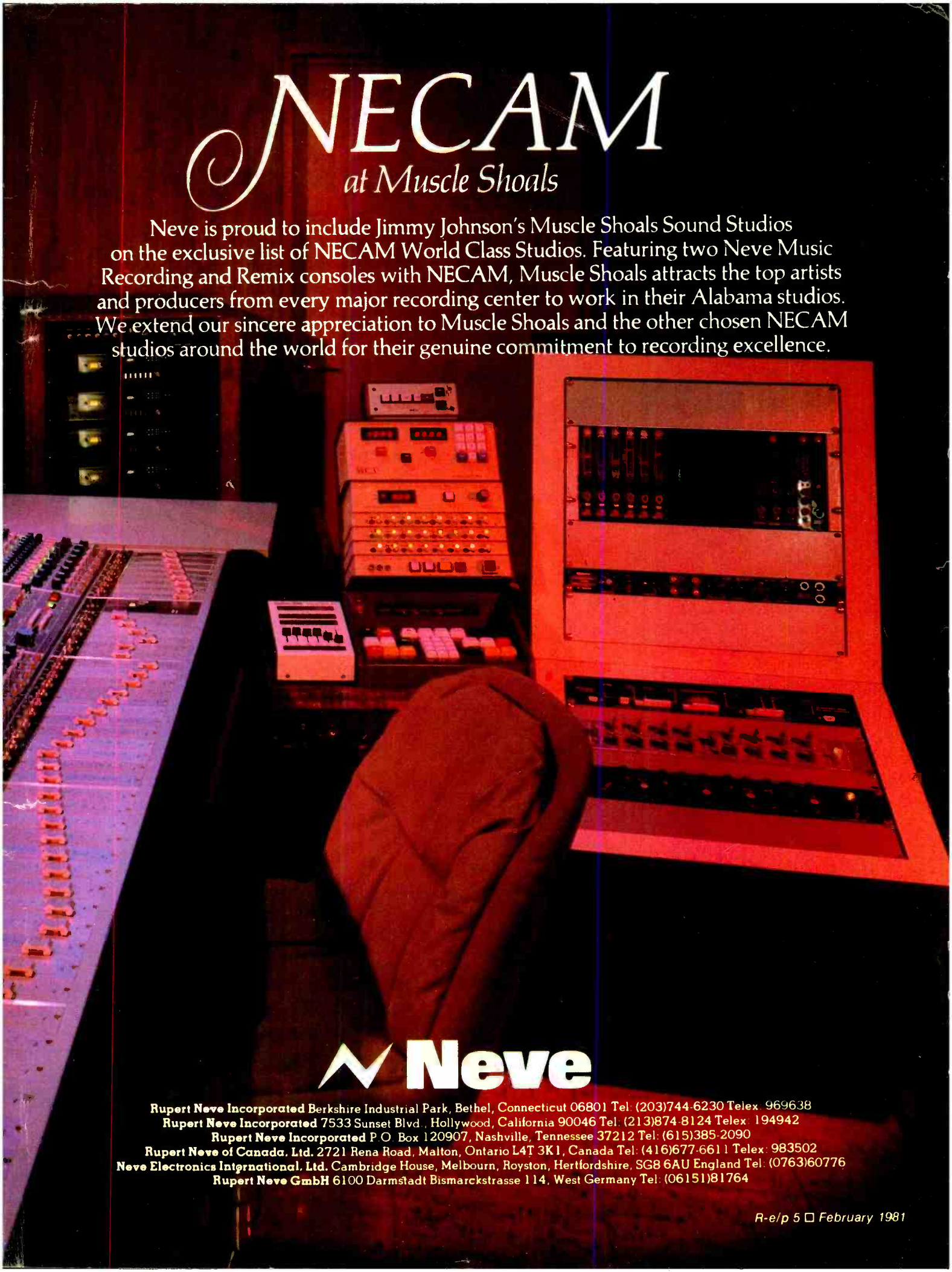
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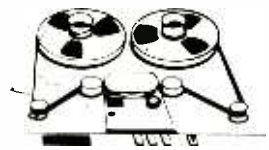
— Contents —

— **The Cover** —
. . . and unusual view along an API console . . . **Clover Studios,** Hollywood, California. Photograph by **Michael Boshears.**



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— AUTOMATIC MICROPHONE MIXING —

from: **John Eargle & Ron Means**
James B. Lansing Sound, Inc.
Northridge, CA

Chris Foreman's article on automatic microphone mixers in your *August 1980* issue discusses the operation of the Dugan/Altec system in detail. While the Dugan/Altec approach has much in common with the JBL 7510 Automatic Microphone Mixer, there are some significant differences which we believe will be interesting to the readers of *R-e/p*.

All automatic microphone mixers worthy of the name provide at least two functions: unused microphones are effectively turned off; and the *ensemble* of *open* microphones is gain-regulated to maintain some fixed margin of stability against acoustical feedback. The Dugan/Altec system accomplishes both objectives through the use of differential amplifiers which compare a given microphone's level with that of the entire ensemble of microphones. Since each microphone is part of a "gain sharing" system, a person who speaks louder into his microphone will command a larger "bite" of the available gain, and the other microphones will be reduced in gain.

In the JBL system, a microphone remains off until its input level reaches some predetermined threshold. Once that threshold is reached, a zero-crossing-detector gate turns the microphone on within half a cycle at any frequency in the system's passband. A release-time adjustment can also be set on each input for the most natural action on speech or music. A precision electronic attenuator located after the summing amplifier then attenuates the output according to the law:

Output Gain Reduction = 10 log (NOM)

— where NOM is the Number of Open Microphones.

Such a system as this is not a gain-sharing system; a louder talker will not "rob gain" from a softer talker, and the *relative gains* of all open microphones will remain absolutely constant.

In well-behaved environments, it is likely that both systems described above would give similar results. Most environments are not so well-behaved, and the important operational differences between one model and another are how they handle difficult situations. In short, we must ask the questions of how easily and how often can the system be fooled.

For example, in a typical house of worship, we would like the automatic microphone mixer *not* to turn on when someone drops a hymnal, and *not* to turn on when the organ level rises. The way this is normally avoided is through the use of some kind of adaptive ambient noise threshold, whose shift is a function of the ambient noise level sensed by the ensemble of microphones (in either their *on* or *off* state). In the JBL Model 7510, this sampling takes place in two ways: both *level* and *nature* of the ambient signals are compared by means of complex logic, and the ambient threshold shifted accordingly.

Consider the following example: Let us assume that several microphones are to be used in a house of worship, and that appropriate gain and threshold settings have been made. Now, the organ is playing, louder and louder. The digital sampling process senses the inputs of all microphones and makes the determination that all of them — regardless of individual level — are "hearing" the same signal. Accordingly, the ambient threshold begins to shift upward. Now, if a talker approaches one of the microphones and speaks into it at a level no more than one dB above the ambient level of the organ at that microphone, then that microphone will turn on. The logic will have determined that the nature of the signal at that microphone, irrespective of level, was different from all the others. So it would be for a dropped hymnal — unless of course the hymnal was quite close to one microphone. A background threshold control is used to establish the range over which ambient threshold will shift, and it would normally be set to the point where it would accommodate the loudest ambient levels, but no more.

From this point on, we can compare automatic microphone mixers on the basis of added features which are not directly associated with the automatic mixing and gain riding functions themselves. It is this array of features which will often dictate which model is to be chosen for a given installation. In the case of the JBL 7510, the following special modes of operation are possible:

1. *Priority Mode.* Any input, or inputs, can be put into a priority mode causing them to take precedence over any inputs in automatic mode. In a boardroom situation, only the chairman's microphone would be in this position, so that when he spoke all other microphone would be shut off. Other applications of the Priority function are in broadcasting, and some smaller scale music reinforcement setups.

2. *Direct Output.* Each microphone can, after the gating function, be fed to a direct output for external mixing or processing via a multi-channel console. In this hook-up, the 7510 functions as a set of high-quality noise gates. Although their outputs in this mode are all individual, they are still related in their gating action by the digital control circuitry. In practice, this means that a varying ambient noise level in the studio will not cause false triggering of the gates. This mode of operation is an especially useful adjunct to a music reinforcement situation, where the large number of open microphones may muddy up the sound or limit the gain of stage monitoring. Such externally processed inputs can, if desired, be inserted back into the 7510 auxiliary input, where they will be fed — in mono of

continued overleaf

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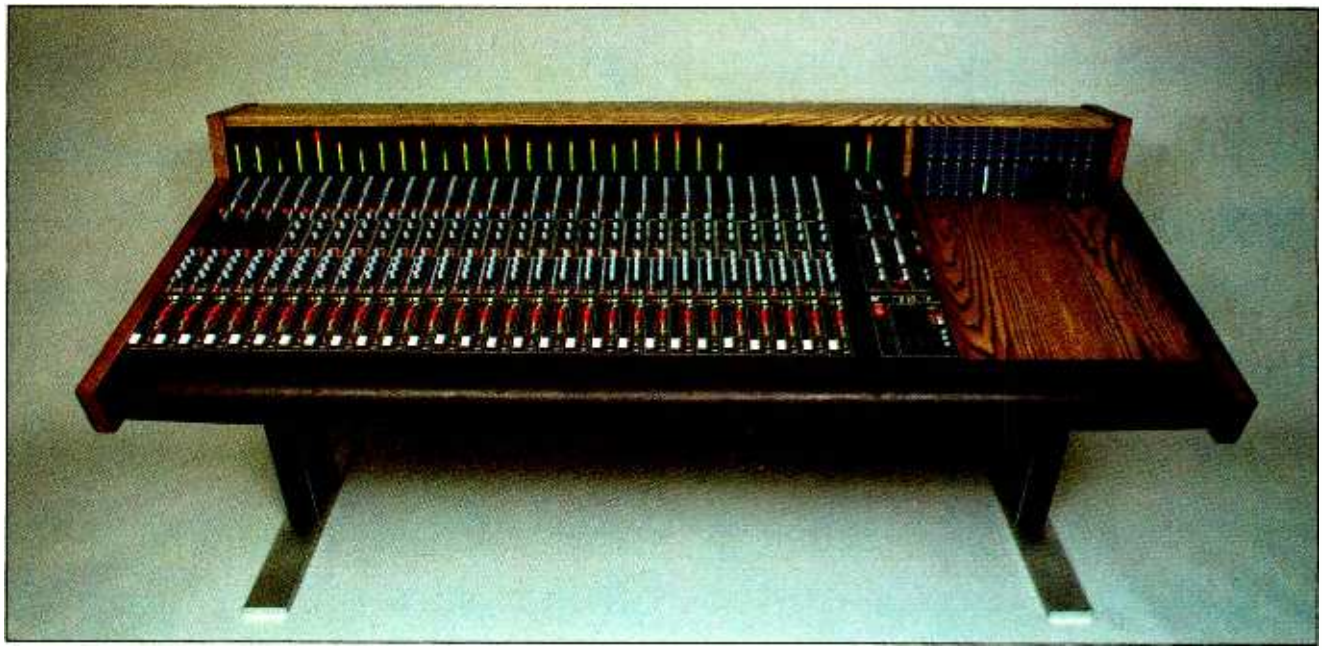

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■ Handcrafted, solid oak cabinetry.

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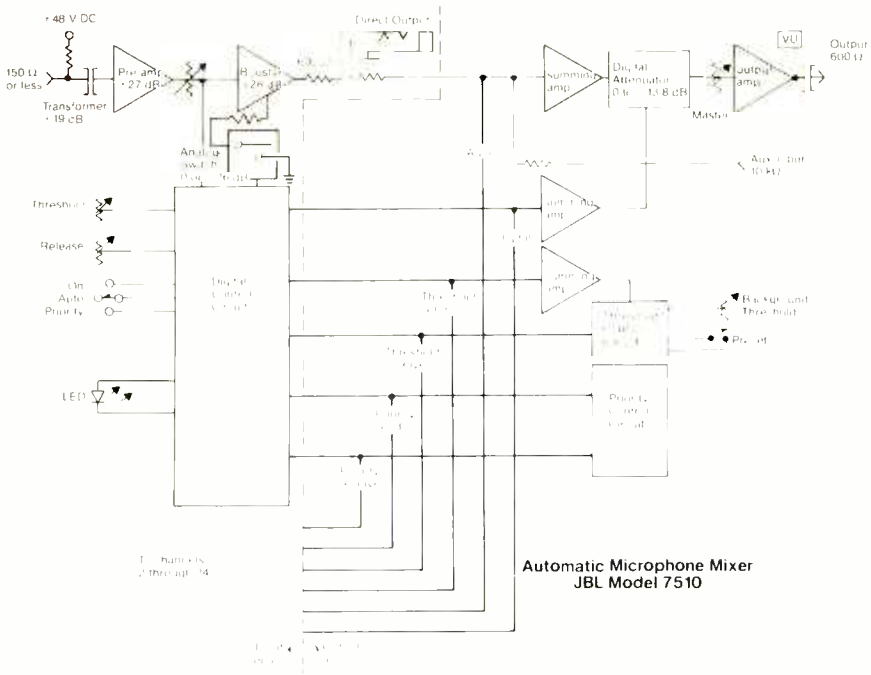

Automatic Microphone Mixer
JBL Model 7510

course — through the system's NOM output attenuator. Through the use of the independent direct outputs, the 7510 becomes a useful adjunct in the recording studio, where the gating action can be set to tighten up a drum set or simply to hold minor studio noises to a minimum.

The accompanying block diagram outlines the functioning of the 7510. All logic and gain control functions are digital and provide for very stable operation. The digital attenuator for example, controls output gain accurately to 0.1 dB.

ed— *Chris Foreman, author of the original piece on Automatic Microphone Mixers has recently left Altec and joined Community Light and Sound, in Philadelphia, Pennsylvania.*

— DISK MASTERING COMPUTERS —

from: **John Bittner, President**
Zumaudio, Inc.
Phoenix, AZ

As the developer and manufacturer of the Zuma Disk Mastering Computer, we're concerned that recent letters *(R-e/p, June and October 1980)*, pertaining to the new generation of disk computers, might have left your readers with some misconceptions.

In his initial letter, Steven Cavanaugh, [of the WUOM Supporting Staff], expresses his concern regarding what he refers to as "the new 'groove nestling' method of disk cutting." He then goes on to say that this "advances the cutting stylus in a series of rapid jerk-like motions." While we share some of his concern, it is incorrect to imply that the potential side effects described are in any way related to groove nestling. In fact, pitch-depth control systems that advance the cutting in the manner in which he describes, but lacking the groove nestling feature, have been in existence for at least the past seven years. Groove nestling simply describes the ability of the computer to utilize the phase as well as the amplitude components of adjacent grooves. The current model Neumann lathe, the VMS-80, as well as previous model Neumanns fitted with the Zuma Computer, are capable of groove nestling without jerking pitch changes.

We agree with Mr. Cavanaugh that such rapid pitch changes are undesirable in that they can generate subaudible signals which can contribute to tracking problems. Why, then, advance the cutter so rapidly? Because the faster the change is made, the more updates that can be made during the course of a turntable revolution, resulting in more efficient use of disk space. However, if the update frequency is sufficiently high, the updates themselves become audible.

Under certain conditions, they can become audible even if they occur at a subaudible rate. This happens because the rapid acceleration of the pitch motor results in a step-like waveform being inscribed on the disk. The faster the motor responds, the shorter the rise time of the step. The shorter the rise time, the greater the number of upper harmonics generated. The degree of change, or the amount of space made as a result, corresponds to the resulting amplitude of the motor generated signal.

The Zuma Disk Mastering Computer resolves this potential dilemma by forcing large pitch changes, which might result in a troublesome inaudible or audible signal if made too rapidly, to be made gradually over a period of up to a half of a revolution. On the other hand, small changes in pitch are permitted to occur as many as 16 times per revolution. This permits efficient use of space, but again ensures inaudibility due to the low amplitude of the resulting change.

The result of this approach is a smooth, continuous, pitch control, with resulting efficiency attested to by the 18 Zuma Computers currently in use by facilities in this country.

views

A DECADE OF "AUDIOPHILE" RECORDS

by Ralph Hodges

Unsung and unsought by the major labels for years, the quality record market rose during the Seventies and began throwing money at numerous smaller entrepreneurs. Now, on the brink of the Eighties, it is ready to turn to . . . what?

Back in the late Fifties I fired off my first letter to record-company executives. "Proposal:", it said in essence. "Produce a special-edition of records made to no-holds-barred quality standards. Charge double or even triple. I'll pay."

To my overheated adolescent imagination, the plan was original and brilliant. To the record people it was routine; some of them even had a form letter for it, by which I was taught the realities of mass-market production and distribution. (Of course I was also informed that the product was *already* made to no-holds-barred quality standards.)

In time I met others who had written the same letter to the same executives, and through them encountered some of the (very obscure) true audiophile records of the day: efforts of people like Emory Cook, Stu Hegeman, and a handful of exotic European labels whose work was being mailed here in batches of three or four by friends and contacts overseas. It was a meager trickle, and the reception it got seemed to justify the attitude of the industry giants. A record needed a recognizable name, musical content with broad market appeal, and — if you were concerned about reviews — a passable performance. It also had to make a noise when played on a phonograph. Otherwise, a record was a record. Audiophile records often met the latter two criteria but never the former. Therefore they were out of the running.

All too true back then, alas, and whatever technical demands an emergent hi-fi conscious public was inclined to make on a record were pacified by promising jacket copy: "Dyna-groove" "Miracle Surface," "360-degree Sound," the ever-serviceable "Sound Spectacular" and, above all, "Stereo" — a concept that entered the language like lightning and the general comprehension like the Greenland glacier . . . slowly and erratically.

It is clear in retrospect that people were becoming dissatisfied with record quality, but were apparently lulled by energetic sloganeering — and the lack of standards for comparison — into a belief in half-understood terms and techniques as progress in the form they wished it. "Miracle Surface," RCA's proprietary name for a vinylite composition that no one seemed to know a lot about, was addressing itself to what was probably their primary complaint: noise. But they thought that stereo, which was "different" and "better" than high-fidelity, was doing the same. Of course, neither turned out to have any significant *direct* effect on noise or basic fidelity, RCA's attempt notwithstanding.

Glitter, If Not Gold

In 1968, about 20,000 albums entitled *Lincoln Mayorga and Distinguished Colleagues* were

continued on page 14

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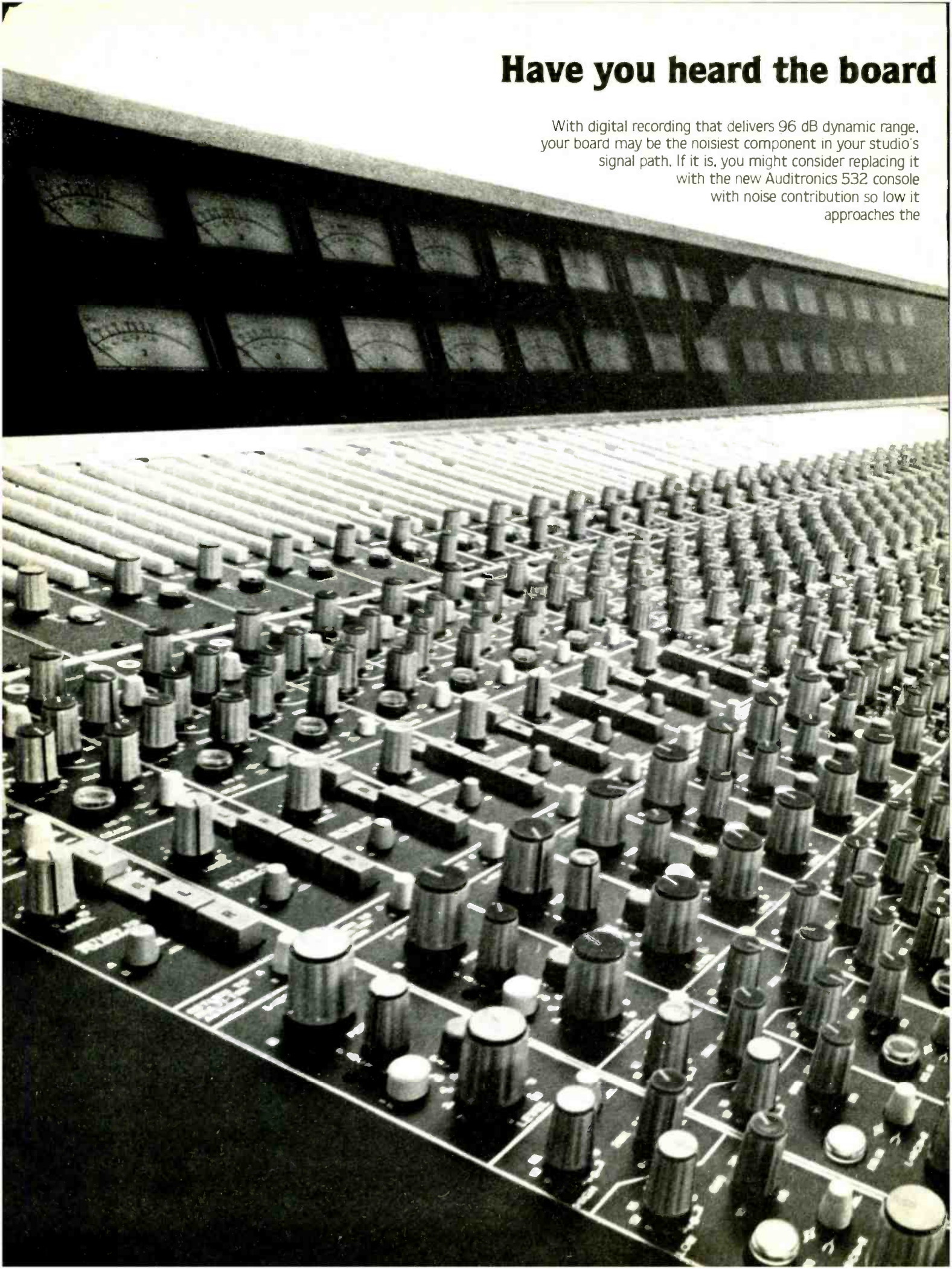

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views

continued from page 11 —

produced by an unknown label, Sheffield Labs. The albums were intended as promotion for a new Los Angeles cutting studio, The Mastering Lab, which was connected with Sheffield Records in Santa Barbara, California. They were meant to demonstrate, among other things, that decent studio session work could proceed on a real-time, non-stop basis. And that competent recordings made directly on a master lacquer, without an intervening tape transfer, had certain technical advantages going for them. Some of these disks managed to get themsevles put on sale (for $6.50) in hi-fi stores. The rest is history.

Why did it happen? Only guesses are possible. As yet direct-to-disk had no strong charisma. The musical content was bland: a modern big-band concoction of standards served up with a California rock beat and a few jazz overtones. The sound was not particularly striking, obviously originating from a near-dead studio environment with a minimum of processing. However, the sound was clean, the overall noise level well down, the surfaces excellent, and the music unobjectionable and consistently lively in a stiff sort of way. Without doubt, hi-fi store salesmen played the record for prospective customers, and also played it as a constant come-on for browsers from the street. It sold, and it put The Mastering Lab/Sheffield Lab into the direct-to-disk business, with a wonderful technical story to tell.

The next direct-to-disk hopeful, Crystal Clear, happened to follow a similar musical path with a release called *Direct Disco*. This may have been an inspiration, because at the time disco had no artist identification to speak of, and Crystal Clear needed to make no apologies for offering unknown artists. The music, being current, constantly vigorous, familiar in style, and uncontroversial, seemed to suit hi-fi sales purposes and customers' expectations equally well. The records sold, and the rush was on. In almost no time close to a dozen direct-to-disk producers popped up, with ever-increasing prices. The ruckus seized the attention of the hard-core audiophiles, classically oriented for the most part, and they pressed for more attention to serious repertoire. A brief golden age was at hand.

By the mid-Seventies Sheffield Labs had recorded the Los Angeles Philharmonic under Leinsdorf, Telarc the Cleveland Orchestra under Maazel, and Crystal Clear the Boston "Pops" under Fiedler. Name orchestras and name conductors on direct-to-disk! Prices were now quite high, however, and critics from audiophile and non-audiophile camps were correspondingly harsh. Merits were awarded, but so were demerits; and digital recording was about to break.

Digital carried Telarc and some very notable others away into a steady association with Dr. Thomas Stockham and his Soundstream recording system. And, incidentally, put Telarc, committed to classical music, on *Billboard*'s classical charts several times. (Bear in mind, however, that direct-to-disk projects are production-limited, while digital projects are not. If sales of 50,000 albums are necessary for a *Billboard* citation, the stampers from a direct-to-disk session may not make it. The tape from a digital session can always be used to generate new stampers.)

Sheffield's ***Mayorga*** *and* ***Sax***

There was a falling-out amongst audiophile record producers, with most of the invective being directed at digital converts. Into the breach stepped Mobile Fidelity Sound Labs, which came up with the idea of remastering existing studio tapes of established appeal, utilizing half-speed cutting and other precepts laid down by the near-legendary Stan Ricker, formerly of JVC Cutting Center. Also into the breach went dbx, armed with a disk system encoded by their 2-to-1 compander noise reduction process, and prepared to rescue any existing tape of merit from technical persiflage. Finally, the majors got into the act: Capitol with a 45-rpm LP; RCA with a digital recording project; Columbia with a special edition recording cut at half speed. All this commotion arose over a market that didn't exist a decade ago, and which is not well understood even now. But more of this a bit later. It's now time to look the field over more closely.

The Contestants

Of the many US audiophile-record manufacturers that have come (and often gone since), five stand out as being of particular historical significance. A profile of each will shed some light on what they did and how they did it:

Sheffield Labs

The partnership of Lincoln Mayorga and Doug Sax established a *modus operandi* that nearly all the major audiophile manufacturers adopted, at least in part. This included the obtaining of highest quality materials and pressings from overseas sources, such as Teldec of West Germany; levering recording commitments from big names by means of artful persuasion and a demonstration of prior successes (signing Leinsdorf and the Los Angeles Philharmonic to a two-LP contract remains a milestone in the history of small recording operations); and, most vitally,

continued on page 19

Crystal Clear's ***Wodenjak*** *. . . producer* ***Allen Zentz***

As Good As You Are.

Quietly, *You* have made OTARI The New Workhorse in literally thousands of studios, radio and TV stations worldwide! To the creative music professional, an OTARI tape machine is known for the kind of performance and reliability that's expected of equipment that keeps on going even when you can't. Session-in/session-out, with an OTARI you have made an investment in a machine that's always ready to expand your art.

For the artistic entrepreneur and recording artist who depend on recording equipment for their livelihood, we have engineered the most comprehensive line of tape recorders in the world. From demo to final master, from ¼" tape and up, there's an OTARI that will get your music off and onto the right tracks. Like our legendary 5050 Series. All 5050 Series are designed with important growth features: switchable +4 or −10 dB levels, D.C. Servomotors for adaptability to SMPTE interlock and video production, easy alignments for optimum performance, overdubbing, and many more useful production features. ¼" transports are available in full track, two or four track stereo, and four channel versions. ½" transports are available in four or eight channel models. They're the first compact recorders accepted by both the broadcast and recording industries. They remain, dollars for dB's, the best tape recorders made. When it comes to one-inch, eight channel production, our MX7800 is the most rugged and functional eight-track on the market.

When you're ready for your next step towards fully capturing your art and expanding the business of your art, OTARI awaits the challenge to be every bit as good as you are.

Call or write today for your nearest OTARI dealer. They will be happy to show you why The New Workhorse *is* as good as you are.

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For additional information circle # 12

Introducing a present

Once you go through a recording session with the new ATR-124 24-channel recorder by Ampex, you'll want to go through another. Because with each new session you'll discover something new you can do. Things that you can only do with a recorder that's full of features of the future.

ATR-124 gives you the unheard of: Time on your hands.
Which means you can use that time to give clients more of what they're paying for—your creative skills. With the ATR-124 microprocessor-based control system, you can pre-program what you want to do ahead of time so you won't waste studio time setting things up. When their time starts, you're ready to record by touching a single recall button.

ATR-124 also lets you duplicate a technique you may have used earlier in the session without having to rethink what you did. Just touch the memory button and it'll all come back to you. ATR-124 lets you rehearse what you've got in mind, without recording it, to make sure what you've got in mind is right. Tape can be manipulated faster which means you'll get the sound you want sooner. And the chance to try something "a little different." All because of the speed and accuracy that ATR-124 puts at your fingertips.

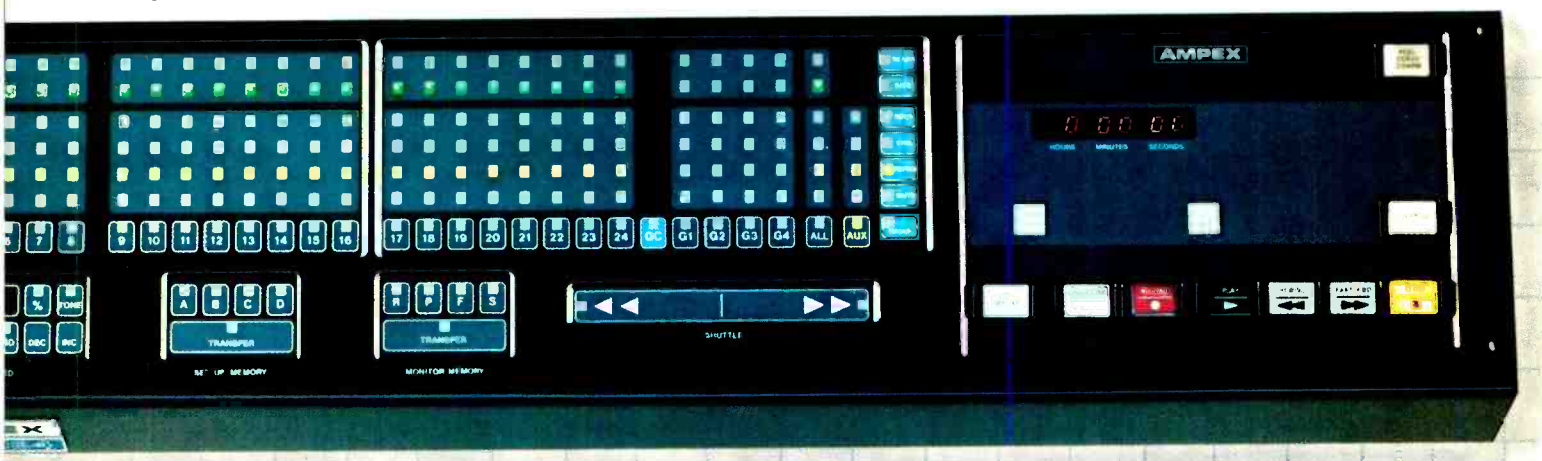
ATR-124 doesn't take away your creativity, it adds to it.
The less time spent setting up, correcting, and redoing, the more time spent creating. And when you add features that help you create to the ones that help you save time, you've got one very potent piece of audio machinery. Take the control panel for instance. It's like nothing you've ever seen. Pushpads linked to a microprocessor give you a new level of creative flexibility. Program a setup, then change it. Then change it back, all with a single fingertip.

A repeatable, variable speed oscillator for pitch correction and special effects is built in. In addition

from the future: ATR-124.

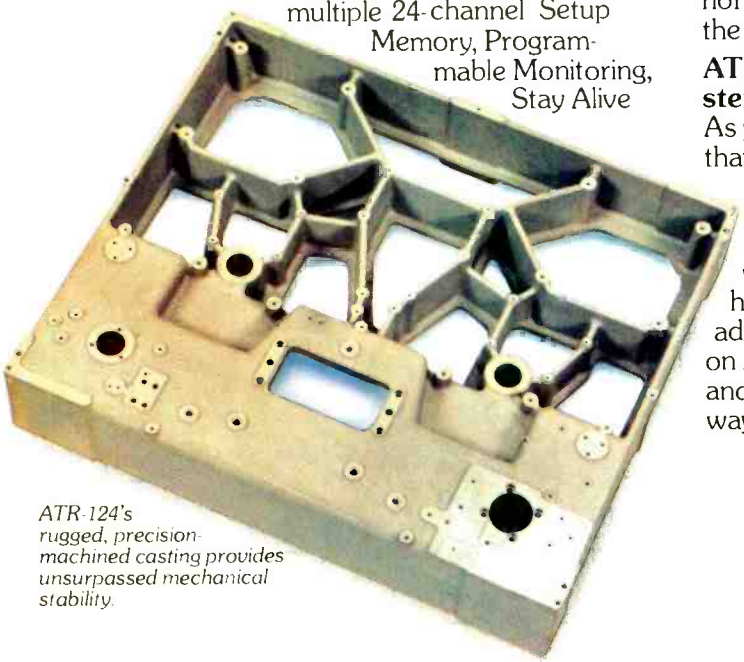
to the standard output, there is an optional auxiliary output with each channel that enhances flexibility. So don't think that ATR-124 is going to replace anything that you do. On the contrary, it's going to improve the skills you have, if not help you develop some new ones.

Memory, and Record Mode diagnostics. The point is this: If you like the ATR-100, you're going to love working with the ATR-124.



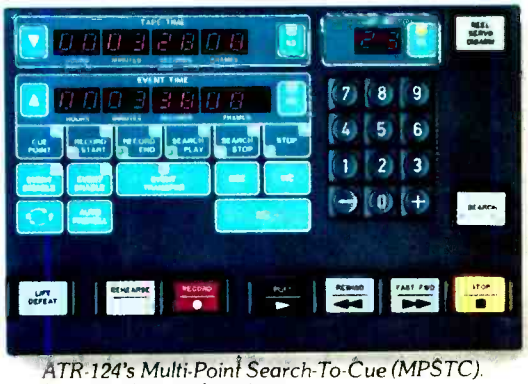
ATR-124's Control Panel. Speed and accuracy at your fingertips.

ATR-124 picks up where ATR-100 leaves off.
It's only natural that the people who brought you the ATR-100 should be the ones to bring you something better. ATR-124 offers you 24 channels instead of 4. You also get many new and exclusive features. The kind that have set Ampex apart from the crowd for the last 30 years. Features like balanced, transformerless inputs and outputs; a patented flux gate record head; 16" reel capability; input and output signal bus for setup alignment; membrane switch setup panel; fingertip-operated shuttle speed control; and microprocessor-based synthesized Varispeed -50% to +200% in .1% steps or in ¼ tone steps. ATR-124 also features microprocessor-based control of Channel Grouping, multiple 24-channel Setup Memory, Programmable Monitoring, Stay Alive



ATR-124's rugged, precision-machined casting provides unsurpassed mechanical stability.

ATR-124 options.
As impressive as the ATR-124 itself.
With the addition of a built-in Multi-Point Search-To-Cue (MPSTC), you can rehearse edits and control five tape-time actuated events and be compatible with SMPTE time code. Separately controlled auxiliary output amplifiers with each channel provide simultaneous monitoring of normal and sync playback as well as all other monitoring modes. A roll-around remote control unit can also be added to the ATR-124 which contains all control features normally found on the main unit.



ATR-124's Multi-Point Search-To-Cue (MPSTC). Provides 100 cue locations.

ATR-124. Your next step is to experience it firsthand.
As you scan the points we've covered, remember that you're scanning just a small portion of ATR-124's story. We haven't even begun to discuss the accessibility of key components for easy servicing and minimal downtime, or the features we've built in to give you greatly improved tape handling. To find out more, write to us at the address shown below. We'll send you a brochure on ATR-124, our latest audio effort. Better yet, call us and we'll set up a demonstration. It's really the only way to listen to the future.

ATR-124. Pure 24-Channel Gold From Ampex.

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For additional information circle # 14

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All this for the price of a 2-inch recorder.

If you don't need 2-inch compatibility or 24 tracks, you don't have to pay the price for expensive 2-inch hardware.

Instead, you can own the heart of a 16-track studio.

The Tascam Model 15 Mixer. 24-in 8-out 16-track monitor with a comprehensive cue system that can be fed simultaneously by 48 signals.

The Tascam 85-16 Recorder/Reproducer. A 1-inch transport with 16-track integral dbx.*

And the Tascam 35-2B Mastering Recorder. A 1/4-inch 2-track with integral dbx.

With this Tascam 16-track system, you'll get professional sound at an affordable price. And because it's all new equipment, you save even more with tax credit potentials.

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TASCAM

TEAC Production Products Group

*dbx is a registered trademark of dbx inc.

views

continued from page 14 —

securing the cooperation of hi-fi retailers as distribution outlets. Without this last innovation, the entire audiophile-record movement would probably have been reduced to mail order, and thence to speedy obscurity. As things stand today, none of the big five considers mail order a significant sales factor, and several don't bother to cultivate it at all.

The Sheffield direct-to-disk project is still a sideline to The Mastering Lab's main business of cutting disk masters for outside clients, but a profitable and stimulating one. Doug Sax, who oversees the technical end, is highly motivated and working steadily toward a vertical monopoly. Mikes and electronics (all vacuum tube) are proprietary, and there will henceforth be four lathes in operation on sessions. The company does its own metalwork (the production of mothers and stampers), and at last has found what it feels to be a satisfactory local source for pressing (reportedly Record Technology). Vinyl is still imported from West Germany, however.

Up until now, Sheffield Labs has released one album per year, but Doug Sax would like to step up the pace to four. In the beginning, disks were pressed until the stampers began to go and then, if demand continued, the original session was done over. Nowadays, with more lathes on line, an ultimate production capability of perhaps 80,000 pressings is possible, after which the title is permitted to expire. At this moment the Sheffield catalog lists some 13 titles, only ten of which are still available.

A typical Sheffield session consists of multiple takes, perhaps six of which turn out to be keepers. With four lathes running, that will result in 24 lacquers, and a theoretical production capability in excess of 250,000 pressings. In accordance with former practice, what is considered the best take will be released first.

Sheffield continues to be committed to direct-to-disk, although Doug Sax would consider a truly superior analog tape-recording system if he could manage to coax one into his hands. As for other coming attractions, arrangements for a Count Basie album and another Thelma Houston release are in negotiation. (It's interesting to note that Sheffield's original Thelma Houston album, *I've Got the Music In Me*, stands virtually alone as an audiophile production with a featured vocalist.) The most immediate release, which should be available when you read this, is two sides of drum solos with two different soloists. As Doug Sax emphasizes, Sheffield Labs is a sound company as much as a music company, and capturing sounds with fidelity that no one else has achieved is where it wants to go.

Crystal Clear

Ed Wodenjak's Crystal Clear is the eminent example of a record company made out of whole cloth. With a background in publishing (*Sound Advice* magazine, one of the "underground" audio journals), Ed Wodenjak embarked on direct-to-disk operations with no previous experience in record making, inspired by the example of Sheffield and ultimately motivated by the results of a poll in which his readers overwhelmingly volunteered to pay $10 or more for a record of genuine high quality.

Ed Wodenjak was the first audiophile-record manufacturer to exhibit at the semi-annual Consumer Electronics Shows, and by so doing he refined the procedure of distributing through audio retailers. Another thing he accomplished was the opening up of an extensive export market which, interestingly enough, has embraced the audiophile-record phenomenon at least as eagerly as US buyers.

Up until now, all of Crystal Clear's production has been done out-of-house, with leased facilities and hired personnel. Recently the company completed lease acquisition of an entire recording chain, including a Neumann SX-74 cutting system, which has been in use for three years. Now that the system has been paid for, it is due to be modified in various ways and put into service as soon as possible. (Like its opposite numbers, Crystal Clear keeps fairly quiet about the nature of modifications to recording gear. For one thing, some of the steps taken are always highly controversial.)

In the manner of Sheffield, Crystal Clear offers a balance of classical and "popular" selections, the latter leaning fairly heavily on jazz and avoiding electronic instruments completely. It is Ed Wodenjak's experience that the vast majority of the quality-conscious market seeks classical material (five out of ten of his best-selling titles are classical), and he admits to making his strongest technical efforts in that direction. Of course, Crystal Clear's sessions are invariably backed up by tape recorders, and on occasion these have been the Soundstream or Sony digital recording systems. Some of the back-up tapes have been made available by dbx in the form of transfers to encoded disks, most notably recordings of the Boston "Pops" and organist Virgil Fox.

Distribution is split about evenly between hi-fi and record stores, which began taking on such labels as Crystal Clear and Sheffield Labs as word began to spread throughout the record-buying public. Crystal Clear allows its dealers about a 70% markup, which is said to be roughly typical of audiophile-record manufacturers, although undoubtedly wide variations exist in individual cases. The company is devoted to the direct-to-disk concept and enthusiastic about its prospects, although digital and a few other developments have made their pinch felt.

The profitability of the company's first release, *Direct Disco*, has held up well through subsequent offerings and, with a slowed economy, studio time and facilities have actually become cheaper. Ed Wodenjak has also been able to withdraw his pressing operations from overseas contractors, and is constantly experimenting with domestic vinyl suppliers such as Vitek and Kaiser. Like Doug Sax, he strongly identifies with his product, and gives himself up to it almost totally. Under present consideration is a line of high-quality recorded cassettes, but the idea has not gone beyond preliminary planning stages.

Telarc

Exclusively a classical label, this company came to audiophile prominence with a direct-to-disk album of the Cleveland Orchestra, followed by a digital recording of selected members from the same august ensemble (the Cleveland Symphonic Winds), and then a well-received digital rendering of Stravinsky's *Firebird* with the Atlanta Symphony Orchestra, Robert Shaw conducting. Its head of operations, Jack Renner, has an instinct for the big production, a flexible attitude, a flair for putting together a good production team, and a keen consciousness of press and public relations.

His abrupt and very early embrace of the Soundstream digital recording system (the Cleveland Symphonic Winds album was the first digital production in general distribution) left many direct-to-disk purists shaking their heads, but the resounding bass drum from that recording was probably the most frequently heard sound at audio shows from coast to coast.

Telarc's ***Jack Renner***

Upon entering the audiophile market, Telarc made a wise distribution arrangement with Audio-Technica US, the local arm of a prominent Japanese manufacturer of phono cartridges, microphones, headphones, and accessory items. This put the recordings into the showrooms of Audio-Technica dealers, and ultimately into many record outlets, as the well-financed Audio-Technica team sent reps in search of new markets for its diverse products. At one time the distributor for quite a number of audiophile-record labels, Audio-Technica finally singled down to Telarc, and now exclusively handles distribution in the US and Japan.

Telarc records with Soundstream digital equipment, cuts where the cutting looks best, and presses overseas in West Germany or Japan. It runs a tidy technical ship, and has even gone so far as to invite cutting engineers to attend initial recording sessions for confirmation that the mix will be suited to disk transfer. The company has a position of leadership in the digital domain that it will not easily relinquish, and a determination to produce material that will get the attention of classical reviewers and buyers.

Mobile Fidelity Sound Lab

Under the trademark "Original Master Recordings," Mobile Fidelity remasters session tapes with proven track records, and carries on through metal and pressing to a product that often retails for $20 or more. That a remastered version of *Abbey Road* or *Dark Side of the Moon* might sound different from the original release should surprise no one who has had occasion to compare, say, US, British, and West German pressings of these warhorses. That it sounds better to most ears is a tribute to what Mobile Fidelity is about, and a vindication of those who have always felt that records are nowhere near as good as they ought to be.

Mobile Fidelity began in the mid-Sixties with some releases by the un-prepossessingly named Mystic Moods Orchestra, and then progressed to a sound-effects demonstation record, *The Power and the Majesty*, in which the concept of half-speed cutting and immaculate subsequent processing first solidified. According to Gary Georgi, who oversees the Original Master Recordings project, Mobile Fidelity began approaching major labels for access to master tapes because it didn't know any better.

— *continued on page 22*

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And now, with this full range of Yamaha speaker components to choose from, you have the flexibility to design a sound system that meets your specific needs.

Low frequency drivers: JA3882 & JA3881 The new JA3882 low frequency driver is specifically designed for high-efficiency sound systems. Its very high sensitivity level enables it to produce high SPL with less amplifier power. With large edgewound copper voice coil, durable cone assembly, and stiff compliance, the JA3882 produces clean, powerful low frequencies.

- ☐ 15" diameter cone
- ☐ 102dB SPL/1 meter/1 watt sensitivity
- ☐ 30Hz to 4kHz Frequency Range (maximum recommended crossover, 800Hz)
- ☐ 8 ohm [JA3882] and 16 ohm [JA3882(B)]

The new JA3881 is an excellent choice for use in stage monitors, keyboard speaker systems, or for 2-way systems. Its flexible suspension and lightweight edgewound aluminum coil give the JA3881 a usable response up to 5kHz.

- ☐ 15" diameter cone
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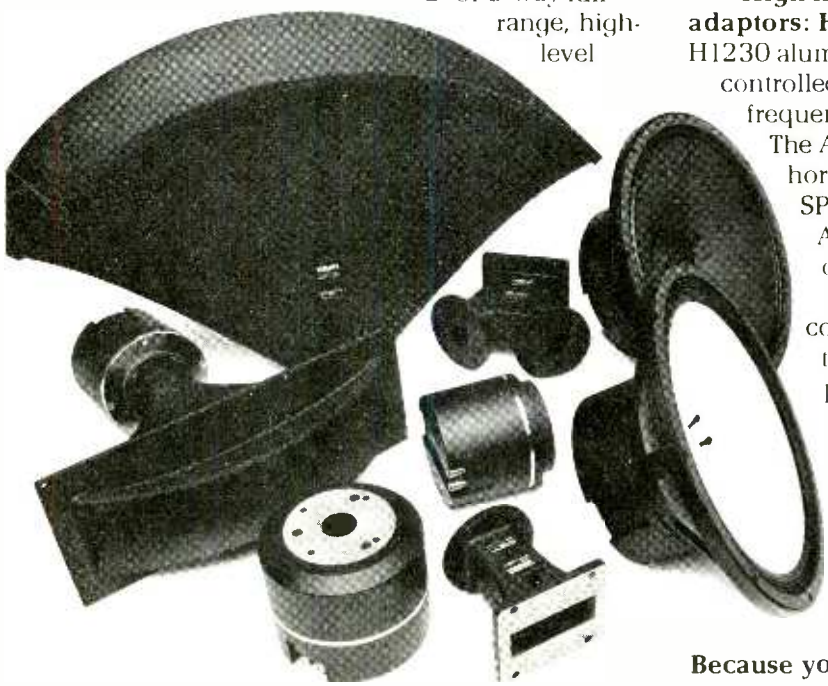
- ☐ 8 ohm [JA3881] and 16 ohm [JA3881(B)]

High frequency compression driver: JA6681B With high sensitivity and high frequency handling capacity, the JA6681B high frequency driver makes an excellent mid-to-high frequency reproducer for use in 2- or 3-way full-range, high-level sound reinforcement or monitor speaker systems. Its unique S-shaped beryllium/copper suspension system and quality construction ensure long life.



- ☐ 145dB SPL reference sensitivity, 1 watt, using 1 inch plane wave tube
- ☐ 108dB SPL at 1 meter, 1 watt (using Yamaha H1230 horn)
- ☐ Nominal 800Hz-12kHz, usable down to 500Hz
- ☐ 16 ohms nominal impedance

Combination high frequency horn & driver: JA4280B/H1400 This high frequency reproducer's versatility enables it to be used as the mid and high frequency reproducer in a full-range stage monitor, keyboard monitor, or general sound reinforcement system. Or as the upper midrange reproducer in an ultra-wide-range system.

- ☐ 90° H x 40° V dispersion
- ☐ 106dB SPL at 1 meter, 1 watt
- ☐ Aluminum horn with damping
- ☐ 16 ohms nominal impedance
- ☐ Nominal 1,500Hz-16kHz, usable down to 800Hz.

Compression tweeter: JA4281B This new tweeter is a high-sensitivity, integral horn/driver unit designed to handle the uppermost portion of the frequency spectrum. It is an excellent super-tweeter for use in 3-way or 4-way full-range, high-level sound reinforcement systems when used in conjunction with our JA6681B high frequency compression driver. Its superb on/off axis response and absence of diaphragm resonances also make it a fine choice for studio monitor systems.

- ☐ 120° dispersion pattern at 10kHz
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- ☐ Nominal 7kHz-20kHz
- ☐ 16 ohms nominal impedance

High frequency radial horn and throat adaptors: H1230, AD3500 & AD3502 The new H1230 aluminum radial horn is designed to provide controlled dispersion (90° H x 40° V) of high frequencies in high-level, wide-range systems. The AD3500 throat adaptor is used to couple the horn to the JA6681B driver to produce 108dB SPL at 1 meter with 1 watt input. Use the AD3502 throat adaptor to connect two drivers for greater output.

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Because you're serious.

YAMAHA

views

continued from page 19 —

Evidently no one else did either, because gradually the tapes were obtained and the recordings made. For a typical project, the label is persuaded to open up its catalog, and Mobile Fidelity selects titles therefrom. Approval for use may require some dickering with artists' management but, if all works out, Mobile Fidelity gets the tape along with freedom to proceed as it sees fit.

Subsequent proceedings include half-speed mastering at the JVC Cutting Center in Los Angeles (with equipment modified and operated by Stan Ricker, who recently joined Mobile Fidelity); shipment of refrigerated lacquers to Japan for electro-forming and pressing; and the return of magnificently packaged final disks for distribution through audio and record dealers. In exchange for the courtesy, original labels and artists split an augmented royalty on sales, and enjoy a new lease on life for titles with a tapering-off market.

Mobile Fidelity's catalog is dominated by popular music, and the company claims to have working arrangements with all major US labels and subsidiaries except Columbia, with which negotiations are in progress. Compared to typical audiophile-record concerns, Mobile Fidelity is a big operation, and it has big plans. A line of cassettes, recorded with undisclosed technology on to BASF Pro II chromium-dioxide tape, has already been introduced. A new record-pressing technique, said to have arisen out of work on videodisks in Japan and involving press cycles on the order of 5 minutes(!), is in the wings, with per-disk prices expected to exceed $40. And finally, Mobile Fidelity hopes to urge upon recording studios the use of a mixdown tape machine built to its own specifications, so that the quality of its product will not be intrinsically limited by the quality of the equipment used to make the original master tape.

dbx, Incorporated

The dbx disk system is quite an old lady, having been demonstrated years ago to members of the industry and press, and then sort of left hanging. But then Jerry Ruzicka was given the chance to do what he could with the concept, and things moved very rapidly indeed. The current dbx catalog lists contributions from more than 24 labels, with a fair crop of titles that come from digital tape sources. Distribution has gone beyond dbx dealers to several major record chains. And the operation is showing a clear profit.

The system itself is no more (and no less) than the familiar dbx consumer tape noise-reduction compander system applied to phonograph records. The consumer must own and use an appropriate dbx decoder to play the encoded disk or the results will be bizarre, to say the least. But if he has the required replay equipment, a theoretical 90 dB dynamic range is at hand, and with the better dbx disks such a promise is subjectively fulfilled.

Like Mobile Fidelity, dbx approaches outside sources for master tapes, but pays an up-front fee for their use. The company then supervises the encoded cutting and the metalwork, returning stampers to the label of origin, which carries on with final production in its normal fashion. (Because a compander noise-reduction system loops the final product, quality of pressing is not overly critical.)

dbx's ***Jerry Ruzicka***

Where dbx makes its money on all this is not immediately clear. At first the idea was to collect on hardware sales, but with success some new arrangements have apparently come into existence, and dbx is able to take a fair cut from what its ingenuity has wrought. Its pricing structure is multi-tiered, depending on what must be paid initially for use of the recorded material.

The current catalog is fairly diverse, but generally lacking in big names. The availability of encoded disks from other manufacturers' audiophile-record back-up tapes affords a unique opportunity to chart the progress that has been made in taping, cutting, processing, and pressing over the past few years, just by buying both versions for comparison. dbx has been accused of trying to execute an end run around problems of record quality that should be solved before new techniques are considered. The company is right in saying, however, that conventional records are at best limited to a dynamic range of 65 dB or so, whereas some listeners just might appreciate a bit more.

Are These People Serious?

The answer must be: Yes, deadly serious, and they've demonstrated their right to be taken seriously. A conversation with these companies may sometimes elicit a stream of mystique, mystery, audiophile mumbo-jumbo, and even misconception. But in the end they have learned to recognize what their product has to sound like in order to satisfy their market. How they go about achieving that sound is their own business; and it's a business in which most recording engineers and even producers cannot participate, since they lack control over the whole production process, and also the time to exercise such control if they had it.

Can they remain serious? The answer also seems to be yes, because they have discovered how to make a profit at what they're doing. Some of those who have been in the business over the full decade have observed certain trade-off cycles in their markets. At first a concern for technical quality was paramount. Then, as a surfeit of technically respectable

— *concluded on page 101*

A CHALLENGE TO YOUR STEREO SYSTEM FROM THE ORIGINAL MASTERS

SHAKESPEARE'S masterpieces challenge the standards of literary perfection. An Original Master Recording,™ Lp or cassette, challenges the sonic potential of your stereo system and markedly improves its performance.

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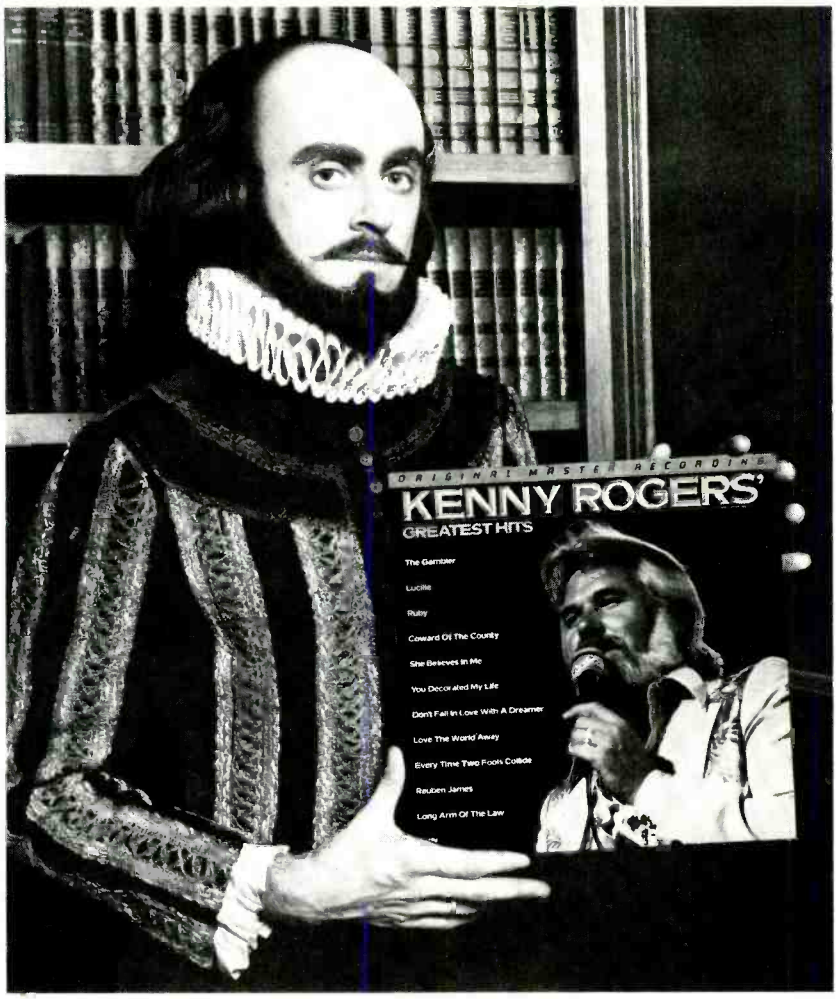

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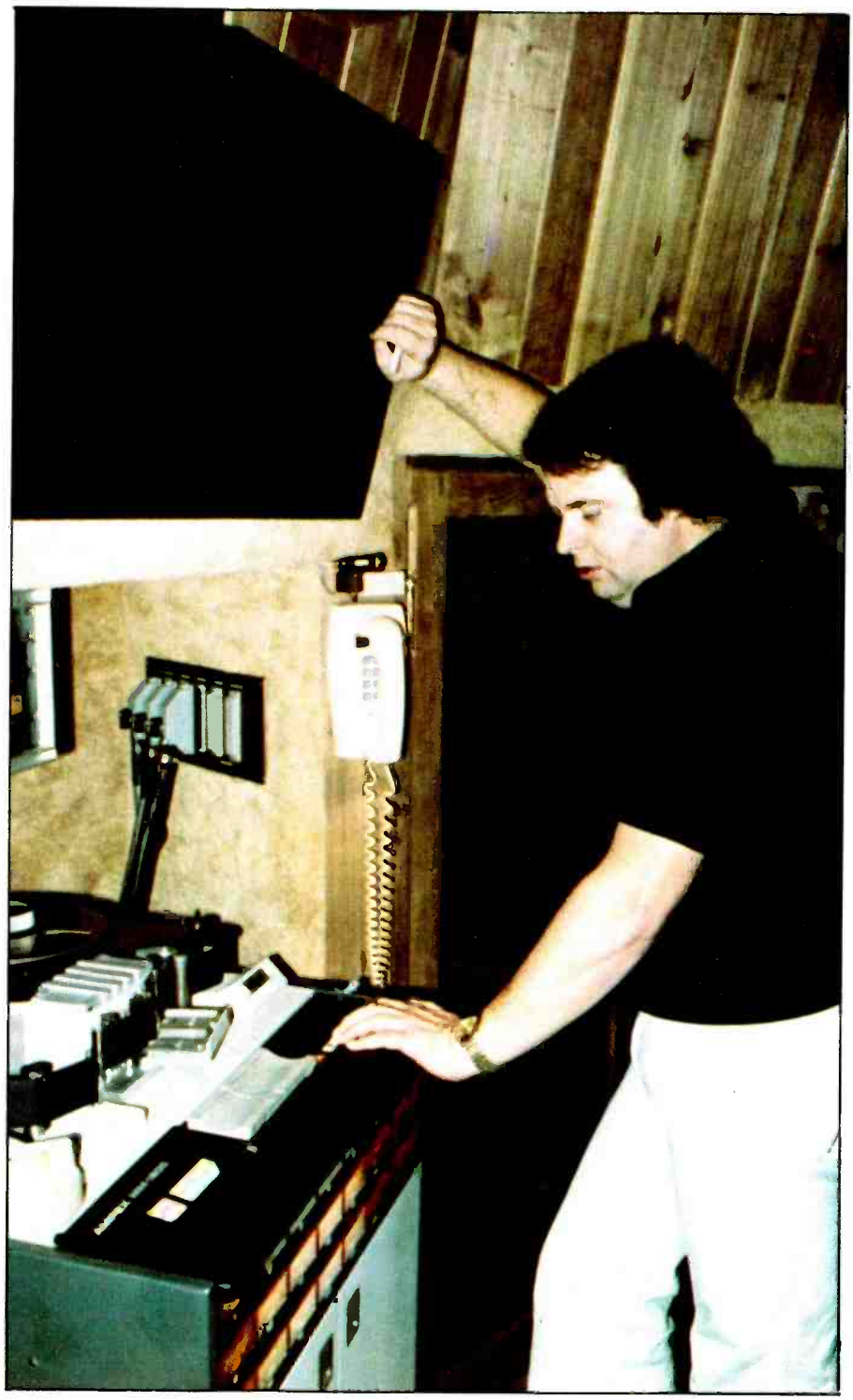
Disco and Beyond - Juergen Koppers

by Paul Laurence

IF being the main engineer for one of the leading acts to emerge from the Disco movement entitles one to the moniker of "Top Disco Engineer," Juergen Koppers is surely such an engineer. A native of West Germany, Juergen began with TV and movie audio before moving over to records in 1971. Much of his early work was done in his hometown of Munich, at MusicLand, a studio whose reputation is well known in the United States. At MusicLand he and songwriter/producers Giorgio Moroder and Pete Bellotte recorded Donna Summer and, in so doing, were instrumental in forging the Disco sound. (Which it should be said, has been very much in evidence for close on seven years.)

And, of course, Juergen has worked with other artists: a slew of the top German acts, plus Donovan, Madleen Kane, Village People, Brooklyn Dreams, and Marc Bolan/T. Rex. He recently settled in Los Angeles, and bases his operations from Rusk Sound Studios in Hollywood.



Photography by Roman Olearczuk

R-e/p (Paul Laurence): Would you characterize the sound at Rusk at all?

Juergen Koppers: I think it's accurate, yeah. If you talk about a special "flavor," it's how you record there. If you use like very close miking, it actually doesn't matter how the room is, because there is not a lot left of the room ambience.

R-e/p (Paul Laurence): The less "air" on the tracks, the less the room is a variable, I guess.

Juergen Koppers: Like the sounds Glyn Johns or somebody got on the Stones in the very beginning — he used only two or three mikes on drums and whatever. So I mean you will have the room characteristic, and you can speak about the "flavor" of the room. But when the whole disco thing happened, that didn't have anything to do with "natural" sound; it was absolute isolation.

R-e/p (Paul Laurence): Are you a part owner of Rusk?

Juergen Koppers: No. I have a production company here, and a publishing company. I prefer one studio, and that's the reason I work there most of the time. In the meantime everything is built the way *I* wanted it.

R-e/p (Paul Laurence): What, all you have done? You no doubt have some equipment preferences.

Juergen Koppers: Actually no, I don't have equipment preferences. First thing I like in the studio is the sounds there, and for me it's the truest monitoring I've heard in a studio. I think that's one of the most important things, because it's important that you can *trust* something. I know a lot of studios where you don't hear enough bass, or you hear more bass than there is on tape, and you always have to concentrate on that; so there is actually no time to concentrate on the music. Because you always have to compensate for what's not right.

R-e/p (Paul Laurence): So what kind of equipment do you have at Rusk?

Juergen Koppers: In the studio they have a Harrison 3232B board, Ampex ATR-102 2-track, ATR-104 4-track, and an MM-1200. And they have Sierra Audio speakers.

R-e/p: You like the Harrison board?

JK: That's a question — "You like the Harrison board?" It's as good and as bad as other boards. The only fact is you get *used* to something. As long as you know what you can do with a console, it really doesn't matter what it is actually. I like the Harrison because it's fast . . . everything is within reach, and within a small space. That's the main reason.

. . . continued overleaf —

When he was 16, Humberto moved to the U.S. from Chile, where several of his relatives were successful singers. He worked on an assembly line for a while, before wandering into MGM Studios. A year later, when an engineer got sick before a major session, Humberto was the only one around who could get the job done. He's been getting the job done ever since for an incredible variety of people, from Debbie Boone to Alice Cooper, as well as Frank Sinatra, Sammy Davis Jr., Steve Lawrence, Tony Bennett, Shaun Cassidy, The Osmonds, David Bowie, Denise Williams, Gladys Knight, Bill Champlin, Lee Ritenour, Hall and Oates, Leo Sayer, The Average White Band and Bernie Taupin, whose album he produced.

ON RECORD BUYERS

"When you make hits, you have to think hits—14, 18, young. The people have to be realistic. How many albums is a 27-year-old guy going to buy, as opposed to a 15-year-old? I mean, you go to a record store. Maybe a 16-year-old is going to buy four albums. A 23-year-old is going to buy one or two—he's very picky. He might buy very specific groups that he likes. He might follow critics. When you make records, you have to think kids. Those are the guys who buy the records."

ON RETAKES

"I hate perfect records. You cut the basic track, the vocals, and then the producer goes all the way back again. He starts replacing the drums. And then he replaces the bass, because the bass doesn't feel quite right. And then he starts doing the keyboards again. So that by the time he's finished, he's done it all over again. If it's not right, I understand. Let's do it all over again. But when you start patching things that already have the specific feel in there—that 'something' that has already been printed—you can hear all the human things that are all there for the first time—I don't want to be a part of that. I have been part of one of those and it just drove me crazy."

ON NOISE REDUCTION

"I don't use any noise reduction. I never use it, either when I'm doing tracks or when I'm doing final mixes. They really affect the music. They affect sound in general. To me, the punch is all gone. The drums sound different. The vocals sound different. The keyboards sound different. I can hear those things and it really bothers me, so I don't want to be a part of it."

ON TAPE

"Since I started with MGM, we always used Scotch. Only once, I've experienced a different brand of tape. And I was very disappointed. And I had a serious problem. It got so bad, like in the middle of the mixes, the tape started giving up—heavy drop-out in places. And then the tape started peeling. Not on the outside. It was giving up on the inside. I mean, I was doing a mix, and halfway through the song, the whole top end disappeared, like someone threw a blanket on top of the speaker. So we mixed about halfway through the album. We mixed in sections. We cleaned the heads all over the place. We did the introduction. Clean the heads again. We don't want to take chances. I wouldn't do a project with any other tape besides the 250. I have done the past 20 albums, the past 30 albums all on Scotch. It gives me what I want, and what I want is a real clean taping, punchy bottom end, very little hiss, almost none. You have to try things in order to know if you're doing the right thing. If you don't try, you'll never know. And I have tried, and the results have been different."

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. . . for me the most important thing on every recording is: first [satisfy] the musician! . . . then the producer . . .

Left to Right: **Juergen Koppers**; *second engineer,* **Steven Smith**; *lead singer and leader of the group "Rox,"* **Mike Rox**; *"Rox" manager* **Sandy Ross**.

Tape machines . . . on 24-track I work with the Ampex, and . . . it's okay. I personally *would* prefer Studer, but the results are okay on the Ampex. The good thing with Studer is that you have two amplifier sets for playback: one each from the sync and replay heads, so you can use it for effects a lot. And it's more friendly for the tape — with Ampex and 3M . . . I'm always scared. The handling of tape with a Studer is *much* better. When the Ampex stops, I mean it *stops*, whereas the Studer stops very slowly, it handles the tape more carefully.

R-e/p: A certain engineer, referring to the Harrison console at MusicLand — which you know very well — felt it was just inordinately complicated. And the switching — the ability to have functions change at the push of a button — he found disconcerting. Are we speaking of the same board?
JK: Well, it's actually the same board. The only difference is that Rusk's board is a little bit modified. It's just a question of getting used to it. If I see English boards — like a Neve or whatever — they are *much* more complicated than a Harrison. You have to get used to a Harrison because everything is smaller. In the beginning you think your fingers are too big to handle the whole thing because all the knobs are very tiny, and it's a change. I know many people are used to Helios boards. *I* was used to them, because MusicLand, in the beginning, had a Helios board before it changed to Harrison. And it *was* a big change. But in the meantime, I've done more than 50 or 60 albums on a Harrison.

R-e/p: Let's talk about monitoring. Do you hear characteristic sounds of the different manufacturers? Some say that oftentimes JBL has a "boxy" quality.
JK: I wouldn't necessarily say boxy. The biggest problem on JBLs is in the mid-range. Because if you mix on JBLs — like, for instance, on 4330s or 4331s at this time — you have to have such a hot mid-range in your mix. Otherwise it would sound dull afterwards.

R-e/p: So there was a cut in the mid-range, you're saying?
JK: Actually, not that. It's a strange characteristic somehow. If you work a lot on JBLs and once in a while you go to a doctor, to check your hearing, you will have like a notch filter or dip around 3 kHz. It's very, very narrow. It's like a kind of natural protection somehow for your ears.

When I started as an engineer in music recording, most of the studios I worked in at that time had JBL speakers. In England, a new trend came up and most of the studios had Tannoys. Here it was Altec. Today there are still a lot of studios here that have Big Reds. Somehow, because people are so used to it they don't want to change it. I don't like the high end, and I don't like the low end — it's somehow not precise enough. When we talk about a "boxy" sound, even an Altec sounds more boxy than a JBL to me.

R-e/p: How about Tannoy? That's not a brand we see out here too often.
JK: The only thing I can tell you is that I would never use them. I worked at Wessex Studios in London, and we had Tannoys there; for me it was the hardest time of recording. Especially at this time — I mean it *was* disco. To hear our kind of drum sounds — especially bass drum — first thing I blew out three Tannoys immediately. I just equalized the bass drum the way I was used to, and I wanted to listen to it *loud* . . . but they couldn't handle it.

R-e/p: That always endears you to the studio management, doesn't it? How about Cadac monitors? Are they still at MusicLand?
JK: No. MusicLand has Westlake. They had Cadacs in the beginning — these huge models. The thing with Cadacs is they are not true at all; they're very bright. You hear much more highs than there are actually on tape.

R-e/p: Who is really flat? And is that really the way to go, in your estimation?
JK: No speaker is really flat. That's the reason most studios today use EQ on their monitors, to get it close to flat. A lot of studios go down at 8 kHz, and others at 12 kHz, or whatever. And there are different theories about it.

R-e/p: Do you remember your first record?
JK: My whole thing started differently because I started more in the film and television business than music. It was like music recording was more of a kind of a hobby for me. I did some classical things for German television, but we did it on film at the same time. Then I went over to music. I did a film, but wasn't involved in the soundtrack. I went to a studio, and I didn't like the sound. I asked the engineers, "Can you try another drum sound?" And the guy said, "Listen, I've been a *drummer* for 15 years. Don't tell me how drums have to sound." The funny thing was he was the owner of the studio, and I got the chance a few months later when somebody asked me to build a studio for him. It was a film dubbing studio, but as soon as it was built I started recording music there all the time. I then had to build a music recording studio. There was a point where I changed over completely from film to music — that was in 1971.

The first record I did was with a German group called Amon Duul, which at the time was very popular. That was just when we had opened up the studio. A crazy guy I'd never met before came down to the studio, shouting and yelling, and I said, "Listen, I've mixed this album now in three different studios and it still doesn't sound right. Can you mix it again?" That was the first time I got actually involved in working with groups. After this time I did a lot of groups — this time I *only* worked in Germany, and most of the work we did in the studio was like group work.

R-e/p: What projects are you working on at present?
JK: Last month I finished Donna Summer's new album. And it was quite a change from disco; there are much more rock elements. The amazing thing was that you could record differently when you didn't have to have so much separation. It's much more kind of an open, live sound. Disco got boring — somehow to have an absolutely separate kick drum, snare, and high-hat. But, to get disco you had to have it. That's the reason a lot of people recorded everything separate, like they started with the bass drum and then overdubbed the snare.

I think the main problem was that most of the disco stuff was created in mixing. And if you *only* wanted a bass drum, or *only* a bass drum and a snare, then you *had* to have absolute separation. You actually started *arranging* in the mix — punching things out; and if there was any leakage you couldn't do it. That was the main reason to have it isolated and absolutely separate. There are noise gates and Kepex and whatever like crazy — you used them on *everything!*

R-e/p: I guess you were in on some of the earliest disco recording. When did that begin?
JK: Actually it began in '74. One of the first disco songs was called "Rock Your Baby." We started to do disco around the time of Donna's "Love To Love You," and at the same time was done like Silver Convention. And then we tried to create our own type of sound. The first thing was a very punchy but very unnatural drum sound. I think the most important thing was that everything had to be "crystal clear," you can say.

R-e/p: I've noticed a disco kick drum sound: very bright, compressed, boost 3 kHz, roll-off at 100 Hz maybe, so that it comes across every AM radio.

. . . you can learn the whole technology of recording, but then you come to a point . . . where either you can do it or you cannot! . . . that is nothing to do anymore with technology . . .

JK: Well, I wouldn't say "compressed" kick drum because I hardly use any limiting or compression. If you have this hammery kick drum you're gonna lose the absolute bottom. It's just "punchy." Well the way *I* did it — in the recording I boosted like 12 dB at 60 Hz, 10 dB around 3 kHz, and even 10 dB at 8 kHz. And the whole thing over again in the mix! So you can imagine . . . it has nothing to do with natural sound — no kick drum would sound like that!

R-e/p: I think of "disco bass" as being mostly direct.
JK: Actually I started recording bass direct only during the last two years. On all of Donna's first records I always used a mike and never a direct box on the bass. But in the meantime there are direct boxes which are very good. They're even *better* than a mike; very convenient. It's a more natural sound; a bass sounds like a bass now. In the early days it sometimes didn't with direct boxes. I don't know if it was the transformers or whatever.

At the moment I like the new Westlake Active Direct Box. I mean it's a very, very *natural* sound, and somehow it doesn't sound direct anymore — it sounds warm. On Donna's new album I *only* used direct boxes; there was no microphone involved whatsoever on the bass.

R-e/p: Can you still get excited by a project, or an artist?
JK: Oh yeah. I can get excited about songs, if they're really good. I wouldn't say that I *hated* disco. Disco earned my living, and most of the time it was . . . rather fun to do. You could always experiment and learn a lot, because of different technologies. In the end the technical side got so sophisticated sometimes. You had to find new ways, and to use whatever . . . it was pretty crazy.

Personally I love soft rock; like the Eagles. I like the earlier stuff more than I like the stuff today. I like Supertramp, although I don't agree with their way of doing albums. They take so long — I see no reason for that. Studios are too expensive to spend that much time on a project. And most of the things you can do before you go into the studio; when you get into the studio, just *do* it. It's stupid when somebody tells me: "Okay, the cost for this album was $800,000." I mean, how many albums do you have to sell?

R-e/p: I think a lot of people get caught up in their own image. Like being perfectionists, and feeling that they have to take so long to show that they're really trying their best, or really being heavy artists.
JK: I think that's wrong. For me the prefect example was Toto. Toto's first album was great because somehow it had atmosphere and whatever. The second one — which they wanted to do perfectly — is not so good.

I hate perfection sometimes. Not recording-wise, but 'specially vocal or playing-wise; it's sometimes so dead that it has no atmosphere at all. If I produce somebody, and he's out of pitch sometimes, so long as the atmosphere is right I don't care. Just so long as it feels right to me.

With engineering mistakes you sometimes make a mistake and it turns out great! We used a lot of those toys; we were always searching for new toys and whatever. But I think they are not the main things you have to use in recording. If you want to go new ways, I think it doesn't help if you have new toys. You can change the sounds and whatever — and maybe make it more interesting — but for me the most important thing on every recording is: first the musician, and then the producer. When I do basic tracks, first I want to satisfy the musicians, since they have to be happy in there. Especially with what they hear in the cans; to feel comfortable.

R-e/p: What "toys" have you found?
JK: I personally like DDLs; I use them a lot. At the moment my favorite DDL is the AMS — it's the cleanest one. I don't know what the model number is, but I do know that it's English. The things I want when I mix are at least three digital delays, with the AMS if possible — stereo with two inputs and two outputs, and long settings up to 1½ seconds. I use them a lot on vocals. I can use one channel for vocals and the other for something else; the AMS has two independent channels.

I also use a Harmonizer, Lexicon Prime Time, the Roland phasing device — which I like sometimes on Rhodes or different things. And the Roland Dimension D on vocals, instead of using an Aphex. And good reverb devices. I love the AKG BX20 — if it's good. There is such a big difference; if you have a good one, it's a very warm echo — it doesn't sound "springy" at all. I like the new Lexicon digital reverb unit. The EMT 240 Gold Foils are sometimes a little bit noisy. And I really love the old EMT 140 — the big plate.

R-e/p: Who are the engineers you like?
JK: I like Bill Schnee. For me everything he did is — from an engineering point — consistently good. I like Alan Parsons, Phil Ramone; I like a lot of the stuff Bill Szymczyk did.

R-e/p: All of these people that you mentioned do tend to have some things in common — they make very audible recordings. You might have said that you like hearing a lot of the room; you might talk about going for raw, nasty sounds . . .
JK: Oh, I don't like raw and nasty sounds that much. I just did an album with a new rock group, and it sometimes has a raw and nasty sound; it has a *room* sound . . .

R-e/p: Are you of the school that develops a sound for an artist, and pretty much just evolves that slowly through the course of albums?
JK: Most of the time I have a definite sound, and *sometimes* it varies with the song or with the music. Sometimes I want a little bit more freedom, and I build *with* the track. But on a lot of things right from the beginning it's a very distinguished sound.

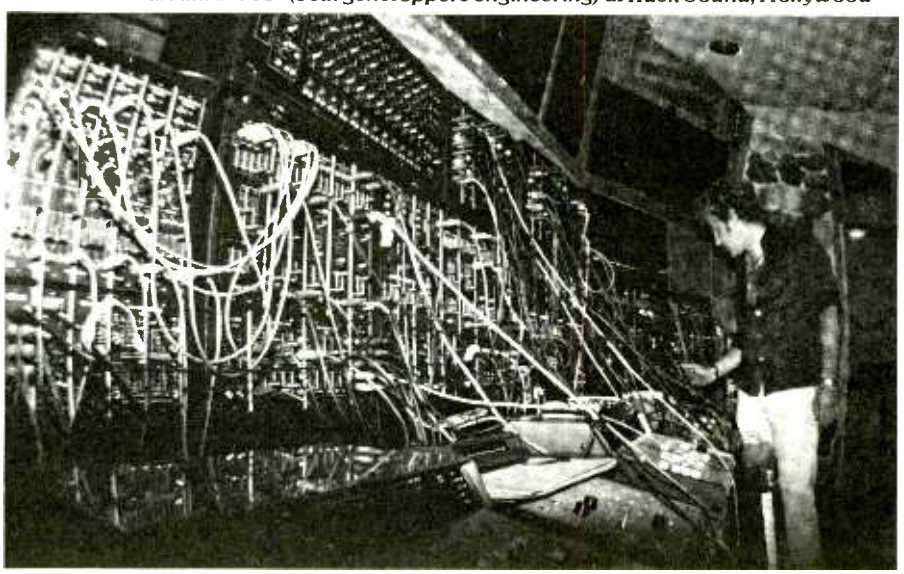
R-e/p: With Donna Summer certainly, by virtue of the tracks having so many synthesizers, the sound would be different from song to song. But you'd hear similar drum sounds, say.
JK: Most of the time the drum sound doesn't change. Yeah, I change the drum sound, not in the recording but when I mix it. I still like to record the drums pretty dry and controlled. In the mix I would play the whole sub-mix through the studio speakers, then feed them back over two mikes to get a more live sound.

R-e/p: Any examples of engineering you don't like?
JK: There are a lot of examples I don't like, but with particular engineers you never know the circumstances. And who wanted what. For instance, I love the Pink Floyd's latest album, *The Wall.* But it's hard to say there what's the input of the engineer, because I know that the bass player [Roger Waters] and the guitar player [David Gilmour] are highly involved in all technical things. So there it's hard to say how good somebody is, or how much he was involved.

One day, two guys came to me with a 24-track tape; it was one song, and they asked me to mix it. They told me: "Do whatever you want. We've mixed it already; if you want to hear it, you can." I listened to it and it sounded great. Then I listened to the 24-track, and thought, "It's impossible. That's not the same thing," because the 24-track recording was pretty bad.

It took me seven hours to mix it. Then I played it to them, and they liked it. I don't know if it was as good as their mix. But then came my question: "How long did you mix?" And they told me: "32 days!"

Harold Faltermeier, Donna Summer's synthesist, setting up patches for Giorgio Moroder's album* E=MC² *(Jeurgen Koppers engineering) at Rusk Sound, Hollywood



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JUERGEN KOPPERS . . .

(continued)

You always want to satisfy yourself when you're mixing. And you have to satisfy *people*. Sometimes it's pretty hard. Yeah it's easy if there's a producer you work with, who knows exactly what he wants. Or if there's a producer who doesn't know *anything*, and says, "Do whatever you want." That's no problem, but if there's somebody who doesn't even want to be responsible, who changes his mind every two minutes, and listens to every *idiot* who's coming in and listening . . . I mean that's really a pain.

R-e/p: People who have a little knowledge can be difficult to work with — they'll just fixate upon one little thing, and elevate it to inordinate status.
JK: One thing: I prefer it if they're real professional, and know what they're doing. But I want people who can make decisions. And it's so funny — like you lock two 24-tracks, because you don't want to make a decision. You *have* to make his decision in the end when it's mixed down to two tracks. If I have to bounce things I'm not worried, because what *difference* does it make if you have to make your decision today, or if you have to make it next week?

R-e/p: It's not too terribly dangerous to live-mix the drums to four tracks, or strings to stereo.
JK: No, absolutely not; strings to stereo is no problem. Whatever you have — be it brass, backing vocals or whatever. I did a couple of recordings where I just used one person as a backing singer — it was Bill Champlin. And he did like eight or ten tracks. You bounce them; there's no problem with that.

R-e/p: Do you have any memories of the T. Rex sessions you did?
JK: Yeah, it was pretty bizarre. Marc Bolan was quite a strange character. The funny thing I remember was that the group was always sitting in the studio, ready to start within a second. And Marc would walk around the studio telling stories of his life, of the future, and I don't know what. But right in the middle of a story he'd turn 'round and say, "One, two, three, four!" — tape had to run, and the musicians had to play in the time he announced. So everybody was always sitting ready — the drummer, sticks in his hands, ready to go. I mean he was talking for hours, and I was sitting and waiting. And I had to have my hand on a tape machine because I knew . . . it will come.

R-e/p: What did you do as far as recording there? What album are we speaking of?
JK: That must have been one of the last things he did, because he went over to the States and finished it here. [The album was "Zinc Alloy & the Hidden Riders of Tomorrow Or A Creamed Cage in August," not released in the US.] I just jumped in for Mackie [Mack Munich], because he started recording and then got into a big argument with Marc Bolan. And so I took over for a couple of days.

R-e/p: Did you inherit Mack's setup there in the studio? Or did you have to actually start working on a sound with them yourself?
JK: I changed it a little bit because that's the way I wanted it. I changed the placements of mikes a little bit, and maybe the EQ a little bit; otherwise no big changes really.

The drum mikes were Neumann 87s on overheads and toms; on bass drum was an AKG D202, and a Beyer M190 on snare. Marc Bolan played his solos over a little Pignose amp. But otherwise the recording technique wasn't different.

R-e/p: Let's talk about Donna Summer. Is she easy to do vocals with?
JK: She's hard to record, because her dynamic range is so great. It's the same with Streisand. When I recorded them both together in the beginning I did them at the same time. Barbra always wanted a U47 tube mike — when we changed studios we had to carry the mike with us. She didn't want *any* EQ. For Donna I used a 47 FET, and EQ. Donna's voice was always dominant. The first thing I had to do was just sneak in some EQ without telling anybody. And then the problem was to concentrate on riding microphones like crazy, because you had to use your fader and the mike preamp.

R-e/p: Were they in separate rooms?
JK: No, the same room; opposite to each other about 1½ yards apart. Sometimes I had the feeling that they tried to out-sing each other. If Barbra held a note for six or eight bars, Donna held it for 12 or 16 bars — or the other way around. So we tried it for days, and then we decided to record them separately. John Arrias recorded Barbra in the daytime, and I recorded Donna at night. The next day when Barbra listened to Donna's vocal, she did *her* vocals again, and it was going like that. It came to a point where I gave up and said, "Here, I'm sorry. I cannot handle anymore."

John Arrias mixed the CBS version, and Harold Faltermeier mixed the Casablanca version. I mean at this time I had quite a little fight with Giorgio [Moroder] until . . . Well, he mixed, then Donna came with the tape, and gave it to me to listen to. I didn't like it and she told them to mix it again. And so it went on and on. And in the end I said, "Listen, don't play me anything else. I don't want to be involved anymore."

The hardest song — vocal-wise — I've ever recorded was "MacArthur Park" because of the dynamic range. Sometimes Donna sings really soft and a fraction of a second later, it's like full voice. I had one hand on the fader and the other hand on the mike preamp, and Steve [Rusk engineer Steven Smith] was sitting on the floor handling input and output on the UREI 1176. We did it in Westlake, and so there were those low equipment racks. The patching was: mike preamp, into the 1176, and then back to the board. Equalizer and fader; I had to ride everything. It was crazy. And when we mixed it, I had to use the whole setup again.

R-e/p: So there's no way to just run her voice through a compressor and to a track?
JK: No. Easy songs where she can sing with full voice all the time or whatever — it's no problem. She has to sing the song at least once for me, so that I know what happens. On her last album she sang *most* of the songs with a very soft voice, and I didn't even have to use a limiter. And today I don't use an 1176 on her voice anymore — I use a dbx 160 or a 165. On "Enough Is Enough" I had *two* limiters and had to ride levels on the two units!

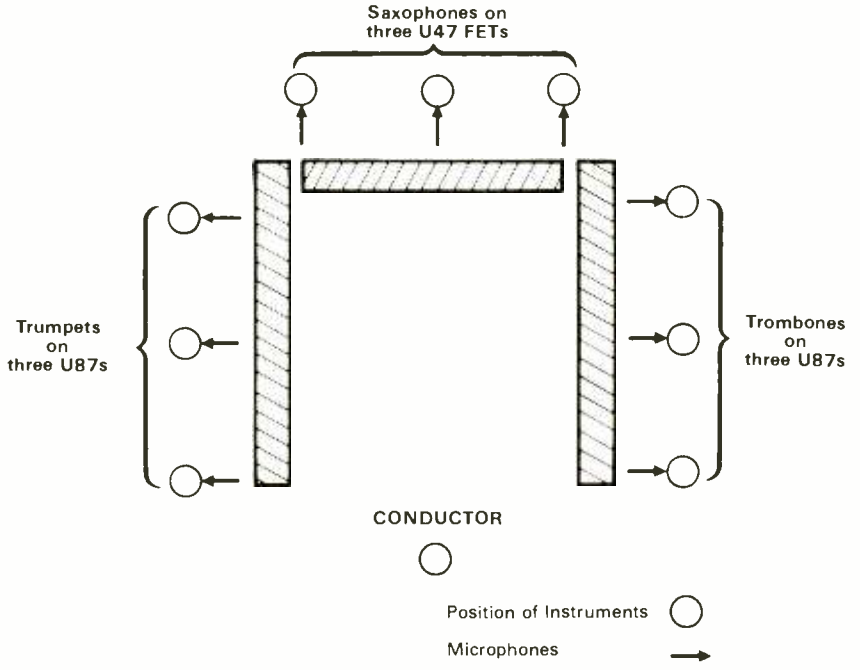
R-e/p: Where was "I Feel Love" recorded?
JK: "I Feel Love" was done in Munich, at the time we did the album, *I Remember Yesterday*. It was kind of a concept album starting in the '20s or '30s, and carried the song out of these times and into the '50s, and a kind of Spector Sound. Well a ballad was involved and then to the beginning of the '70s, and "I Feel Love" is supposed to be the song of the '80s.

So we decided to do that with a synthesizer, and we laid down about eight or so tracks, and never touched the thing. I mean we started overdubbing on everything else and working out and finishing the songs, and whenever it came to "I Feel Love" . . . we'd say, "Well, we don't know what to do — let's just leave it."

Eventually we came to L.A. to put vocals and backing vocals on, and then we were sitting there and thinking "what can we do?" The only thing we did, we *transferred* recorded tracks, and just changed the effects and whatever; doubled them up with effects and started panning things on the 24-track.

The first thing we laid down a click track with a metronome, to trigger all the synthesizers and sequencers later. And second thing we do is to get a kind of bass drum sound with a synthesizer. And record it straight . . . four-on-the-floor . . . all the way through for five, eight, even 10 minutes. And the same thing with the

Studio setup for horn overdub on Donna Summer's "I Remember Yesterday."



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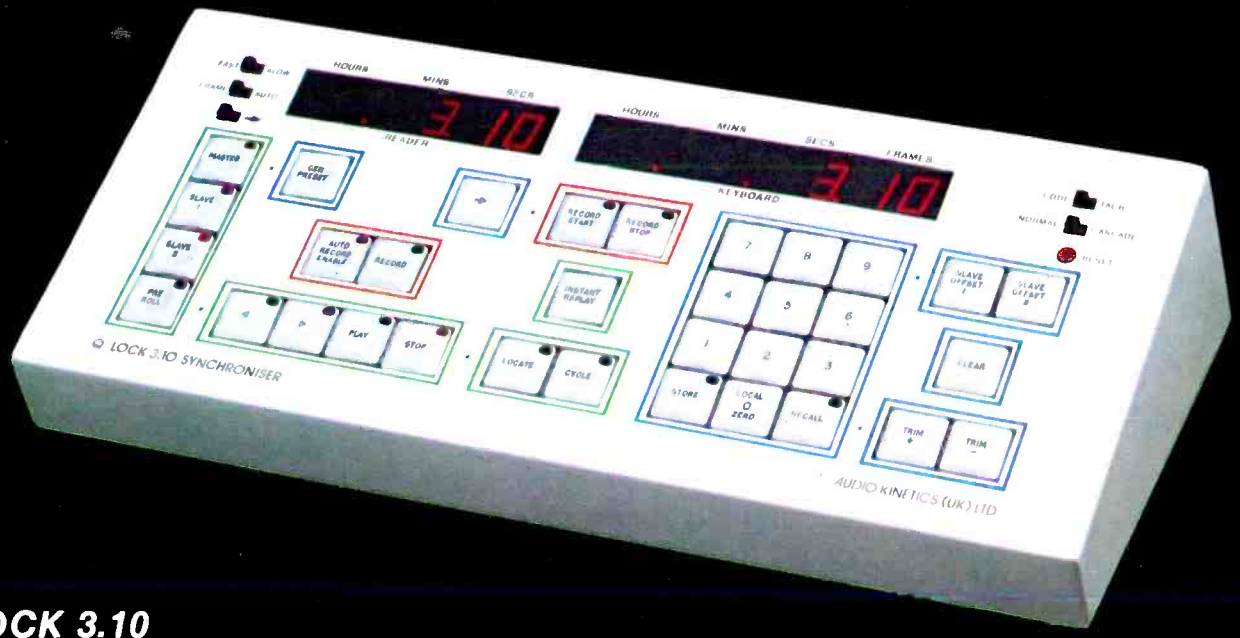

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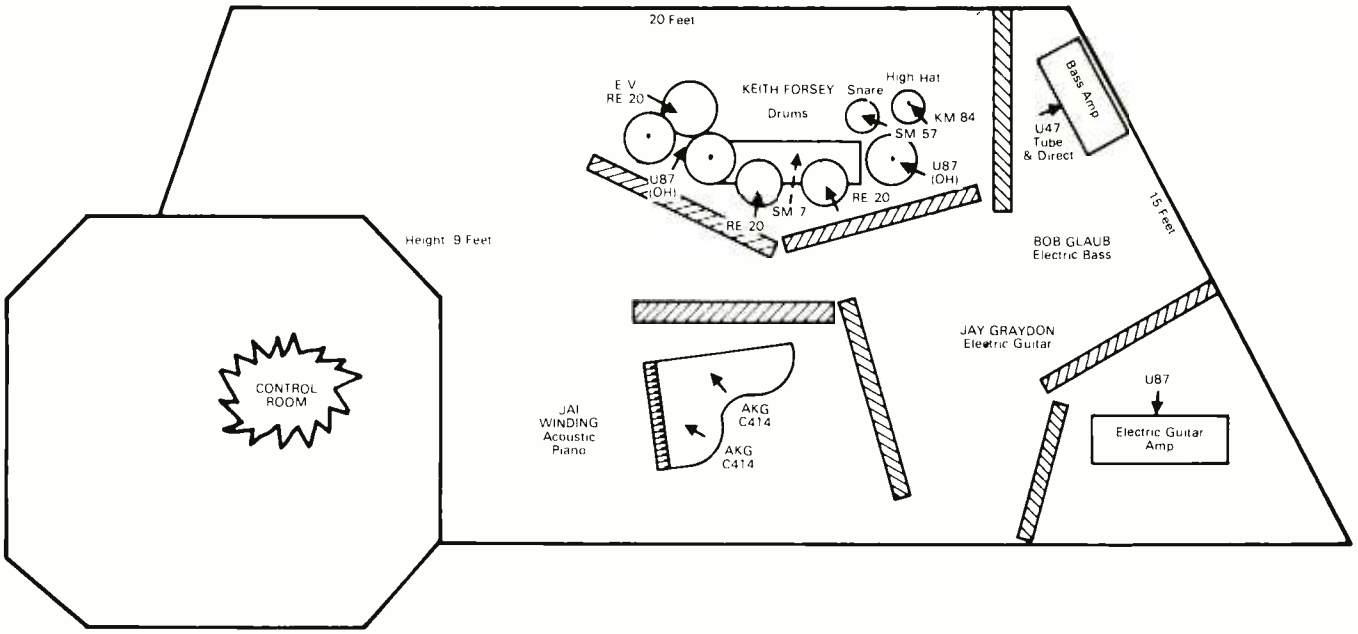

Studio setup for recording of basic track for Donna Summer's "Hot Stuff" - Rusk Sound Studios, Hollywood, January 1979.

snare; a separate overdub with synthesizer — no natural snare, just a big Moog. The same thing with high-hat. In the end we decided that the synthesizer bass drum was not strong enough, so we added a real bass drum; I mean that actually was the only natural overdub on "I Feel Love."

I remember we had recorded like eight or nine tracks: bass drum, snare, high-hat, some synthesizer percussion tracks, and then a couple of things on an Elka string machine. We phased and flanged the Elka and whatever, and put it on different tracks and started moving percussion stereo-wise: left-to-right, right-to-left and whatever. And double it up with DDLs. I mean the song actually was only 1½ minutes long.

R-e/p: And then you re-recorded it?
JK: Nope, we didn't re-record it — we mixed it in different ways and edited it. Like if we had a disco song that was 10 minutes long, we actually recorded the basic tracks for 10 minutes. That means drums, bass, and guitar. The first overdubs were like maybe seven minutes, and the last overdubs ended up like three minutes — because it was always a *repeat;* a certain sequence, that repeated all the time. When Donna was singing, she just sang for the first three minutes or whatever. And then everything I told you, the whole arrangement, is the *mix* afterwards!

R-e/p: What do you mean by "moving percussion?"
JK: Let's say we had electronic percussion on one track, so I panned it between two other tracks and with the float of the music I moved it left-to-right, or right-to-left or whatever. And since I recorded it on two tracks of the 24-track, I didn't have to do the pan movements in the mix.

R-e/p: You said there was no Donna Summers track where you didn't first use a click track?
JK: Yeah. The main reason for that is editing. You can edit wherever you want — the tempo is always the same; it never varies. So that's the main reason for it. I record a rhythm track from a Roland Rhythm Ace on track 24, for instance. Maybe 5-minutes worth — depending on how long the song is gonna be — and then run the tape and record the band. Or they rehearse, and you just play them the click track. If we want to use synthesizers, we have to use another device, which can give us this rhythm track *and* a proper click track with the same timing. There is another Roland rhythm machine that gives you a click track *and* a rhythm track at the same time. Both tracks are set by the same tempo switch, and are absolutely in sync. I record them on a couple of spare tape tracks — maybe 22 and 24.

R-e/p: Okay, so you've got your basic track on tape and one track of your Roland Cha-Cha. And now . . . you want to start overdubbing synthesizers. What do you do?
JK: It depends on whether you want to use a sequencer or not. When we have this other click track to trigger the sequencer or synthesizer . . . most of the time we use a Moog synthesizer with a Moog sequencer. And it's always like 16 bars click before the actual track starts. So you can start counting 1 - 2 - 3 - 4, 2 - 2 - 3 - 4, and start your sequencer on a 1.

R-e/p: Is there someone who programs your synthesizers?
JK: On the last two albums, the keyboard player, Harold [Faltermeier] programmed synthesizers. He worked a lot with the Prophet, and you can store up to I think 50 different sounds on it. Normally he can find very quickly what he wants.

R-e/p: How did you record the bass drum on "I Feel Love?"
JK: "I Feel Love" was the funniest thing! We recorded the bass drum in Studio C at Record Plant [Los Angeles]. In the middle of this big room our drummer was sitting with just a bass drum. I used a Neumann 47 FET mounted *in* the bass drum, about one foot away from the back skin. And no compression.

R-e/p: No? It's amazingly tight.
JK: We always used the same drummer, and for this stuff he became kind of machine-like, because we used a Roland Rhythm Ace Cha-Cha setup. Sometimes you have problems with leakage over the headphones — because the rhythm track is very loud, and just so bright you could hardly get rid of it.

R-e/p: Anything special that you did to the bass drum of "Hot Stuff," because it sounds like a slightly harder sound?
JK: In the mix I used an ADR Vocal Stresser on bass drum. The only thing I used there was the compressor and equalizer unit. On the Stresser you have a ±20 dB of cut and boost, on four separate equalizers — one each for the low end, lower mid-range, high mid-range, and top range. The compressor in the Vocal Stresser is very good, and it also has an expander to cut off unwanted noise.

R-e/p: Do you find yourself still wanting to re-mix songs that have been out for years and hearing all your edits. Are you an obsessive-compulsive type?
JK: Actually not, because that's a point where I don't agree with most people. For me disco music is just music to dance to. Let's forget "art" and whatsoever. When you're sitting in the studio and recording this for a couple of weeks, it sounds good to you *there.* Why spend days to mix it; I'm absolutely sure it wouldn't sell one record more. If you are *involved,* and sit there and say, "Okay, that sounds good," why not do it? Sometimes I would take just a rough monitor mix as a final. I came to a point that when I do a rough mix I automatically record it on two-track. Because sometimes you never get it back, what you did there. Hardly using any EQ whatsoever, and it sounds great — somehow getting atmosphere.

R-e/p: Yep, there's a definite living quality to recording. Where certain things happen, and won't happen again.
JK: Yeah that's right. There are also different theories of recording — a lot of people record the whole thing pretty flat. I never would do that, because when I record I want to hear the sound. I don't *measure* a thing, I just *hear* it; as long as it sounds good, my God . . . what's wrong with it?

You can *learn* the whole technology of recording and whatever, but then you come to a point where either you can do it or you cannot. That is nothing to do anymore with technology. □□□

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GUIDE-POSTS IN THE USE OF ACOUSTICAL MATERIALS

by F. Alton Everest

There is enough do-it-yourself acoustical work going on to involve many innocent bystanders — the first thing they need to know is something about acoustical materials. What kind does what? What is available? And from whom?

The topics considered here may be old hat to acoustics experts. Let us hope, however, that letting a little sunshine into the subject will be helpful to those upon whose shoulders fall the responsibility for that odd job in acoustics.

One way to gather information on commercial acoustical materials is to visit your favorite neighborhood building materials suppliers, and ask questions. The yield in this approach varies from zero to minimum to limited. The mention of "acoustical materials" usually brings enthusiastically-delivered information on the ubiquitous tile and ceiling boards, and then abruptly stops. Another way is to write to manufacturers. This method presupposes your knowing enough to ask intelligent questions even after locating suppliers which, in itself, is a big part of the problem.

Compendium

Those tax dollars of yours have finally produced something of immense value in this very area: the *Compendium of Materials For Noise Control.*[1] This 380-page, 8½- by 11-inch book summarizes basic acoustical data on materials offered by 146 different companies. Not only that, the addresses of all 146 companies are included, as well as a useful section on acoustical fundamentals running to almost 100 pages. The book is available from the U.S. Government Printing Office, Washington, DC 20402, and costs $8.00. The latest edition, dated May 1980, is far more comprehensive than the 1975 edition. The identification number is DHEW (NIOSH) Publication Number 80-116. One way of getting rapid service is to place your order via telephone: (202) 783-3238, giving your VISA or MasterCharge number.

F. Alton Everest has been involved in sound and acoustics since the mid-thirties. He has been involved in the research of acoustic problems as well as the practical applications of their solutions. He has authored numerous books including the "Handbook of Multichannel Recording" (Tab), "Handbook of Public Address Sound Systems" (Tab), "Acoustic Techniques for Home and Studio," and "How To Build A Small Budget Recording Studio From Scratch" (Tab). His achievements over the years are numerous and include co-founding the Moody Institute of Science, Whittier, California, where he was Director of Science and Production for twenty-five years.

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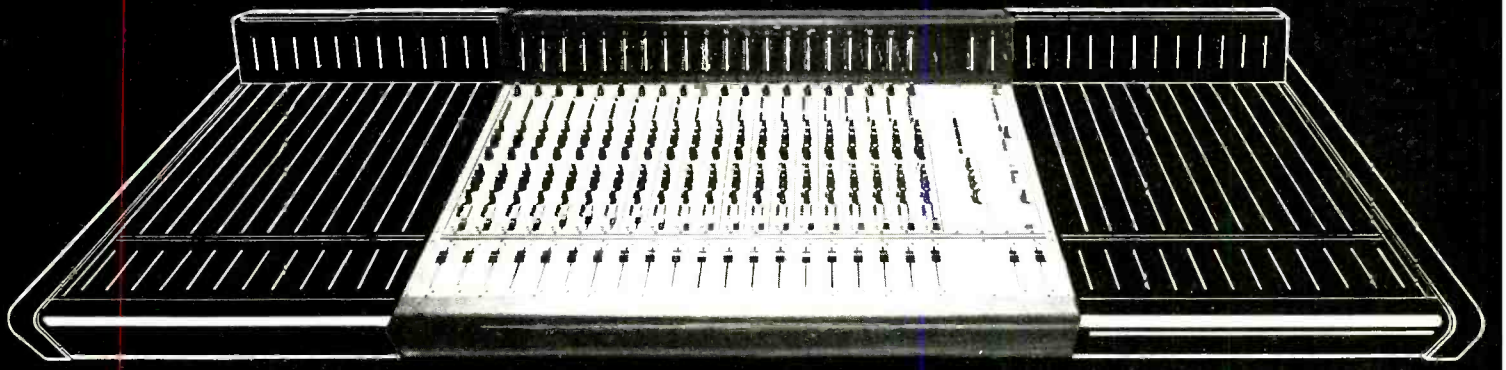

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Thermal Insulation In Walls

Characteristically, the acoustical treatment of recording studios uses great quantities of glass-fiber materials of various densities. In double walls, staggered-stud walls, or even in single-stud walls, thermal type insulating batts are commonly used to kill resonances caused by the air cavity between inner and outer wall surfaces. This material is usually of a density of about 1 pound per cubic foot, or even less. Such material is often identified in the popular literature as R-11, R-19, or other such numbers. These R-prefixed designations have to do with thermal insulating qualitites which are, of course, related to thickness. Thus R-8 is 2.5, R-11 is 3.5, and R-19 is 6-inch thick in the very helpful Owens-Corning brochure.[2]

Installing building insulation batts within a wall increases the transmission loss by a modest amount, primarily by discouraging cavity resonance which would tend to couple the two wall faces at the resonant frequency. A certain increase in the wall's transmission loss can be attributed to attenuation of sound in passing through the glass-fiber material, but this loss is relatively small because of the building insulation's low density. Considering all mechanisms, the transmission loss of a staggered-stud wall with a layer of gypsum board on each side can be increased about 7 dB by adding 3.5 inches of building insulation. A double wall with a layer of gypsum board on each side might achieve as much as 12 dB increase in transmission loss with 3.5 inches, and 15 dB with 9 inches of building insulation. As far as wall transmission loss is concerned, denser glass-fiber between walls offers no appreciable advantage over ordinary, inexpensive building insulation.

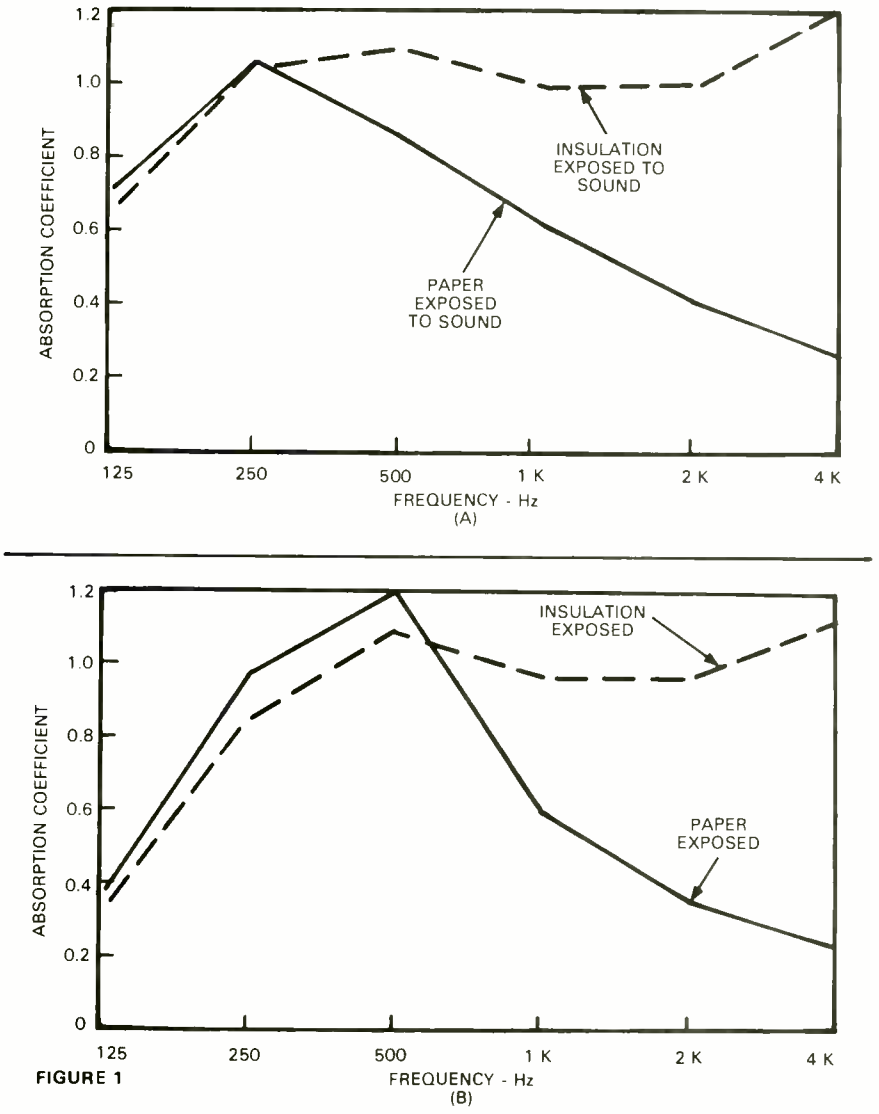

FIGURE 1

Figure 1

Absorption coefficients of Fiberglas building insulation: (A) R-19, 6-inch thickness, and (B) R-11, 3.5-inch thickness; both mounted directly on a solid surface. Whether the paper backing or the insulation is exposed to the sound has a major effect at the higher frequencies. (Data taken from Reference 2.)

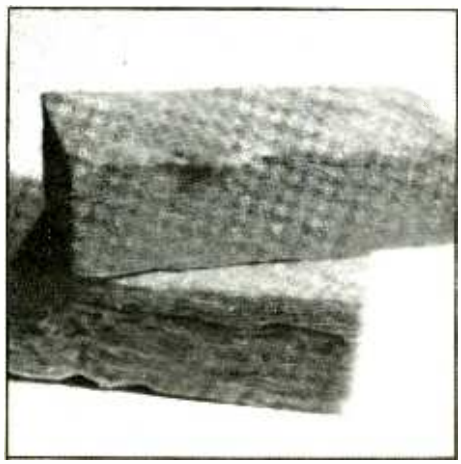

Figure 2

Semi-rigid board types of glass-fiber materials commonly used in studio treatment. The upper sample is Owens-Corning Type 703 Fiberglas, and the lower sample Johns-Manville 1000 Series Spin-Glas; both samples of 3 pounds per square foot density.

Building Insulation — Other Uses

Building insulation commonly comes with a kraft paper backing. The question arises: How does the backing affect the sound absorption characteristics? The answer is to be found on page 22 of the Owens-Corning brochure quoted in Reference 2. These data are plotted in Figure 1 for R-19 (6-inch) and R-11 (3-inch) building insulation material. In Figure 1A (top) is shown a comparison of sound absorption coefficients for the insulation and paper exposed to sound. In both cases the insulation is against a solid backing, such as the concrete floor of a reverberation chamber. (Mounting #4 which can be remembered by auto aficionados as "4 on the floor.") When the paper is exposed it shields the glass-fiber from higher-frequency sound, but has little effect on the lower frequencies. This gives peaks of absorption at 250 Hz (6-inch) and 500 Hz (3.5-inch) without recourse to Helmholtz resonators, a characteristic which might be very useful in balancing other materials whose absorption is principally in the high-frequency region.

But who ever considers building insulation as a legitimate absorbent in studios? The answer is . . . practically no one. If economy is a big factor, the 100% absorption above 250 Hz for 6-inch R-19 might look good, even considering the cost of a cosmetic and protective cover of fabric, expanded metal, metal lath, hardware cloth, or even perforated vinyl wallcovering (to be discussed in further detail later).

While considering Figure 1 don't let the absoption coefficients greater than 100% bother you. These are the values measured in the reverberation chamber without applying somewhat doubtful corrections. Because of the diffraction effects at the edges of the standard 8- by 9-foot sample, the sample appears acoustically larger than it actually is. We can't press the accuracy of these coefficients too far, because the size of the patch of material on a wall or ceiling affects its overall absorption. The coefficients shown in Figure 1 are for such an 8- by 9-foot patch. If this same area of material is broken up into two or more separated patches, more edge is revealed and greater total absoption realized.

Other Glass-Fiber Products

The type of glass-fiber semi-rigid boards usually used in studio treatment is shown in Figure 2. Note that a distinction should be observed between "fiberglass" and "Fiberglas," the latter being registered by Owens-Corning as to be applied only to its proprietary materials.

The upper sample displayed in Figure 2 is Owens-Corning Type 703 Fiberglas,[4] and the lower Johns-Manville 1000 Series Spin-Glas,[14]

. . . *continued overleaf* —

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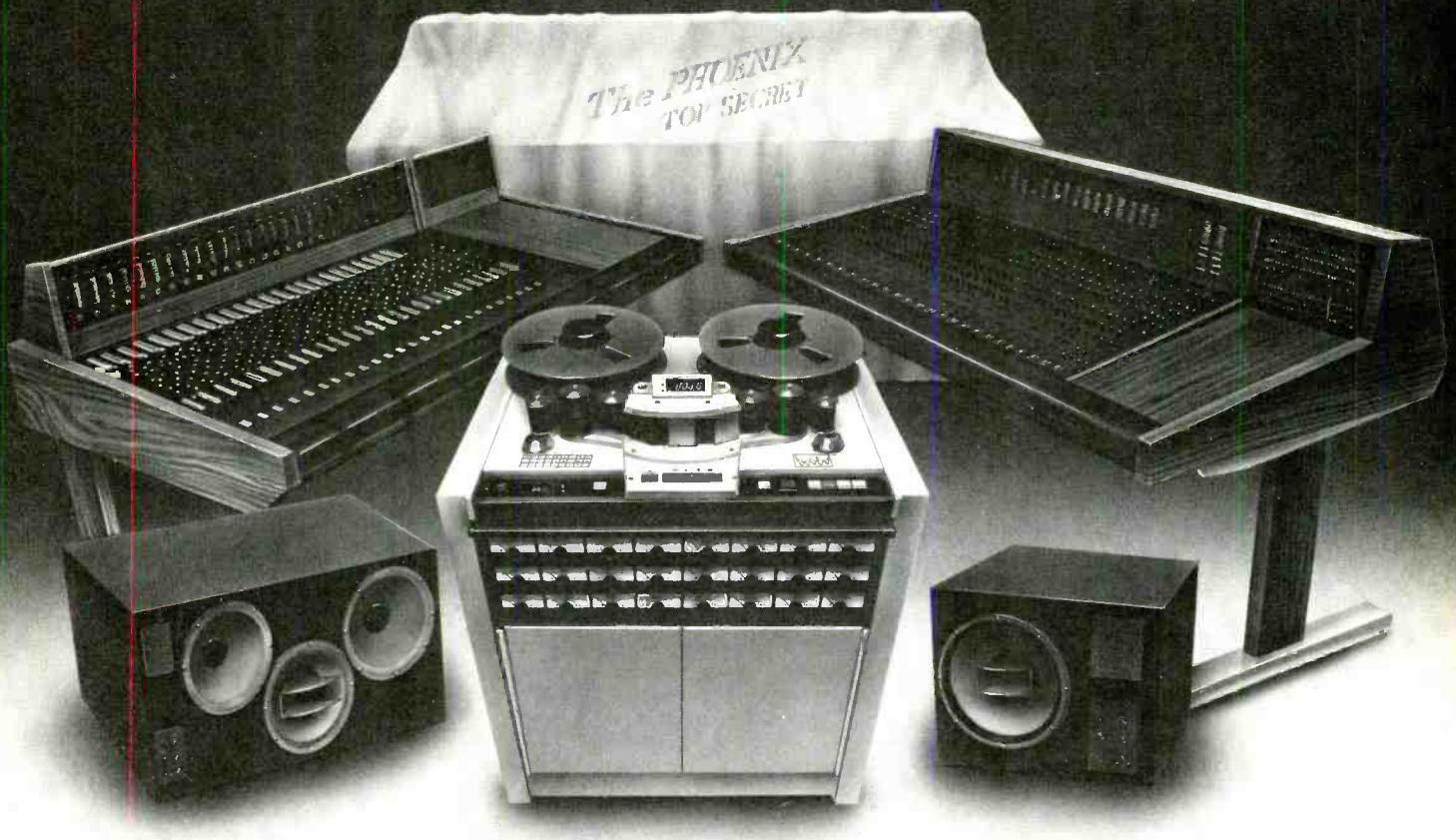

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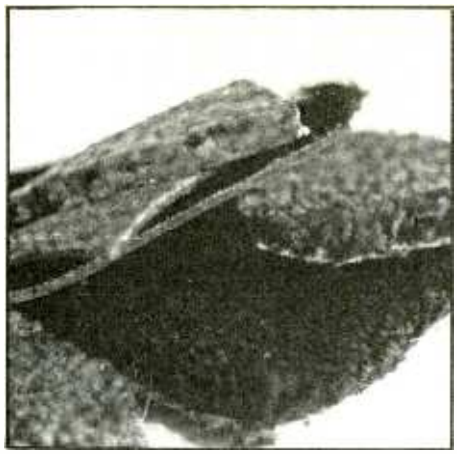
Figure 3
Carpet samples of various types.

Figure 4
Range of carpet absorption coefficients as given in reference 15.

Figure 5
Typical 12- by 12-inch acoustical tile.

Figure 6
The average of the absorption coefficients for eight cellulose and mineral fiber tiles of 3/4-inch thickness (mounting #1, which is similar to mounting #4).

Figure 7
Robac II 12- by 12-inch units of folded glass-fiber covered with colored burlap.



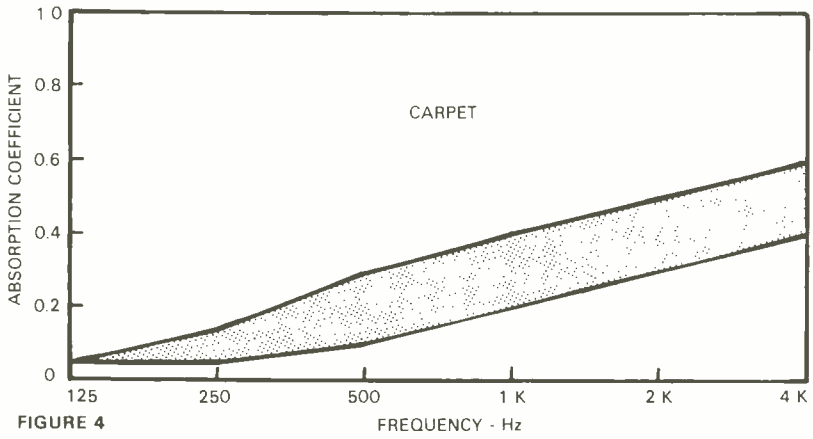
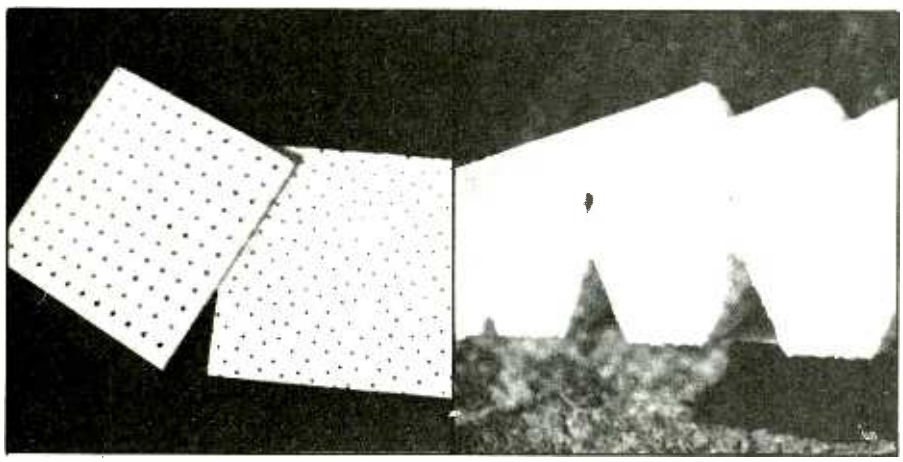


FIGURE 4



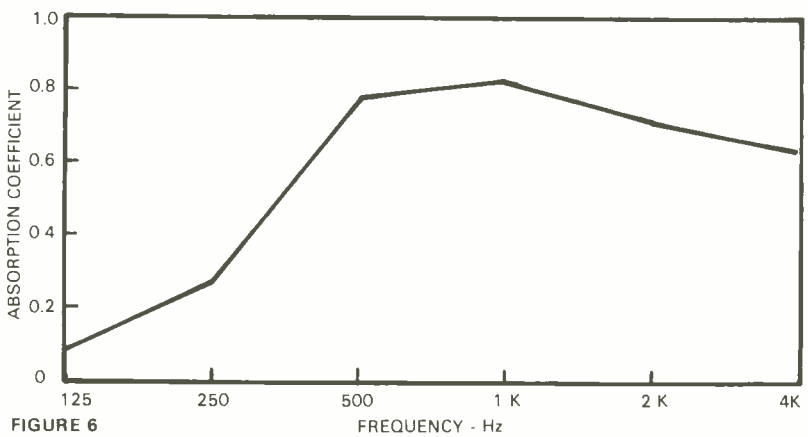


FIGURE 6

both of 3 pounds per cubic foot density. There has been some confusion of terminology in the 700 Series Fiberglas designation, since "703" has been widely applied to this product — and, in fact, is used in Reference 2 — but the number 733 is also used for 3 pounds per cubic foot density material. Type 701 has a density of 1.58 pounds per cubic foot, and 705 6 pounds per cubic foot. The density of 3 pounds per cubic foot, however, is most widely used in studios.

References 3 through 12 list specialized brochures describing in detail glass-fiber products that may be of interest in studio work. The noise barrier batts of Reference 3 are blankets of unfaced light density glass-fiber designed for use inside walls. The 700 Series cited in Reference 4 has been described previously, as has the building insulation of Reference 5. The sound dividers of Reference 6 are classy looking barriers designed for open offices, but could serve just as well in recording studios as isolating screens, barriers, and baffles. The wall panels of Reference 8 are built like the dividers of Reference 6, but designed for application to walls in the form of modular panels or continuous coverage, and have possible studio applications.

Suspended ceilings have not found a wide application in studios. The possibility exists though, if there is sufficient room height to throw away, and absorption across the band is desirable. Such lay-in ceilings can cover unsightly ductwork and other service hardware, but the many variables involved, such as cavity spacing above, often result in unpredictable absorption.

When used to line metal ducts, the duct-liner boards of Reference 10 and 11 can help absorb noise from air conditioning equipment. The flexible ducts of Reference 12 are especially good in attenuating noise. The drywall construction handbook of Reference 13 is full of good advice on mounting drywall sheets, and includes a section on the STC (Sound Transmission Class) ratings of various wall constructions. Reference 14 lists the acoustical products of the Johns-Manville Company, many of which parallel the Owens-Corning products of References 2 through 12.

Noise Reduction Coefficient

In listings of sound absorbing materials the mysterious "NRC" symbol is often encountered as the single number description of a material's absorbing efficiency. Sometimes a figure such as "NRC 0.90" occurs alone, and sometimes in addition to absorption coefficients for different frequencies. The single-figure rating for a material is obtained by averaging the absorption coefficients for 250 Hz, 500 Hz, 1 kHz and 2 kHz, and then rounding it off to the nearest 0.05. Because of the crude method used to obtain an NRC rating, it is of very limited value in studio work but often helpful in screening long lists of possible materials.

Carpet

Carpeting (Figure 3) is a dominant absorber when used in a studio, and a potential source of acoustical problems. There are so many different types of carpet that only rough estimates of absorption coefficients are available for any specific product, which throws a significant uncertainty into calculations. Further, carpet offers unbalanced absorption; it is good at high frequencies and poor at low frequencies, as shown in Figure 4. This means a struggle in balancing carpet absorption with diaphragmatic absorption of panels, bass traps,

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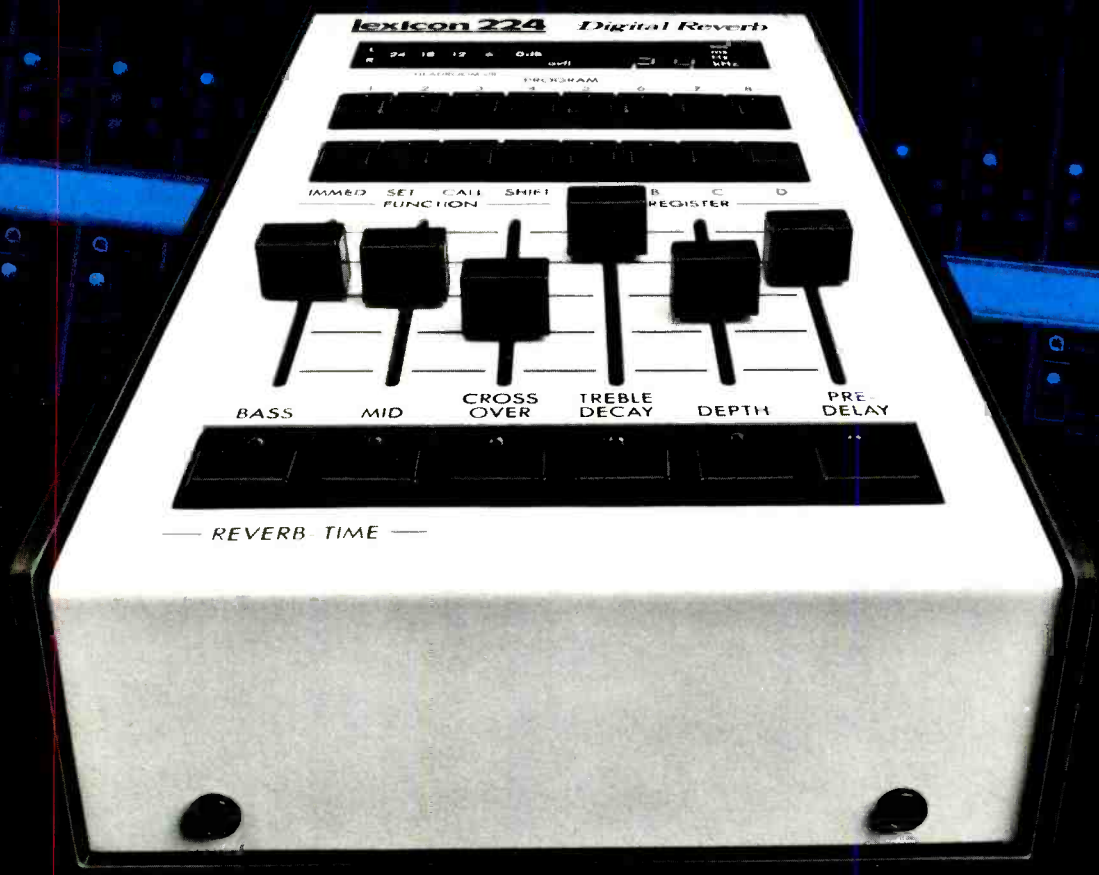

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and/or Helmholtz units. No one will deny the advantages of carpet, so we must live with it even if it is often an acoustical headache.

Acoustical Tile

The common 12- by 12-inch acoustical tile shown in Figure 5 was probably the first proprietary absorbent offered for sale (anyone remember Acousti-Celotex from the Thirties?). This type of material has been widely used and abused, yet occasionally it has a very logical place in professional recording situations — unless one is biased against its modest price. The absorption characteristic of acoustic tiling is somewhat like a carpet, in that it is deficient in low-frequency absorption because of its thinness. Good mid- and high-frequency absorption is available in many different slot and perforation configurations and surface textures. A basic rule is that too much of the stuff guarantees room boominess.

It is becoming more and more difficult to find absorption coefficients for specific 12- by 12-inch tile mounted directly on a hard surface (Mountings 1 and 4). Manufacturers emphasize their use for suspended ceilings, along with the more common 2- by 4-foot panels. Coefficients for their use in suspended ceilings cannot be utilized for tiling applied to a hard surface. Almost all building materials suppliers can supply 12-inch square tile from stock; providing coefficients is another matter, however. Figure 6 shows data from obsolete literature, the average of coefficients for eight different cellulose and mineral fiber tiles ¾-inch thick, Mounting 1.

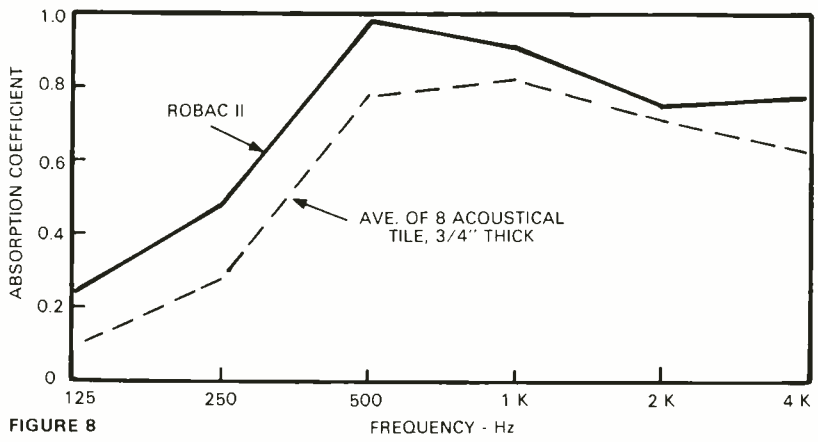

FIGURE 8

Figure 8
Absorption coefficients for Robac II units (solid line) compared to those for 3/4-inch acoustical tile of Figure 6 (broken line), all for mounting #4. (Robac data from Alpha Group, Inc., literature.)

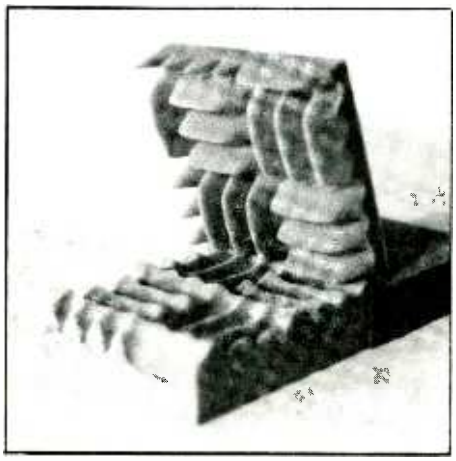

Figure 9
Sonex, a contoured open-cell foam material offered by Alpha Audio.

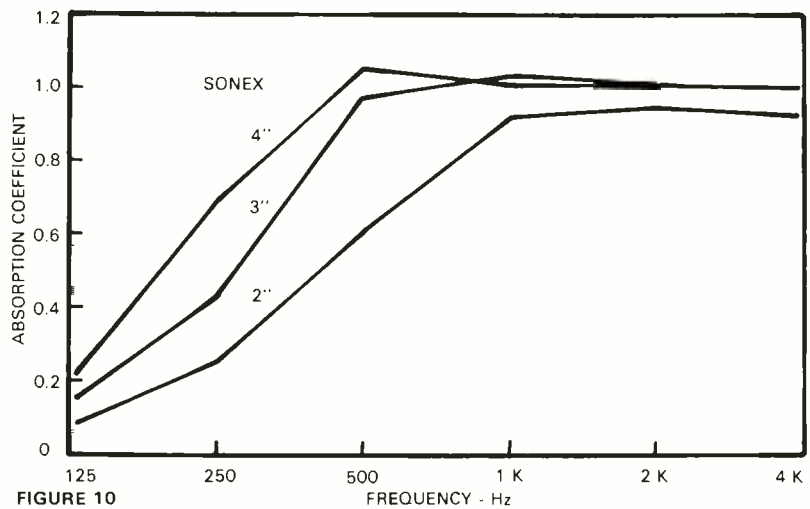

FIGURE 10

Figure 10
Sound absorption coefficients of Sonex having overall thickness of 4-, 3-, 2- inches (mounting #4).

Robac

Robac II is a Canadian product aimed more at the hi-fi market rather than recording studios (and hence not listed in the more industrially oriented Compendium), but it offers certain visual and acoustical values which justify its inclusion here.[16] A typical 12- by 12-inch Robac II unit is illustrated in Figure 7. These units are made up of folded ¾-inch glass-fiber sheets of good density glued to cardboard. The exterior surface of the glass fiber is faced with burlap available in six different colors. These 12-inch square units may be stapled or cemented to walls, or stapled to wood strips affixed to masonry surfaces. A favorite way of mounting Robac units is to alternate horizontal with vertical units.

Although the geometrics of Robac II can present a dramatic visual impression, their similarity to the wedges used in anechoic chambers, emphasized in the descriptive literature, falls somewhat short both visually and acoustically. Absorption coefficients of Robac II are shown by the solid line of Figure 8; for comparison, the average coefficients of ¾-inch cellulose and mineral fiber tile from Figure 6 are shown as a broken line. The benefits of some airspace in Robac II is evident at the lower frequencies. Justification for the higher cost of Robac II as compared to ¾-inch tile must be found in aesthetics rather than acoustics, for the low-frequency absorption of the latter can be easily improved by furring it out a few inches.

Sonex

While on the subject of "anechoic wedges," it is worth discussing Sonex[17] products of the type shown in Figure 9. This material, which is also missing from the Compendium listing, comprises a contoured open-cell foam. It comes in 4- by 4-foot meshed pairs, which might be variously designated as positive/negative, male/female, or wedge/indented patterns. Standard color is charcoal, but blue, brown, or yellow are also available, as well as a silver effect when provided with a fire-retardant spray. Some colored samples I have had on the shelf for four or five years have faded badly, although the charcoal version holds its appearance well.

The wedge and indented patterns may be alternated on a given surface, or some surfaces may be covered only with the wedge type and others with only the indented type. Acoustical characteristics of the two patterns are quite similar, although the wedge pattern might have a slight advantage. Sound absorption coefficients for Sonex are shown in Figure 10. In the Alpha Audio brochure distributed at the May 1980 AES Convention in Los Angeles, absorption coefficients are given for Sonex measured under two different ASTM standards. Coefficients below 500 Hz differ markedly between these two tests; the coefficients in Figure 10, plotted from the later measurements, are far more conservative at low frequencies, and probably more dependable.

Vicracoustic

Glass-fiber is well entrenched as an effective sound absorber of reasonable cost. The problem is that its appearance in the raw state is dingy, and it requires protection from abrasion. One of the most interesting and attractive coverings for glass fiber is perforated vinyl. L. E. Carpenter and Company[18] is prominent in the manufacture of perforated vinyl-covered glass-

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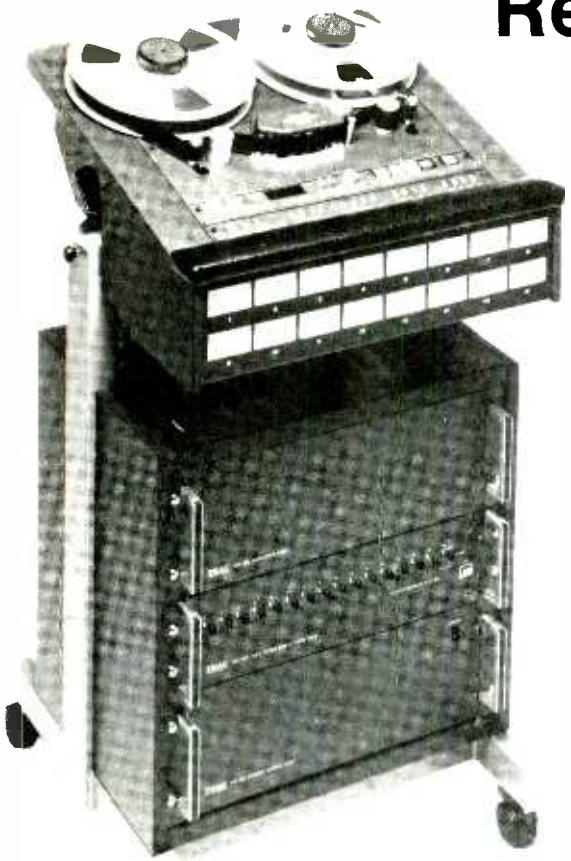

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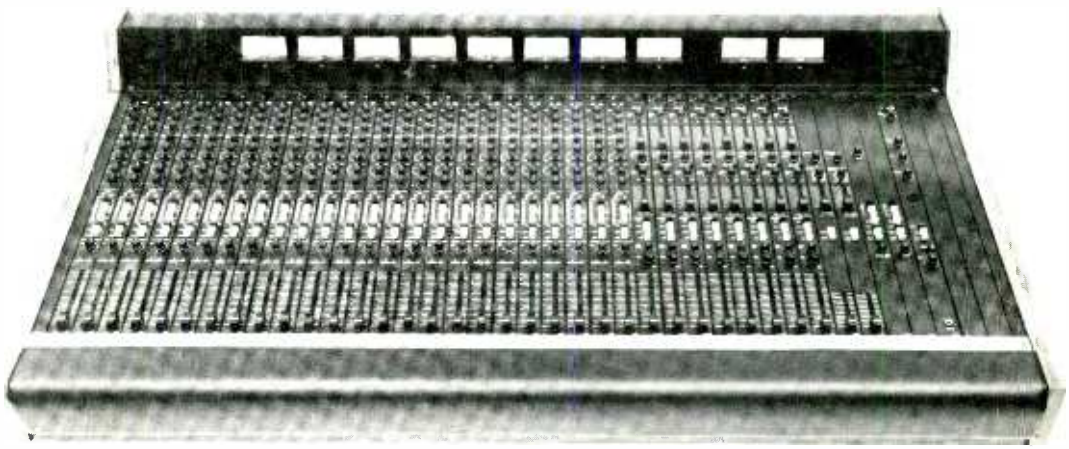

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fiber materials. The company's products are included in the Compendium. Application of such materials in studio treatment has been limited, but where both acoustical performance and studio decor are high priorities, serious thought should be given to them.

Figure 11 shows several types of L. E. Carpenter Vicracoustic panels. The cosmetic vinyl wallcovering is perforated with scarcely visible holes, so that about 18% of the surface area consists of holes. The secret of abrasion resistance is partially in the tough vinyl wallcovering itself, and partially in the ⅛-inch high-density molded glass-fiber sheet immediately behind the vinyl. The "working core" is either 1 or 2 inches of normal glass-fiber. A rigid composition backing board is included for certain uses. Panels made up of these components may be hung by Z-clips, magnets, batten strips, or cement, depending upon whether they are in the form of modular panels in wood or metal frames, flush-butted, or in unbroken monolithic form.

Absorption coefficients for Vicracoustic panels mounted directly on a solid surface (Mounting #4, comparable to other graphs) are shown in Figure 12 for 1- and 2-inch working core thicknesses. The absorption of the 2-inch type extends well into the low-frequency region, and this with a wide range of beautiful textures and colors.

Doors and Door Sealing

Let's depart briefly from sound-absorbent materials to consider materials that offer a high transmission loss to sound penetrating them; specifically doors. Mass is required of door material to keep outside noise from penetrating a studio. There are many ways of obtaining mass, such as the door section shown in Figure 13. This door has hot-pressed board faces and particle board center, and a surface density of 5.3 pounds per square foot. These are about as effective as solid-core doors of the usual kind. Even a massive door is ineffective unless it is well sealed. Gummed strips of felt, foam, or sponge rubber (Figure 14) are excellent for this purpose, provided they are renewed from time-to-time as they deteriorate.

Conclusion

Nothing short of a few dozen years experience in acoustical treatment of spaces will give a person anything approaching a sense of confidence in tackling such a project. However, those having such confidence remember vividly two things: (1) the agony of deciding what to do and where to get the materials with which to do it; and (2) the ecstasy over the results. Hopefully, this brief overview opens the door just a tiny crack on obscure sources of data, and introduces several products heretofore not widely used in studio treatment.

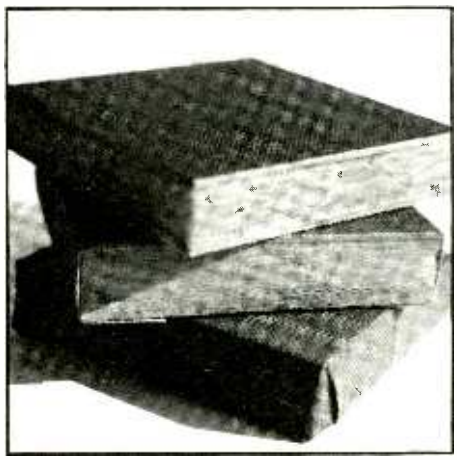
□□□

Figure 11
Different forms of Vicracoustic panels manufactured by L. E. Carpenter & Co. A perforated vinyl wallcovering backed by 1/8-inch of high compressed glass-fibre for abrasion resistance cover the working core of glass-fibre.

Figure 12
Absorption characteristics of Vicracoustic panels with working cores of 1- and 2-inch thickness (mounting #4).

Figure 13
Structure of door with particle core having a density comparable to usual solid core doors.

Figure 14
Gummed weatherstripping tape, foam, or sponge rubber as used for sealing doors in sound sensitive areas.



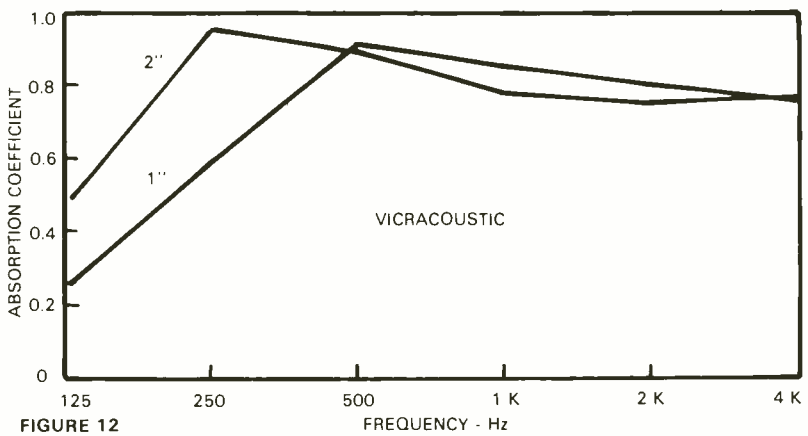
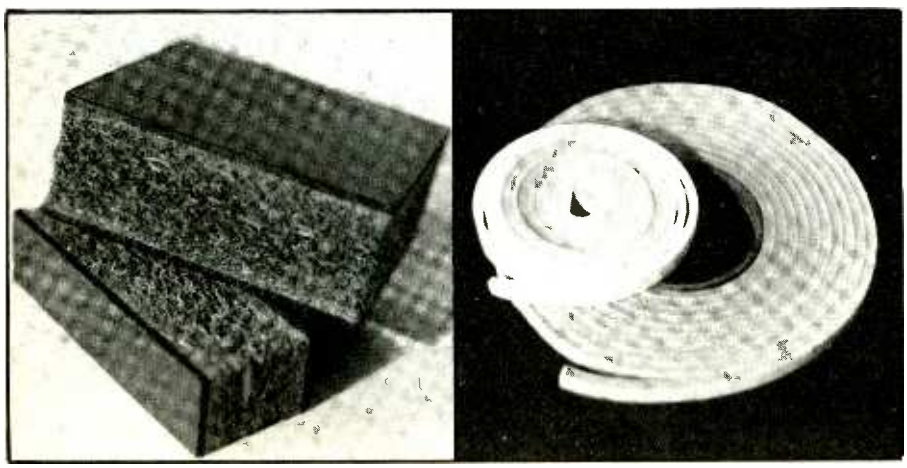


FIGURE 12



References:

1 - Hedeen, Robert A., *Compendium of Materials For Noise Control*, DHEW (NIOSH) Publication No. 80-116, US Government Printing Office, Washington, D.C. 20402; May 1980 edition, 380 pages, price $8.00. Telephone: (202) 783-3238.

The following publications are provided by Owens-Corning Fiberglas Corporation, Fiberglas Tower, Toledo, Ohio 43699. Telephone: (419) 248-8101.

2 - *Noise Control Manual* (June 1980) 40 pages. Publication No. 5-BMG-8277-A.

3 - *Noise Barrier Batts.* Publication Nos. 1-AC-7197, 5-CW-7654.

4 - *Fiberglas 700 Series Insulation.* Publication Nos. 1-IN-6964, 1-IN-6360.

5 - *Fiberglas Building Insulation.* Publication Nos. 1-BL-6066, 1-BL-9506, 5-BL-9033A, 5-BL-9328 and 5-BL-9329.

6 - *Sound Dividers.* Publication No. 1-AC-7815.

7 - *Wall Panels.* Publication No. 5-AC-7405.

8 - *Wall Treatments.* Publication No. 5-AC-4250.

9 - *Ceiling Boards and Panels* (Glass-cloth faced). Publication No. 1-AC-7523.

10 - *Duct Liner Board.* Publication No. 1-MS-3557.

11 - *Duct Board.* Publication No. 1-MS-6517.

12 - *Flexible Duct* (INL-25). Publication No. 1-MS-6747.

13 - *Drywall Construction Handbook*, United States Gypsum, 101 S. Wacker Drive, Chicago, Illinois 60606, Department 122 (Revised 10/72); price $1.50. Telephone: (312) 321-4000.

14 - *Insulation Systems - Thermal/Acoustical Insulation Products*, Publication No. IND-3211 (1978); 40 pages; Johns-Manville, P. O. Box 5108 IPD - B, Denver, Colorado 80217. Telephone: (303) 979-1000.

15 - *Acoustical Ceilings - Use and Practice*, (1978); Ceilings & Interior Contractors Association, 1800 Pickwick Avenue, Glenview, Illinois 60025. Telephone: (312) 724-7700.

16 - Robac II is distributed by Alpha Group, Inc., 7321 Victoria Park Avenue, Unit 2, Markham, Ontario, Canada L3R 2Z8. Telephone: (416) 495-1260.

17 - Sonex products are manufactured by Illbruck/USA, 3800 Washington Avenue North, Minneapolis, Minnesota 55412, and distributed by Alpha Audio, 2049 West Broad Street, Richmond, Virginia 23220. Telephone: (804) 358-3852.

18 - L. E. Carpenter and Company, 170 North Main Street, Wharton, New Jersey 07885. Telephone: (212) 355-3080.

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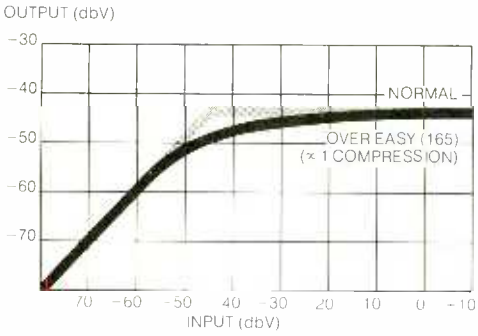

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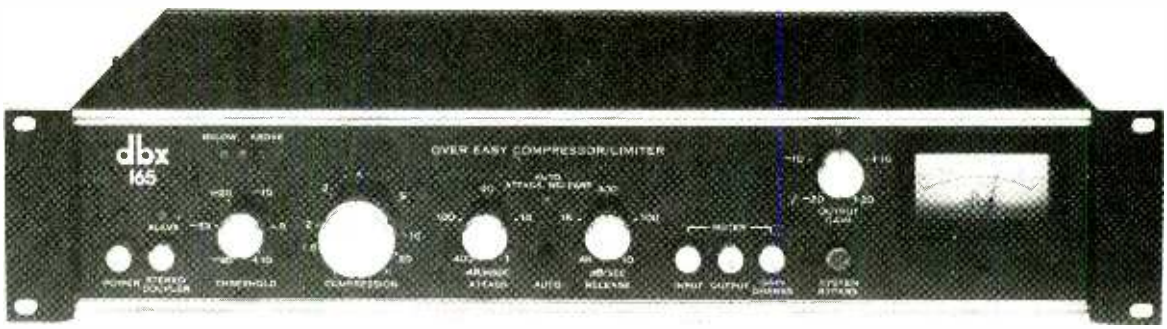

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SOUND MAN'S GUIDE TO VENUES

— number 15 in the series —

EXECUTIVE INN - RIVERMONT
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(502) 926-8000

Driving Directions From Airport

From airport take Airport Road north approximately 3/4 mile. Turn right on to Highway 56. After 100 yards turn left onto Highway 60 by-pass. Continue one mile and turn right on to Highway 60 (West). Continue two miles to corner of Cedar and Highway 60 (also called 4th Street). Turn left on to Cedar Street and continue three blocks to Executive Inn.

Facility

Small entertainment showroom is open for shows at 6 p.m., Friday and Saturday only. Call for appointment to see showroom during the week. No closing-time restrictions. Permanent level stage is 38' W x 29' 6" D x 3' H. No orchestra pit. Low ceiling only 9' 6" above stage. Seats 864 patrons at booths and tables. All seats are padded. Seating begins at edge of stage.

Acoustics

Decreasing ceiling height over audience causes acoustics to vary throughout room. Ceiling height over front section is about twice as high as it is over rear section, resulting in a bassier, fuller sound up front. Basically dry sound with very short RT60. Sound thins out both frequency- and level-wise as you get closer to the rear wall.

Stage acoustics are also fairly dead, due to curtains behind stage and acoustic tiles on low ceiling over stage. Considerable flutter echo on stage caused by large picture windows on opposite sides of room. Side monitors should be angled up or downstage to counteract echo.

Loading

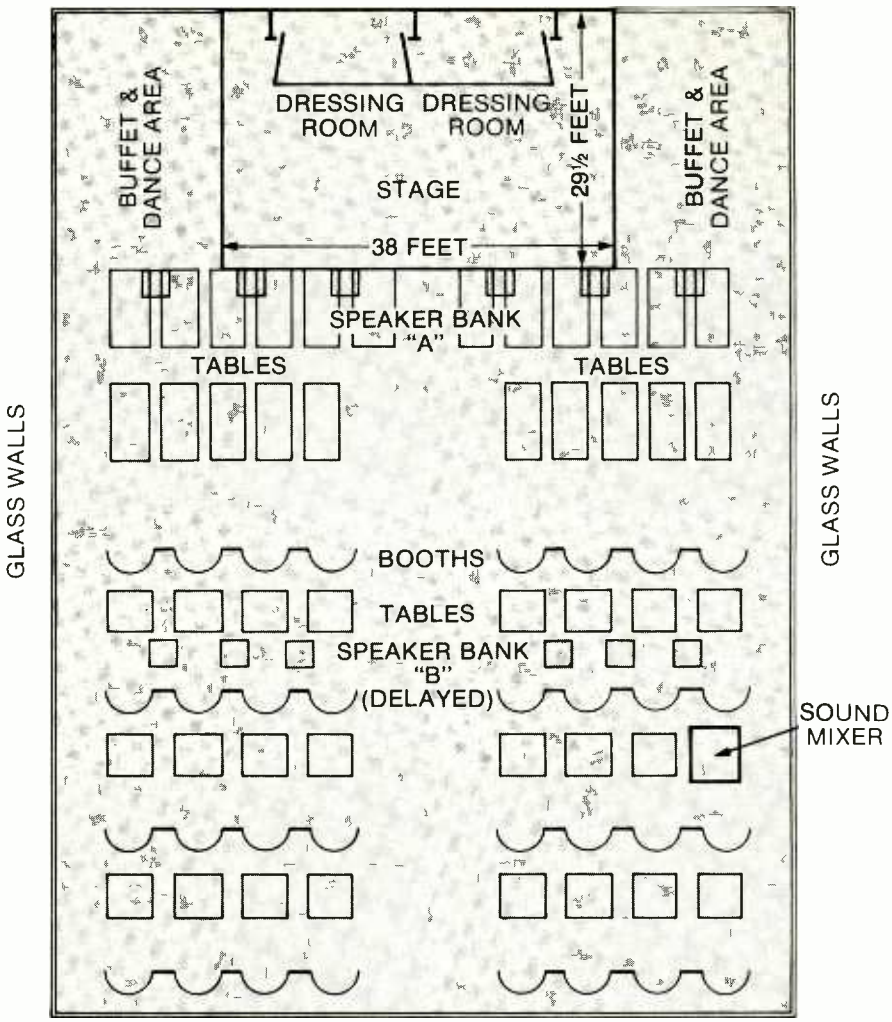
Loading dock located on east side of building. Lift gates not necessary, as trucks can back directly up to dock. Equipment must be wheeled through large kitchen to showroom on other side of building. Smallest opening is door into showroom, which measures 7' H x 3' W. Truck parking available in large lot.

Setup

Area reserved for mixing console is located just over half-way to rear of house, just past row of delayed speakers at extreme right side of house. Distance from this area to stage: 60'. About 100' snake needed to reach stage via approved routing. This mix position is in area of room where sound is more compressed than it is up front. Grounded AC outlet at console is wired with polarity reversed. Suggest taking power from stage. Twenty 4' x 8' risers varying in height from 9 to 12" are available to stack speakers on or off stage. Areas off-stage right and left are used for buffet-style dinner service, so check with house well in advance if you need any of this area.

Sound System

Yamaha PM-1000-16 console; Altec two-channel, 24-band EQ; two dbx 160 compressors; Multivox MultiEcho MX201 tape echo/reverb unit. Front speaker bank of six



Altec 604-8G speakers, passively crossed over at 800 Hz, are mounted in 6.38 cubic-feet bass reflex enclosures spread out evenly across front of room, just above edge of stage. A similar speaker bank is located 52' out from the front system, and is delayed using an Altec 1661 digital delay. Each speaker bank is driven with a single Altec 9440A amplifier. A slight buzz is noticeable in the delayed system, possibly due to the location of the delay unit and amplifiers in the light booth.

Two monitor mixes are available, one of which is normalled through one channel of the Altec 24-band equalizer. Each mix is routed to one-half of an Altec 9440A amplifier. Monitor speakers available: two Altec 604-8G side-fills; two cabinets each containing two Altec 417-8H 12" woofers and two piezos; six cabinets containing a single Altec 417-8H; two Sunn 4x12s with external tweeters.

Microphones available: four Shure SM-58, four SM-57, two SM-56, 565-SD, 545-SD, and two Altec 626A condensers (one omni; one cardioid).

Stands: 14 Atlas floor stands; four Atlas short stands.

System can accept balanced line level signal on 3-pin male XLR connector.

Electrical

Two 100-amp, three-phase circuits available. Main breaker box is 10' from stage; requires lug connectors. Eight 20-amp circuits available on stage. Actual voltage is 117 VAC.

Personnel

Non-union crew will also load and unload trucks.

General Manager: Shirley Austin, (502) 926-8000.

Sound: Terry Heitland, (502) 685-1503.

Lighting: Kevin Duggan, (502) 926-8000.

Chief Electrician: Dan Pearl, (502) 685-1423.

Piano Tuner: Max Chambers, (502) 684-7715.

Traveling Soundman Reaction

"Soundman Terry Heitland is very helpful and knowledgeable, although the rest of the crew was limited in number and expertise. I would rate the quality of the sound at about an 8 out of 10 for a place of this type. Medium-dry acoustics of an odd nature due to the great number of glass windows. Watch overall levels and try to keep peaks below about 100 dB, or else room tends to overload somewhat. ***Tom Mincy,*** *Freelance Engineer.*

"Room sounds pretty good although very dry, and so a reverb unit is useful here. At the mix position you pretty much only hear what is coming out of a PA speaker which is directly overhead, and you can't hear much of the sound coming directly off the stage. Soundman Terry is very helpful, but no crew was available to help load in or out — although they were specified in the rider." ***Chris Taylor,*** *Owner, Shekinah Sound.*

Technics

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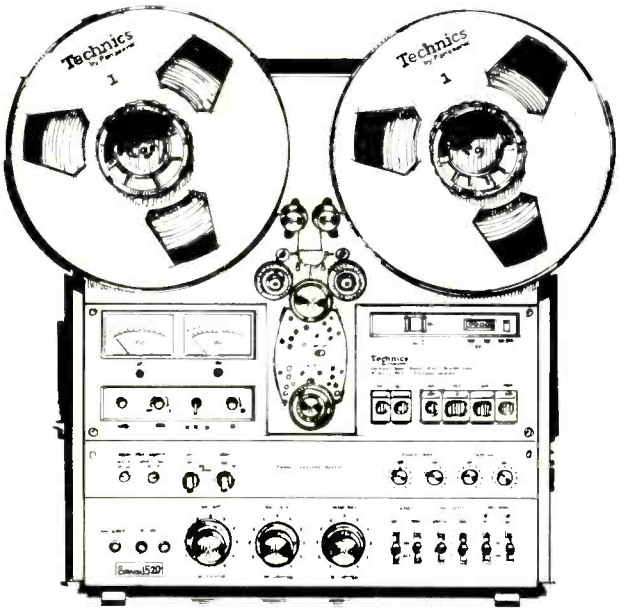

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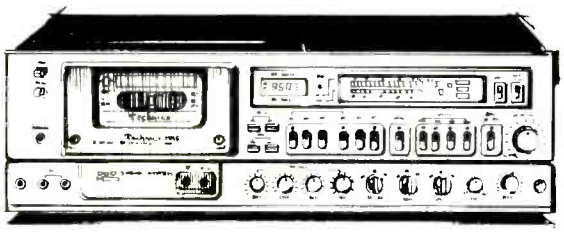

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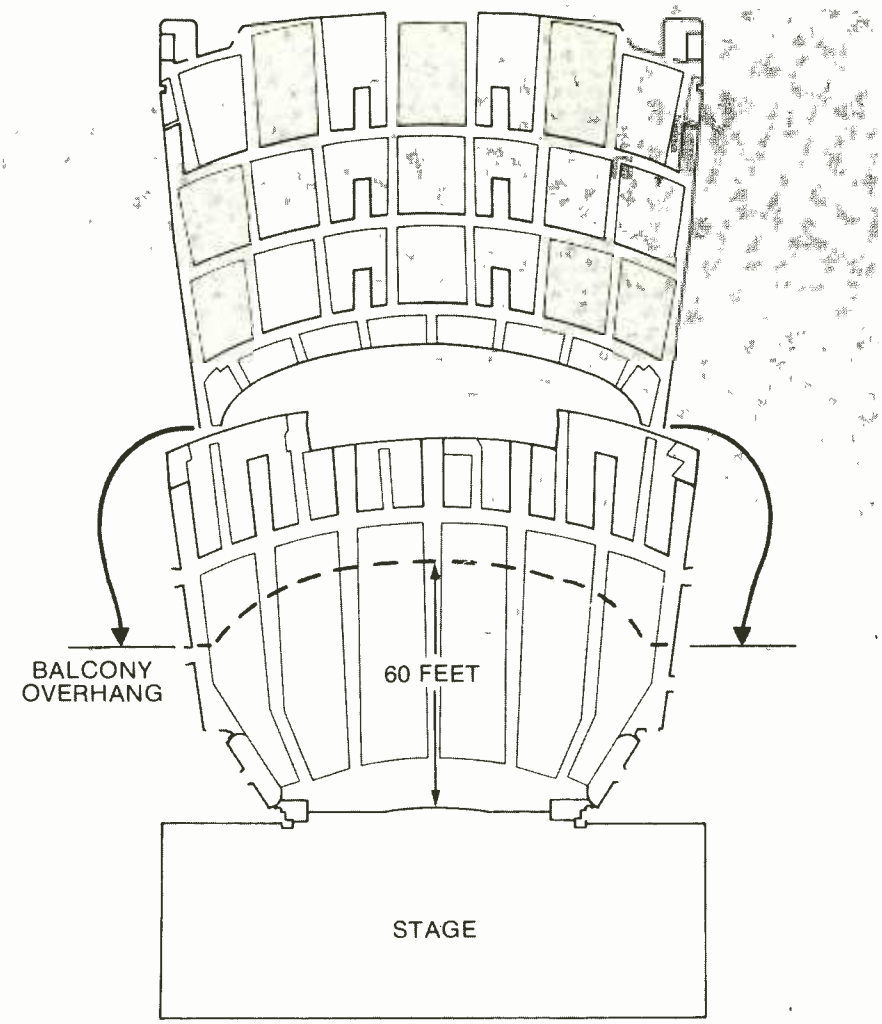

Driving Directions From Airport

From LAX Airport take Century Boulevard to Harbor Freeway North to Exposition Boulevard turnoff. Left on Exposition; right on Figueroa; left on to Jefferson.

Facility

Concert Hall with permanent proscenium stage. Open 9 a.m. to 5 p.m. weekdays. No mandatory closing time, but 12 midnight recommended due to overtime union rates, etc.

Seating capacity: 3,225 orchestra; 3,264 balcony.

Permanent level stage measures 100' W x 65' D and is 4' above audience floor. Distance from apron to first row of seating: 15'; usable height from stage to grid: 86'; usable height from stage to proscenium arch: 35'; movable pipes available: 97; orchestra pit is 70' W x 15' D at the widest point.

Single balcony has three levels and is approximately 60' from edge of stage.

Acoustics

Fixed acoustics; all seats are padded. Hall was built in 1926, and designed so that a voice on-stage could be heard throughout hall without amplification. Live sounding room.

Slapback from PA off back wall of theater makes the use of a good monitor system on-stage a necessity to overcome the resultant 175-200 millisec. echo.

Loading

Loading door accessible from rear parking lot. Loading door measures 17' H x 8' W. Equipment loads directly on to stage via ramp. Ample truck parking available in adjacent lot.

Setup

Area reserved for mixing console is located in front balcony lodges, left or right of center. This area takes up a total of 21 seats and is about 60' from front edge of stage. 250' length of cable needed to reach center stage via fire marshall approved routing. Separate AC cable should be run to stage from mix position.

Areas in front of fire curtain on either side of stage measure 16' W x 5' D. Speakers stacked in these locations do not block any sightlines. Ten 4' x 8' risers are available on which to stack speakers. These risers are double strength and are available in heights of 8, 16, 24, 32 and 40 inches.

No facilities or equipment available to hang speakers.

Sound System

Designed for meetings and small shows — not a loud music system. Two speaker clusters located in front of proscenium on either side of stage are supported by winches, and can be moved from their normal position 20' above the stage. Each cluster is composed of Altec components: four 515 woofers crossed over at 500 Hz to a single 3x5" horn driven by two 515 drivers. Front-fill speakers mounted on top of each cluster consist of the following University components: Cobraflex horn with 21D40 driver; 1 BA8 horn and driver combo. A single 40-watt Altec A128A amplifier drives each cluster/front-fill combination.

House mixing console consists of three Altec 1567 mixers and two Shure M-67s, which are ganged together through an XLR patch bay for a total of 20 mike- and three line-level inputs. Mono system. Monitor speakers consist of two E-V LR4B columns powered by a single 150-watt Roland DX-150 amplifier. Monitor mix same as house mix.

Thirty microphones available, mostly Electro-Voice. Atlas mike stands. System will accept a balanced line-level signal on male XLR connector.

Electrical

Four 400-amp, single-phase legs available for a total of 1600 amps. Power is connected to two bullswitches located stage left behind dimmer board; "sister" lugs or alligator clips needed to tie into switches. Plentiful 20- and 30-amp circuits available on stage. Actual voltage is 125 VAC.

Personnel

Union crew; departmentalized. Separate union crew must be called to load and unload if actually needed inside truck; otherwise regular crew will take equipment into hall.

Building and Stage Manager: Jim Okerson, (213) 748-5116.

Sound Engineer: Alan Midcalf, (213) 579-5100.

Lighting: Jim Okerson, (213) 748-5116.

Chief Electrician: Gary Cleaver, (213) 748-5116.

Piano Tuner: Mr. Lamb, (213) 748-5116.

Traveling Soundman Reaction

"AC is located on wrong side of stage by lighting equipment, and about 125' of cable is necessary to cross over to stage right. Loading can take longer than you'd expect, especially with a big show as the ramp and loading area can get cramped for space pretty quickly. Sound in room is OK. Large stage sounds pretty good especially when all the curtains are flown in." ***Milt Chapman,*** *Filmways Audio Services.*

"Professional union crew. Loading is fairly easy due to truck-level loading dock and long ramp that is provided. Plenty of storage space backstage. With a full house at least half the audience is sitting in the balcony, so mixing from the front row of the balcony gives you a pretty representative idea of what the sound is like throughout the auditorium. Be sure to provide additional horns to get some high end to the very top of the balcony, or all they will hear up there is bass. Good access to balcony mix position from stage. Large wings, high grid and large open area surrounding stage contribute to a good stage sound." ***Al Siniscal,*** *Owner, A-1 Audio.*

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

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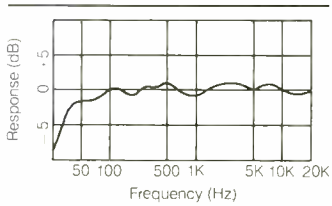

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JBL First with the pros.

Clair Brothers on the road at L.A.'s Sports Arena with

Bruce Springsteen

by Robert Carr

With inflation spiraling ever upwards, not many groups can afford to tour extensively, and fill the large arena so popular a few years back. Bruce Springsteen is one of those superstars who can sell out 16,000-plus seat venues for four nights in L.A., and still turn many thousands more away.

Springsteen's music is hard to reproduce live, especially at an in-the-round venue such as the Los Angeles Sports Arena. He layers his instruments, but many overlap into the same areas. On record they produce textures of sound; in concert the instruments can easily mask or muddy one another. The high energy level of a concert performance — as well as the proper musical balances between players — must be maintained throughout a wide dynamic range, as the repertoire shifts from exploding, steamrolling rockers to down-to-earth, romantic street ballads.

Springsteen insists on the best sound reinforcement possible and schedules a sound check for every afternoon at four o'clock; regardless of whether it's an opening night or a repeat performance. He'll walk through every section of the arena to ensure that patrons in the least expensive seats will be able to see and hear as well as those in the most sought-after front-row areas. No seat for the L.A. Sports Arena show was to be more than $12.00. When Springsteen heard about scalper's prices of $50, $100 and $200 a seat, he made a public announcement to the audience during each of the four shows about a pending bill in the California legislature, which the fans should support in order to put an end to the "rip-offs" in the concert business. With his own group — the E Street Band — and road crew, Springsteen spared no expense in these days of industry cutbacks by providing everyone with their own rooms at fine hotels along the itinerary. This fact is brought up only to point out the climate of the concert presentation, and the family feel and dedication of all involved to provide audiences with the best possible entertainment under what proved — at least in L.A. — to be severe, adverse conditions.

The PA company chosen to do the sound was Clair Brothers, of Lititz, Pennsylvania. Australian-born Bruce Jackson, whose credits include Elvis tours from 1971-1977, Three Dog Night, Cat Stevens, Rod Stewart, and more with Clair Brothers, is chief sound engineer. His crew includes Chris (C. J.) Patterson doing monitors, Stan Horine, assistant sound engineer, and "Midget" and Tony "Brokowski" Gallicchio on set-up and maintenance.

First Impressions

Several weeks before the scheduled appearance in Los Angeles, Bruce Jackson, Springsteen and George Travis, who is in charge of tour production, visited the Sports Arena to determine whether or not they really wanted to do the show there at all. Springsteen didn't mind the design of the hall, even though it's not as good acoustically as the Forum, the usual choice for large music concerts.

"I didn't actually do any acoustic testing the day of our visit," says Bruce Jackson. "It was just a matter of identifying a series of latent problem areas based on my experience with rooms like that."

In the upper concourse there is a high, stark concrete wall that runs all the way around the building. The hall is oval-shaped, and at both ends are great arcs which focus the reflected sound; the stage is positioned right in the center of the focal point of one of the arcs. Any sound from the stage speakers bounces directly back on to the stage area, and makes any on-stage control unpredictable because of leakage problems and abnormal feedback potential. This high-level concourse is reinforced by another concrete concourse located one seating section below, and which also extends all the way around the building. At the lowest level — floor level — is the foyer or entrance area of the coliseum. The foyer is only separated from the main room by structurally functional concrete pylons, which serve to hold up the building and allow direct access to the outer area. This latter area is constructed almost entirely of tile, concrete and glass.

In essence, the main arena is acoustically coupled directly to an echo chamber that runs

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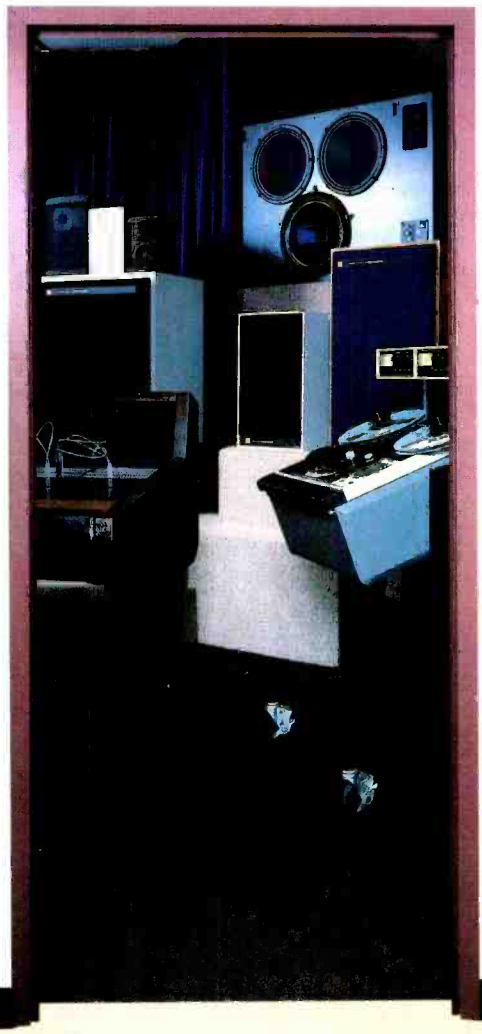

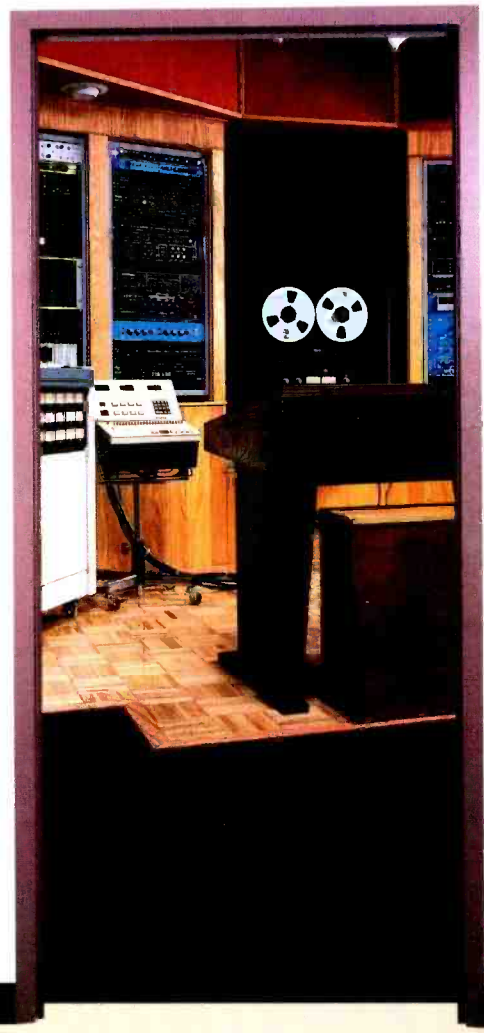

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around the perimeter of the main room. The intended remedy was to hang heavy drapes on all of the large, reflective concrete surfaces, and between the main room and the foyer. The latter idea would, to a degree, isolate the two areas, and reduce the amount of sound transfer from one to the other. Unfortunately, drapes of the appropriate length couldn't be located, and a compromise had to be struck. In addition, the fire marshall at first objected to the drapes on the grounds that they were a potential fire hazard (he tried to burn them, but they were fire retardant), and also because they could impede entrance to and exit from the hall. However, since the drapes were approximately three feet too short, the objection to impeding exits was dropped, although the area was not sealed off as completely as planned. The drapes were rented for the four-show Los Angeles engagement from West Coast Theater Supply, at a cost of around $7,000.

Another potential source of problems was sound bouncing around the inside of the metal ceiling. To break up these reflections, drapes that are normally hung as a backdrop for the stage during performances to only the front of oval-shaped halls were pressed into service (Figure 1). Each drape measured approximately 50 feet long by 25 feet wide. As far as possible, within limitation of the ironwork located in the ceiling, positioning of the drapes approached all the way around the stage, placement being almost directly above the house console to break up reflected sound coming from the back of the room.

"The curtains helped, but it's very hard to document," Bruce Jackson offers. "It did damp things down substantially. Closer to ideal would have been desirable, but when you're working with the laws of diminishing returns, it's a trade-off in terms of how much you spend versus how much you get back in better control and better sound."

Speaker Placement

According to Bruce Jackson, "Placement is a matter of putting power where it's needed. There's no set configuration; the setup changes from place to place depending on the parameters of the building."

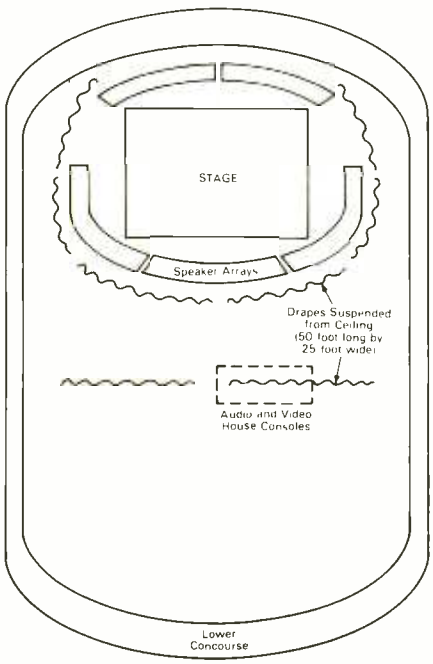

Figure 1: Plan view of L.A. Sports Arena, showing the position of the stage area, mixing position, hanging drapes, and the flown house speakers.

There are several speaker designs developed by Clair Brothers, each built for a specific use. The basic composition of each cabinet will be discussed, but a listing of the specific components is proprietary. The only exception is the house speakers, conceived by Gene Clair. Their S-4 speaker configuration contains:

Two K-151s for bass (18-inch JBL)
Four K-110s for mid (10-inch JBL)
One TAD 4001 compression driver for highs
One JBL 2441 compression driver for highs
Two JBL 2405s for super-highs

The K-151s go from 20 to 200 Hz, and the K-110s from 200 Hz to 1.2 kHz — all are 18 dB per octave roll-off. The drivers run all the way out, with the super-highs coming in at 8 kHz. It's a four-way system driven by a tri-amplification system which will be discussed later.

In addition to an electronic crossover, the horns have a passive, high-pass network to protect them from excessive excursions. There's no high-end roll-off for the horns, and the super-highs are passively crossed over with the high-pass.

The TAD and JBL drivers are used together, because they each have inherent deficiencies and strengths which tend to balance each other out. These complimenting deficiencies stem from the compromises that must be made in state-of-the-art driver design. For example, to gain higher frequency response, one manufacturer broadened the Q or bandwidth of a diaphragm resonance, and moved it up in frequency to reinforce the high-end. Another manufacturer took this resonance, and moved it out of the audible range by reducing the diaphragm mass. Each of these approaches has its own subset of effects, and an analysis of them would be an article in itself.

The Beryllium diaphragm of the TAD driver is senstive to large excursions, and "tends to bite the dust, if asked to do so," according to Bruce Jackson. The TADs are protected by an additional LC high-pass circuit set up close to the electronic crossover point.

A Clair Brothers' employee in the speaker department noted a strange resonance when testing the new JBL 2441 drivers, and discovered that a drop of nail polish placed on the back of the diaphragm damped out the resonance. (JBL has since included such a procedure in its production process.)

As Bruce Jackson explains, "Over the first weeks of the tour I was having trouble with the system sounding particularly harsh and lacking clean super-highs. I couldn't understand why it was necessary to use some strange equalizing, until I was told there was a component mis-calculation in the compression-driver passive protection network. Rather than a smooth roll-off, we had a substantial peak around 2 kHz in the passband. Also unbeknown to me, someone decided to remove all the super-high drivers, because they felt the new drivers would be adequate in that region. We had to fly a crew in to replace the networks, as well as put the super-highs back in. The new configuration is a substantial improvement over the old 2440 S-4.

"The super-highs disperse much more than what you'd think they would. They're supposed to be very directional, but they seem to go everywhere! There's a significant problem in the 1- to 5-kHz area with beaming and pattern control. Since air molecules absorb high frequencies in direct proportion to the increase of the distance the waves travel, a compromise must be reached between how many highs will be heard at the mixing position, versus their relative volume at the back of the room."

Bruce Jackson of Clair Brothers

The Clair S-4 is designed as a sort of universal cabinet, not specifically for long- or short-throw applications. Ideally, Jackson would have a special cabinet designed for long throw to the back of the hall. This, however, would probably require horn loading of the bass and mid-range, and a new compression driver horn, giving the cabinet an entirely different horn-type sound. Such a design would negate the advantage of the existing large array approach.

There are 56 cabinets for the house system, each weighing approximately 450 pounds. The boxes are supported by bumper bars built by Wilber Graybill in the Menonite-Amish region of Pennsylvania. Speakers are fastened to the bumper bars and to each other using straps manufactured to within a tolerance of half an inch. The entire configuration is raised above the stage using a combination of 20 one-ton (single-chain) and two-ton (double-chain) Columbus and McKinnon Loudstar hoists (Figure 2).

The S-4 speaker has a right and left configuration, one being the mirror of the other. This is to aid the coupling effect between cabinets, and reduce the interference patterns which result when more than one speaker covering a given area is driven by the same coherent signal. Such interaction forms a dispersion pattern of peaks and valleys in the frequency response for both the horizontal and vertical planes. The magnitude of interference depends on the distances between the speakers and the wavelengths involved. Since interference varies with frequency, this effect is used to advantage in a radar phased-array antenna, where patterns of fixed antennas are fed with varying signals which interact to form a beam that can be swept electronically. In audio applications, however, the object is to minimize this effect by alternating left and right speaker cabinets..

"I've been trying an experiment on this tour," explains Bruce Jackson, "which seems to be working out pretty well. We're playing 360 degrees for the first time, because Bruce [Springsteen] enjoyed the proximity of the 360 degree seating at the "No Nukes Show." Having left/right stereo in a situation like this is

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Bi-amping and tri-amping (electronically dividing the frequency spectrum into low-high/low-mid-high bands and amplifying them separately) are quickly becoming the accepted methods for insuring the low levels of intermodulation and harmonic distortion so necessary for clean, accurate reproduction of today's music. Unfortunately, this involves the use of multiple power amplifiers and electronic crossover networks — usually a substantial financial burden for the average musician or sound engineer.

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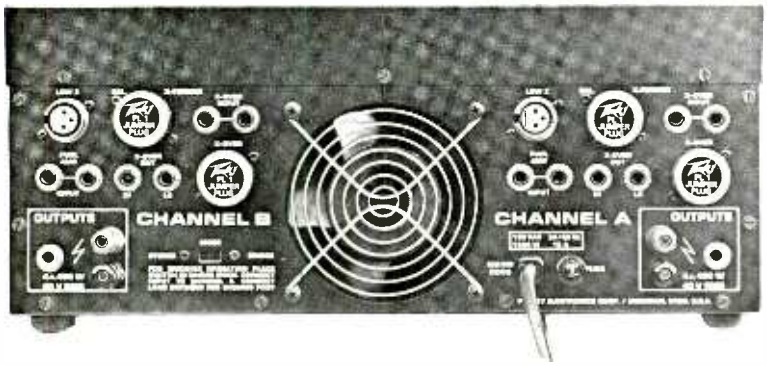

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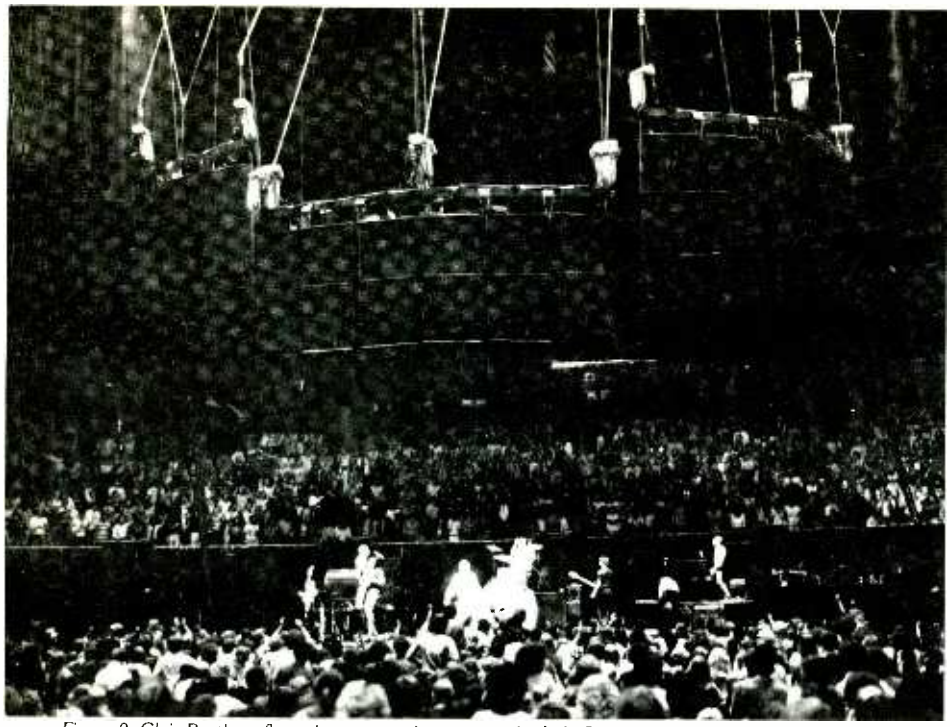

Figure 2: Clair Brothers flown house sound system at the L.A. Sports Arena, made up from mirror-image pairs of S-4 speaker cabinets.

ridiculous, since only the audience in the center can enjoy what the mixer is hearing. The rest hear a dubious stereo, which is fine for a group like Pink Floyd where a distant, etherial sound compliments the music.

"We decided we would give the people at least some stereo to take advantage of the extra dimension given to such instruments as the piano and organ. This was implemented by driving alternating vertical rows of speaker cabinets with the conventional left or right signal. Primarily, this practice serves to break up interference patterns. Neighboring cabinets are no longer driven with the same coherent signal, while also giving a subtle, pleasant stereo effect to everyone regardless of where they're sitting."

Stacking cabinets in a flat array causes interference problems, too. In fact, interference is so noticeable that movement by just one foot to the right or left while in the auditorium puts the listener in a different part of the pattern, and noticeably alters what is heard. To reduce this effect even more, speakers are hung in big arcs both horizontally and vertically.

"There's no particular degree of arcing — just determined by where the seats are; it changes with every set-up. I do it by eye, by projection, and by what I know will spill down from the highs. It's all by feel, really."

Speakers are tested before every set-up by doing a full frequency sweep and a pink noise test.

"During the sweep, we listen for various traits of diaphragm rubbing loose dust caps and so forth," explained Bruce Jackson. "For example, JBL had some bad luck with a run of glue on their speakers, and it caused the voice coil to separate from the diaphragm. That could be heard very clearly, but there are certain things you can't hear as clearly as you'd like with the oscillator. When sweeping, it's hard to find sources of trouble, because of the various interference patterns and effects that go on with a pure sine wave, which rarely happens in a practical situation anyway."

The pink-noise test basically shows the operation of all the speakers, and makes some problems more apparent. After a couple of weeks, a voice check is done on each box. That shows up more subtle changes, such as speaker wear and deterioration.

Power Amplification

Amplification for the house system comprises Phase Linear 700 amps built to Clair Brothers' specifications. The grounding and output stabilizing network was modified to make the output "electronically a little beefier," and the chassis fabricated from steel rather than aluminum. According to Bruce Jackson, "The basic 'Phase' has a lame output network. If it goes, it makes the amp tend towards oscillation, which is compounded by the inter-amplifier capacitance of the long feeds we run up to the speakers. The long cable runs also reduce the damping factor by adding unwanted impedance to the amplifier."

Clair Brothers used to hang the amplifier racks with the speakers, but if an amp or speaker blew during a show there was no way to re-patch it until after the performance. Instead, it was decided to run heavier (12-gauge) cable, and keep the amplifiers on the ground.

There are 14 amplifier racks with four Phase Linears in each. The top amp in the rack drives the highs in four cabinets (two cabinets per side); the second amp down the mids in four cabinets; and the third and bottom amp the bass (one cabinet per side). The two top amps are loaded to about 350 watts into 8 ohms per side, while the bass amps are rated at about 700 watts into 4 ohms per side. All amps are transformer isolated from the console.

Power Supplies

A standard three-phase, Y-system (200-amp capability per leg) with a ground and neutral powers the show. Clair uses two power distribution panels, one on either side of the stage. Each panel has 12 twist-lock outlets powered by two legs, a ground and neutral. There is also a three-phase outlet to supply the Loadstar motors distribution panels, which requires only the ground — no neutral.

One of the theoretical advantages of using a three-phase, Y-system is that if the loads on each leg are equal, no current will travel down the neutral. Instead, the voltage rotates around the legs and balances out; unfortunately, this does not occur with the type of load Clair Brothers has to contend with. Power rectifiers in the amplifiers conduct current only at the top portion of every cycle. Such a phenomenon causes peaky, not sinusoidal current waveforms, which tend to cause very high neutral currents. If the main service transformer is not particularly large, or its distance from the amps is too great, there is substantial power line distortion, resulting in a flattening off of the tops of the incoming power sine waves. This reduces the maximum available power in the amplifiers.

"A lot of the problem is caused because we draw about 150 amps per leg," Bruce Jackson explained. "If the system ground is tied to the same point as the neutral at the power disconnect box, and the neutral is referenced through a long conductor, the large, dirty currents flowing through the neutral line will pollute the ground and cause all sorts of noise in the system."

In most cases, Jackson's crew attaches to the cold water pipe for ground, but be cautious. Sometimes plastic sections will have been substituted for metal pipe, making the ground point invalid. If that's the case, search for another ground source. If worse comes to worse, Bruce Jackson recommends tieing to the box, but warns that the ground must be capable of handling the maximum fault current.

Stage Miking and Amplification

A common complaint from most groups playing in large arenas is the number of mikes, cords and stands that clutter the stage during a

Table 1
Channel Assignments for 40-Way Snake Between the Stage and the Main Mixing Position

Channel	Instrument	Microphone
1	Kick Drum	Beyer 88
2	Floor Tom	Sennheiser 421
3	Rack	Sennheiser 421
4	Snare (top)	Shure SM81
5	Snare (top)	Sennheiser 421
6	Snare (inside)	Countryman EM101
7	Hi-Hat	AKG C451/CK1
8	Ride (SR)	Countryman EM101
9	Crash (SL)	Countryman EM101
10	Leslie low	Sennheiser 421
11	Leslie high (R)	Countryman EM101
12	Leslie high (L)	Countryman EM101
13	Farfisa / Ace Tone / Accordian	Countryman DI
14	Glockenspiel	Countryman EM101
15	Saxophone	Shure SM57
16	Baritone Sax	Shure SM57
17	Percussion / BS' Acoustic	Sennheiser 421 / Countryman DI
18	BS' Peavey amp	Sennheiser 421
19	BS' Fender amp	Sennheiser 421
20	Bass guitar	Countryman DI
21	SVZ's guitar amp	Sennheiser 421
22	SVZ's acoustic	Countryman DI
23	Piano (top)	Helpinstill pick-up
24	Piano (bottom)	Helpinstill pick-up
25	Yamaha CS80	Countryman DI
26	DF's vocals	Audio-Technica ATM41
27	CC's vocals	Audio-Technica ATM41
28	BS' vocals	Electro-Voice DS35
29	SVZ's vocals	Audio-Technica ATM41
30	RB's vocals	Audio-Technica ATM41
31	Wireless/spare	Nady VHF700
32	Spare	
33	Talkback	
34	Spare	
35	Spare	
36	Slap Echo	
37	Tape effects (L)	
38	Tape effects (R)	
39	Intercom A	
40	Intercom B	

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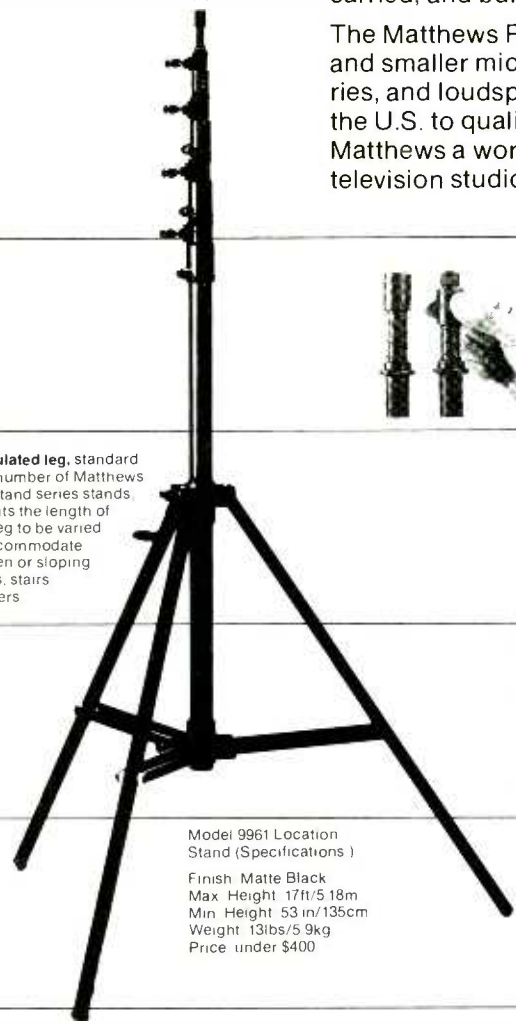

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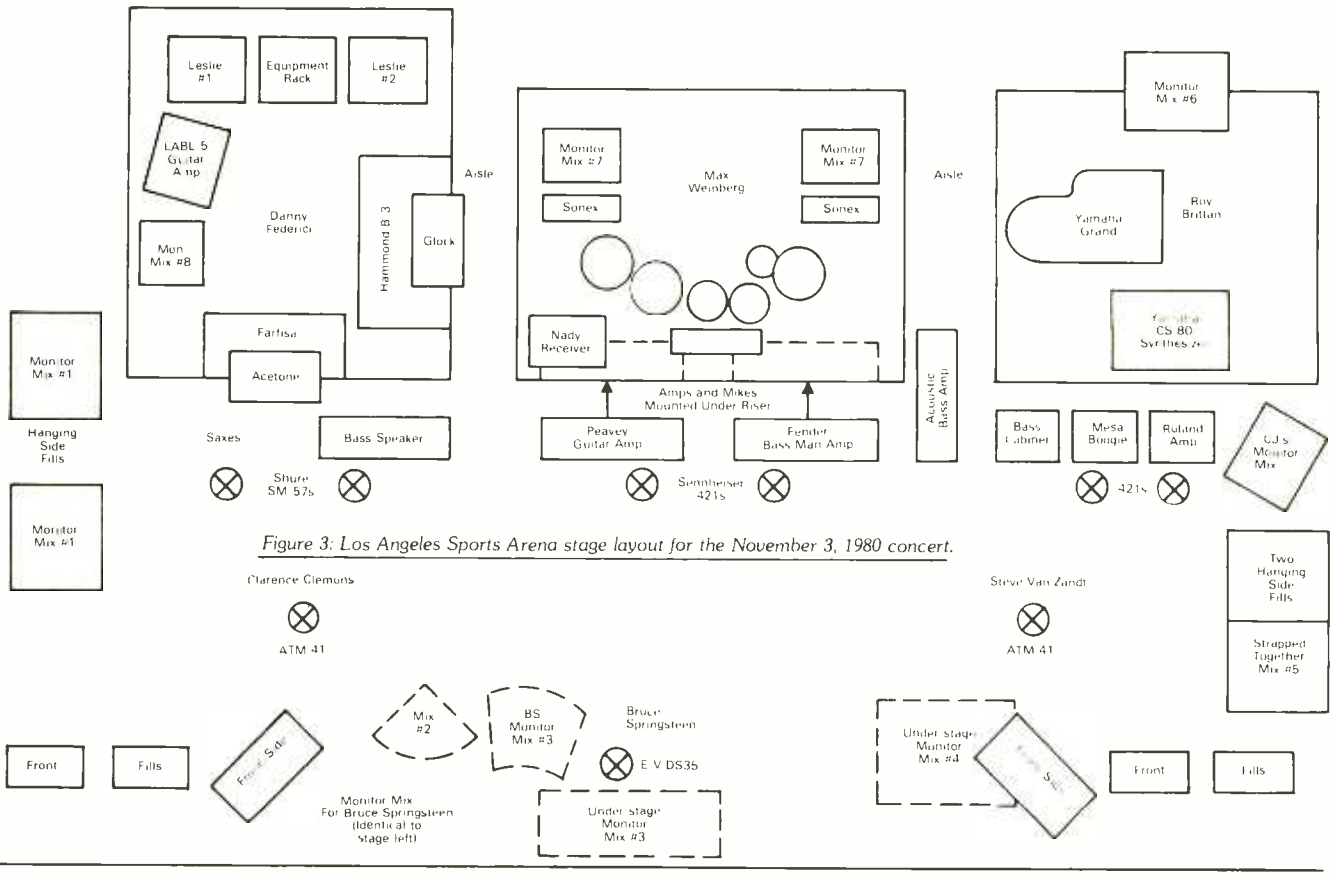

Figure 3: Los Angeles Sports Arena stage layout for the November 3, 1980 concert.

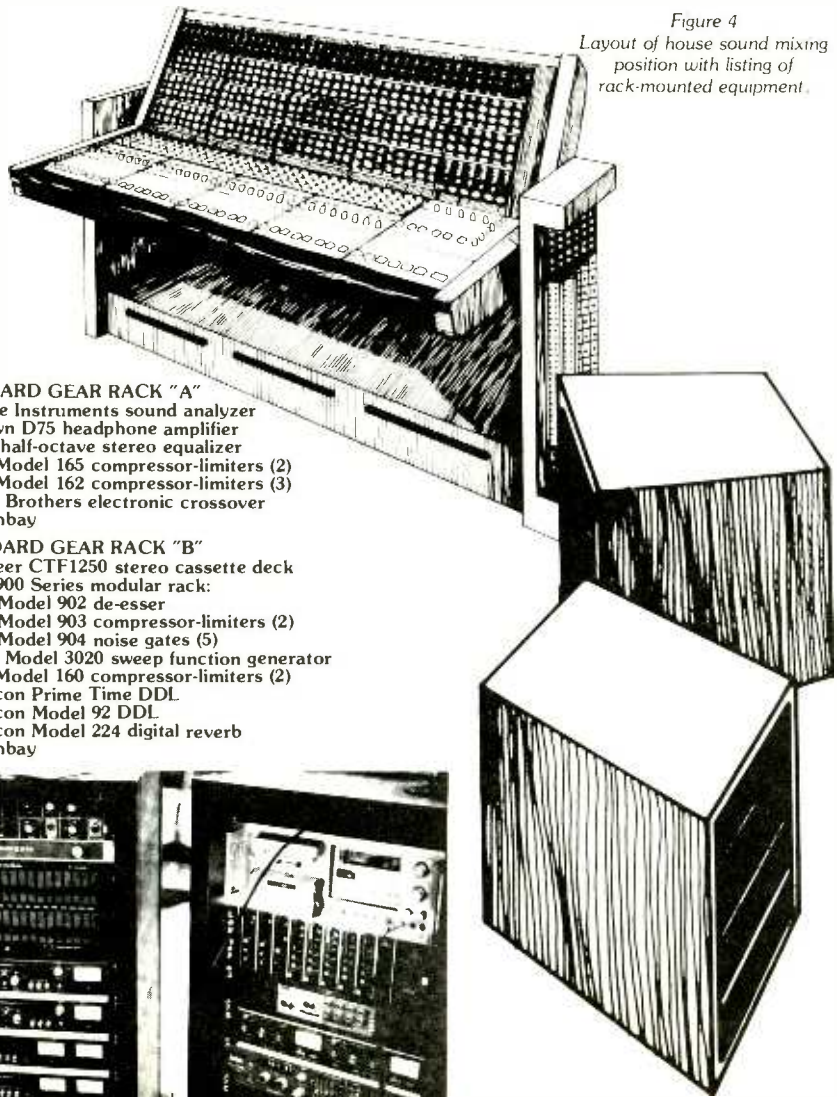

Figure 4
Layout of house sound mixing position with listing of rack-mounted equipment.

OUTBOARD GEAR RACK "A"
- White Instruments sound analyzer
- Crown D75 headphone amplifier
- SAE half-octave stereo equalizer
- dbx Model 165 compressor-limiters (2)
- dbx Model 162 compressor-limiters (3)
- Clair Brothers electronic crossover
- Patchbay

OUTBOARD GEAR RACK "B"
- Pioneer CTF1250 stereo cassette deck
- dbx 900 Series modular rack:
  - -Model 902 de-esser
  - -Model 903 compressor-limiters (2)
  - -Model 904 noise gates (5)
- B&K Model 3020 sweep function generator
- dbx Model 160 compressor-limiters (2)
- Lexicon Prime Time DDL
- Lexicon Model 92 DDL
- Lexicon Model 224 digital reverb
- Patchbay

performance, as well as the confining nature of working with stationary mikes. The keynote of this tour has been to change all that — to obtain as much flexibility and as clean a looking stage as possible (Figure 3). Table 1 lists the on-stage microphones, effects, direct injects, and communications channels routed through a 40-way snake to the front-of-house mixing console (L.A. Sports Arena Concert, November 3, 1980).

As can be seen from the mike sheet, almost all vocal mikes are Audio-Technica ATM 41s. Bruce Springsteen's mike is an Electro-Voice DS35, because it sounds much better with his voice. Bruce Jackson feels that, "His vocal technique is great; he gives us all the level we need. He can run out in front of the PA stacks and still not feedback. Sometimes the proximity effects are a pain in the ass. I find I EQ out the proximity, depending on what song it is and how he's singing it. Sometimes I'll have to add some midrange punch."

Springsteen's mike channel is patched through a dbx Model 902 de-esser. dbx put together a rack especially for this show, containing the 902 de-esser and two compressors with the "over-easy curve." ("The curve comes in much more gently," Bruce Jackson offers. "It's not as radical as the Model 160s.") Also supplied in the rack were five noise gates — "which I'm playing around with to find the best spots to use them. They do a great job on the drums. I find the best method of gating the vocals is to ride the faders" (Figures 4 and 5).

Nady Systems of San Francisco had just put together an E-V DS35 mike transmitter and receiver to be tried out in L.A.

"The fidelity and range are excellent. Bruce has to decide whether he wants a $3,000 mike to go out in the audience for one song. I much prefer he be directly coupled to the system most of the time. The radio mike does have companding circuits in there, and you can hear them if you really listen. But for an effect, the mike's fine."

— continued on page 60

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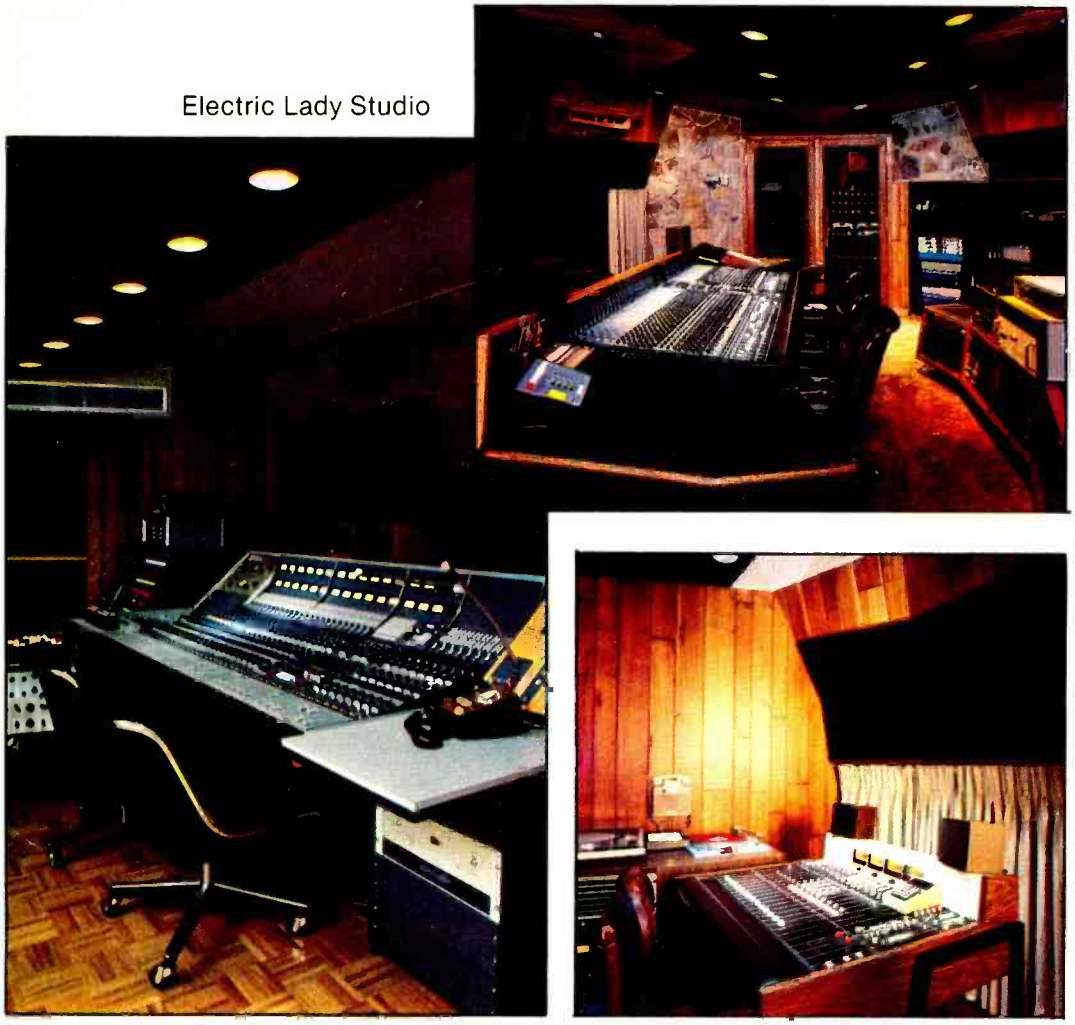

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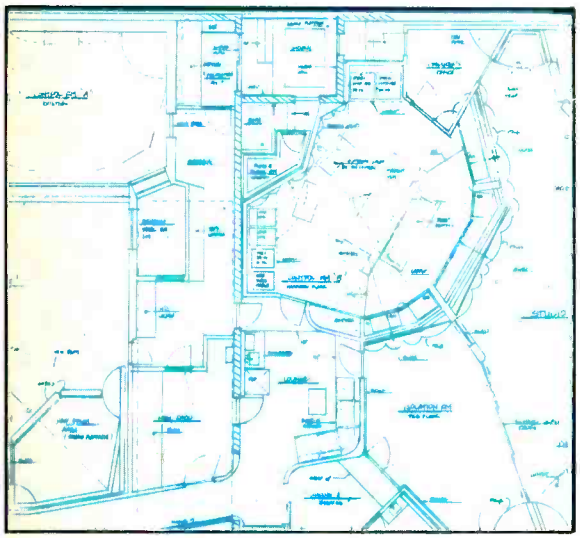

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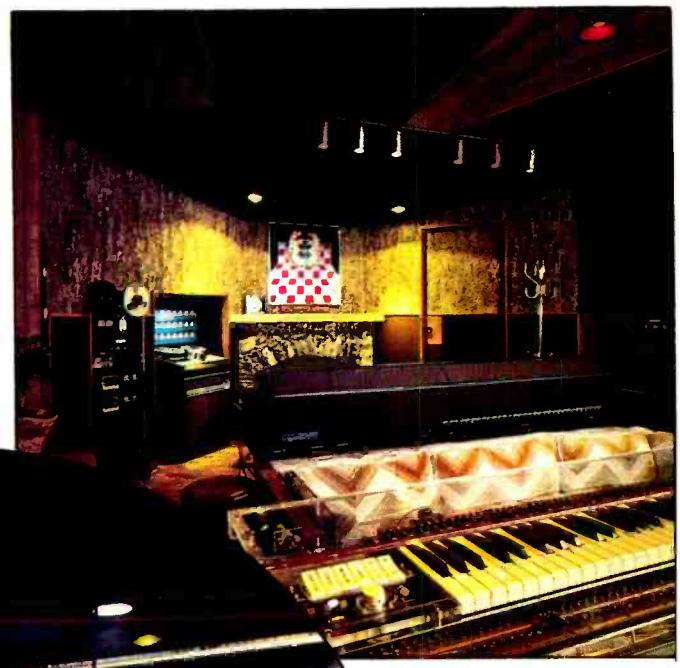

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continued from page 56 —

Nady also brought in a radio system for Springsteen's guitar, which everyone agreed sounded very good. "The previous one colored the sound. The new one seems to have licked all the problems. I'm very impressed with it, but I'd like to have him on a cord."

Springsteen plays through two amplifiers that are both hidden from view beneath the drum riser. Each amp is miked with a Sennheiser 421, and either can be selected for the monitor or house mix. The sound from the Peavey amp is very bright, while that of the Fender Bassman is much gutsier. Bruce Jackson usually uses the Fender sound for the house, while Springsteen perfers the sound of the Peavey on stage.

Since the show is so high energy, and Springsteen so active, a 100-foot guitar cord is used to allow that freedom of movement. Unfortunately, such a long cord tends to load down the guitar signal and roll-off the high frequencies. Bruce Jackson has built an electronic impedance transformer into the guitar, which sends out a low-impedance signal (Figure 6).

"I had to steal the guitar away from Bruce to do the modification. And then I thought I'd better put a switch in there, too, just in case he didn't like the sound. Luckily he uses the low impedance setting all the time."

The only guitar effects Springsteen uses are an MXR Distortion Plus and a Lexicon Prime Time. The Prime Time is used instead of an echo unit; the variable time base also approximates a 12-string effect by subtly shifting the pitch up and down. "The setting was tweaked quickly. It's probably not ideal, but it works fine and eliminates having to keep a 12-string in tune."

Since the Prime Time and MXR are located at the guitar amp, a relay was necessary to allow control of those pieces from the front of the stage. Bruce Jackson substituted a stereo jack at the output of the Distortion Plus: the tip is now the clean signal, and the ring the distortion. A relay in the Lexicon runs off its own 5-volt power supply. The control signal that runs through both boxes also powers the LEDs. Two switches on stage select between fuzz and clean sound, or Lexicon and normal sound. An LED above each switch alerts Springsteen as to whether the circuit is in or out (Figure 7).

Guitarist Steve Van Zandt also chooses between two amps (Mesa Boogie or Roland JC120), depending on the style and sound desired. He makes the choice himself on-stage, by way of a simple switching system. Both amps are miked with Sennheiser 421s, while all acoustics are taken directly through Countryman direct-injection boxes.

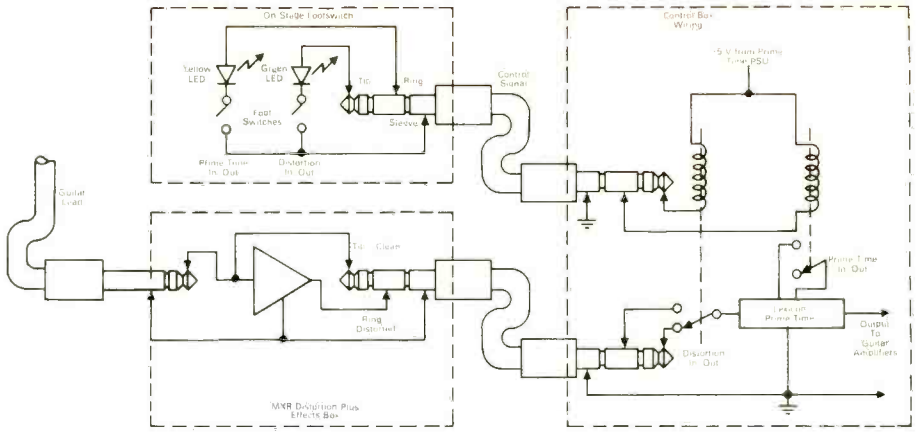

Figure 7: Circuit diagram of a relay-operated footswitch designed by Bruce Jackson. A pair of the switches enable the output from Bruce Springsteen's guitar to be connected through an MXR Distortion Plus effects unit, and/or a Lexicon Prime Time digital delay line.

Bass guitar is also taken direct. "If the house system isn't on," Bruce Jackson explains, "Garry [Tallent] is lost; it doesn't sound like he's playing through anything." Tallent's Acoustic 320 and three bottoms located on stage have very little power relative to the house system; they're primarily there to let him hear some of the highs on stage. The bass is kept out of the monitor mix to avoid muddiness and leakage problems.

The bane of all sax players is to be forced to stay in front of a microphone in order to be heard. Charles Gerber (a previous sound man for the E Street Band) devised a small clip that attaches to the bell of the horn, and shock mounts a mike just outside the bell. The only shock noise it picks up is the actual noise of the instrument itself, which is minimal when compared to the freedom of movement it allows saxophonist Clarence Clemons. Both the tenor and baritone are miked in this way. The soprano, which is only used for one song, is played into the percussion mike mounted on Clemon's mike stand.

A special Helpinstill arrangement is attached to the Yamaha grand, comprising two pickups. One is mounted underneath the strings near the hammers' contact points, giving somewhat of a bright sound. The pickup is actually bolted into the frame of the piano, and extends across the entire sounding board — although not continuously in one long piece (Figure 8). The second Helpinstill is mounted on top of the strings, and more towards the middle. If the pickups are panned left and right (top-left, bottom-right, rather than left piano and right piano), a very fat stereo effect is obtained.

The Helpinstill box looks standard, but is in fact an active device. It has six high input impedance gain stages that feed the pots to adjust individual levels of the two pickups. An active combining network has a frequency-tailoring circuit around it to give the piano its characteristic brightness.

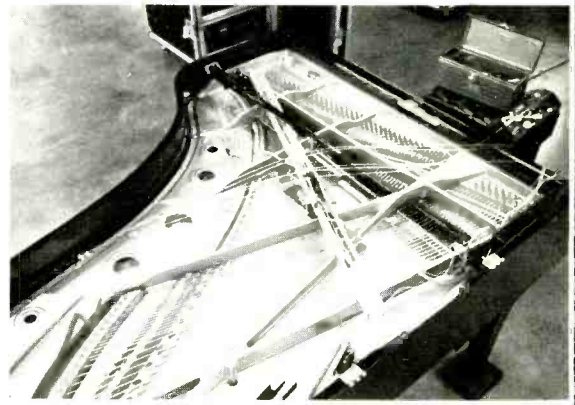

Figure 8: A pair of Helpinstill pickups mounted on the Yamaha grand piano: one beneath the strings near the hammer contact point; the other on top near the middle of the frame.

"Roy [Bittan] is usually left hand heavy anyway," Bruce Jackson says. "He plays to what he hears in his monitors, and they don't have a lot of low end. We talked about it once and he reacted the other way — right-hand heavy! He lightened up a little too much, but the piano is definitely brightened towards the high end. If I have it too fat, it tends to muddy things up when things start rocking. I try to find a happy area that works for both medium and loud levels. I do find myself boosting the low end when he's playing by himself. Basically he acts as a glue to hold everything together, because he's usually pretty consistent and not too harsh."

The Yamaha CS 80 synthesizer is another instrument used only on one song, and is lifted on to stage when needed. It's taken direct via a Countryman box, and fattened up through a Prime Time. Roy Bittan has a volume pedal on the CS 80, which can cause problems.

"It's a situation where we're still working that out," confides Bruce Jackson. "He's building and at the same time I'm pulling him back. He's building faster than the song requires it, probably as a result of what he hears in his

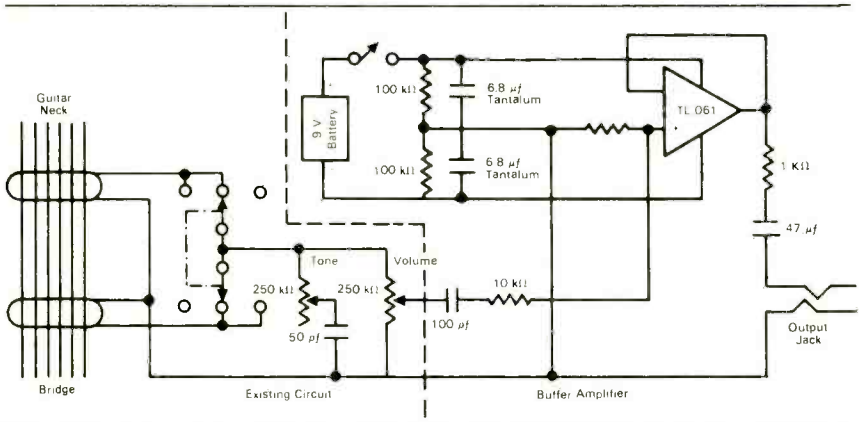

Figure 6: Circuit diagram for modifications made to the wiring of Bruce Springsteen's guitar, including the addition of a simple buffer amplifier. Bruce Jackson points out that the entire circuitry should be built into a Mu-metal shielded box. Also, while the choice of components is not ideal, most of them were scrounged on the road; in fact, the circuit will accept a wide variety of components.

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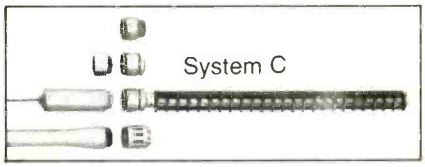

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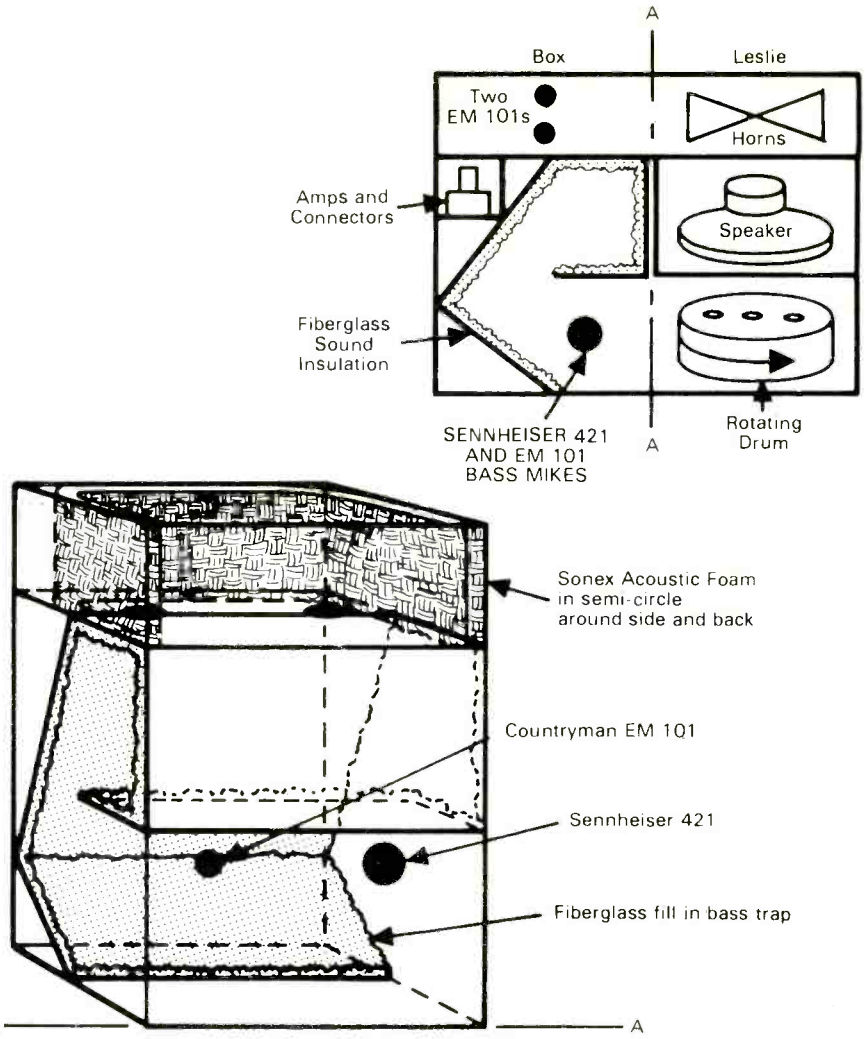


Figure 9: Plan and internal view of special baffle box built for a Leslie speaker cabinet. An Anvil flight case fitted with castors is placed over and around both boxes for easy shipping and set-up. The output from a standard Leslie power amplifier connects to a purpose-built rack unit, designed by Sound Specialties, of Philadelphia, Pa. The rack houses: Biamp Model 270 graphic equalizer; UREI Model 521 electronic cross-over; Roland RV100 reverb; Phase Linear Model 400 amplifier for horns; and Marantz Model 510 amplifier for bass.

monitors. If I let him build up at that rate, it would be the 'Bruce Springsteen Synthesizer Band'. Early on the tour, the organ player would keep time with his volume pedal. That drove me crazy!"

The Farfisa Combo Compact, Acetone Top 5 and Accordian electric pianos are all taken direct for the house and run through a Lab L-5 amplifier for stage sound. The rare, keyboard-operated glockenspiel was rebuilt inside of a box to isolate it, and is miked with a Countryman EM101 — an amazingly flat electret condenser mike. The Hammond B-3 is coupled to two Leslies for on-stage sound.

"Danny [Federici] has special drivers on the horns and they're powered by two Phase 700 amplifiers. Trying to mike them at that level compounds the problems of miking a Leslie in a live situation. Standard Leslies at standard volumes are much easier to put across through a PA."

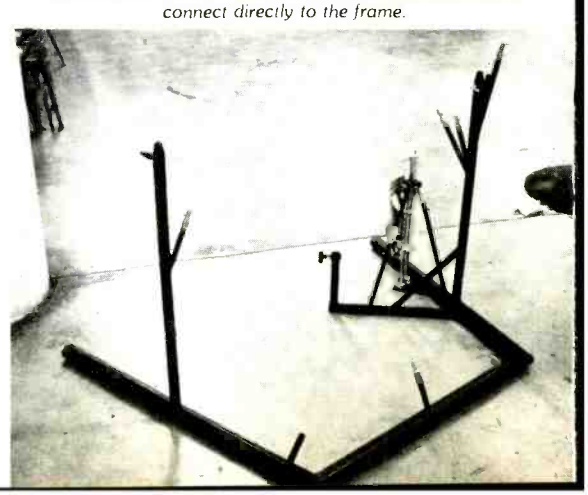
Bruce Jackson had a special baffle box built for a third Leslie, which is kept underneath the stage in a huge flight case (Figure 9). The box is stereo miked on top, double miked on the bottom, and runs at a lower volume to feed the house system. The standard Leslie power amp is placed in the back side of the baffle along with XLRs for easy connection to the mikes inside.

Drums are always the toughest instruments to mike. Leakage and lack of tone control are the chief problems, along with aesthetic concerns after the kit has been buried beneath an avalanche of mikes and stands. Bruce Jackson is striving for a clean "bar band"-look for the drum kit, as well as a present, out-front sound. The first step was to have aircraft welder Bill Carter, from Lititz, Pennsylvania, build a custom frame out of aircraft-grade tubular steel (Figure 10). The bass drum and floor tom fit against the frame, eliminating the common problem of their sliding across the riser.

The snare and high-hat stands are fastened to the frame to allow quick and easy set-up, as well as holding them in place while playing. All mikes have their own quick-release mounts built right

— continued overleaf . . .

Figure 10: A custom tubular steel microphone frame facilitates speedier set-up. The snare drum, high hat and cymbals connect directly to the frame.



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on to the frame, thereby allowing mike placement to be consistent from set-up to set-up. Three mikes are regularly put on the snare: two on top, and one on the bottom. Usually the EM101 inside and the Shure SM-81 on top are chosen to be blended for a room sound; however, any combination is possible depending on the conditions and the particular requirements of any given hall.

The Countryman EM101's compact size allows the mike to be fastened to the inside of the snare shell, but well away from the air hole, thereby preventing any of the wind noise rushing through the opening. Only the mike cord is run near and through the hole.

The Shure SM-81 condenser mike has been modified by adding another capacitor in the head. The standard internal value of this capacitor is not sufficient to keep the mike from overloading. Therefore, an additional capacitor parallel with it creates a 25 dB pad, as opposed to the normal 10 dB pad.

Pre-tour rehearsals were carried out at Clair Brothers' facilities in Pennsylvania — a large rehearsal studio with a sound room isolated from the main room — very similar to a recording studio — and sufficient space to hang all the lighting equipment in order to work out any potential rough spots before hitting the road. Such sound checks foretold leakage problems into the drum mikes from the monitors positioned on either side of Max Weinberg's seat. Sonex foam was fastened to the drum side of the monitors and extended about three to five inches above them, to baffle the speakers output away from the microphones. Although not perfect, it was a very efficient cure.

SHURE SM81
MICROPHONE MODIFICATION

Ron Borthwick, chief engineer at Clair Brothers, recommends the following modification for the SM81 microphone: [1] Open the microphone's switch module. [2] Remove the standard capacitor (it's the only component that protrudes from the module). [3] Replace the capacitor with a 0.001 mfd/200 V component (part number, Pacer/Sprague P10292). [4] Rejoin the module to the body of the microphone.

Bruce Jackson has several ideas he feels may remedy such problems as isolation and the presence of too many obviously visible mikes. He's experimented with guitar pick-ups on the snares, and "the results were great." He's also taped guitar strings to the heads of drums, and then placed pick-ups over them. It gives a solid, punchy sound that can work well for the monitors, where the object is to get the volume as loud as possible without feedback. The overall quality, however, is not totally accurate in terms of an exact drum sound. At the present time, two EM101s are used on the toms to get enough gain for the monitor feed.

"I have some Barcus Berry pickups that I'm going to try on the cymbals," Bruce Jackson continued. "I'll use that signal to gate the actual microphones which will be moved from underneath to above the cymbals, where I think they'll get less leakage. The mikes underneath the cymbals get so much leakage from everything else — drums and monitors — that I can't use the cymbals as much as I'd like to, and I have to ride them a lot. My two choices are the EM101, which is unfortunately omni-directional and picks up from everywhere, or the AKG 451 that offers the feature of a head that can swivel from the body. I'd like to mount the guts of the 451 underneath the cymbal in the cymbal stand, and run a coaxial tube up and over to the basic diaphragm section — which is available as a stock item — mounted above a cymbal.

"The main problem is the tube being sensitive to all the bashing around. It's a matter of isolation, and I'm not quite sure at this point what I'll do. But such a placement would allow the shape of the cymbal to isolate the mike from the monitors and other drums. Right now the monitors reflect off the cymbals into the mikes and it's a trade off: Do I want more cymbals at the expense of ruining the sound of the snare, high-hat, and toms?"

Monitors

C. J. Patterson runs an almost stock 24-in/8-out Midas monitoring board (higher slewing op-amps were added to eliminate IM distortion), and probably has the most demanding job during a Springsteen concert. He is supplying

Monitor mixing engineer C.J. Patterson in front of the Midas 24-in/8-out monitor mixing console.

each musician with his own mix, which changes from song to song, and often during any given song depending on changes in instrumental or vocal volumes (Figure 11).

In order to stay on top of the numerous monitor mixes that need to be made, C. J. uses 3- by 5-inch index cards — one for each song, with the appropriate instructions. For instance, the control card for "Promised Land" may read:

Harmonica Intro
Guitar solo — Steve
Sax
Harmonica
Verse
Harmonica
. . . or "The River:"
Harmonica and vocal - Bruce
Grand to Danny
Organ in sides
Acoustic guitar - Steve and Max -
soft at start then build

C. J. admits that because of the consistency of the parts played, the grand piano is the glue that holds this music together. That fact, coupled with the mixes in Max's (drum), Roy's (piano), Danny's (organ) and Steve's (guitar) monitors staying pretty much the same, makes C. J.'s job a little easier.

As C. J. says, "I'll get a mix in a particular monitor and the guy listening will say: 'That's great! Leave it like that all night.' When in reality he's saying, 'Keep making the changes for each song so the relative volumes stay about the same, even though the stage levels of the individual players change."

Attaching a mike on the bell of the baritone and tenor saxes eliminates the worry of re-equalizing the board setting when Clarence switches from one horn to the other. Each mike is pre-set for the specific horn it picks up. The soprano sax is used for about eight bars during one song and is played through the percussion mike.

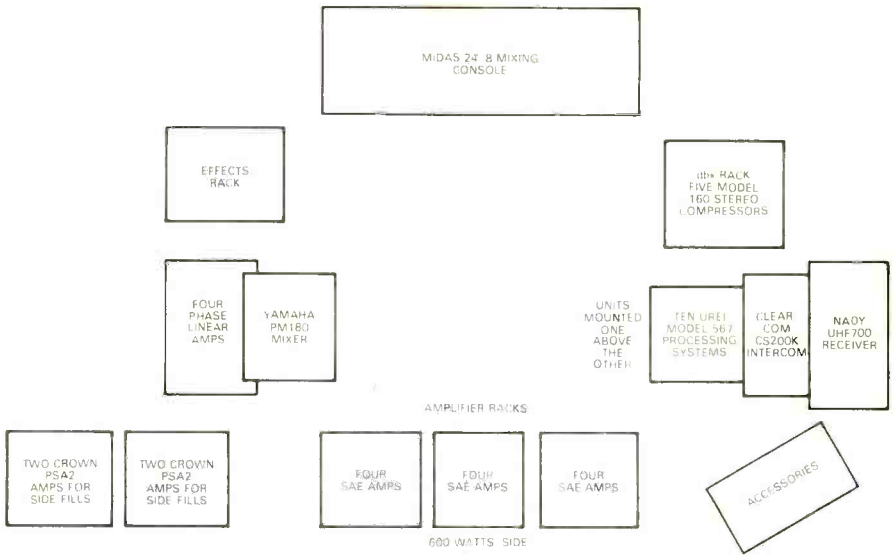


Figure 11: Schematic layout of monitor sound mixing position.

The stage at the Sports Arena was in the focal point of the reflected sound from the walls behind the stage. Those waves, coupled with the monitor outputs and the on-stage instrument sounds, make for some pretty chaotic patterns.

"I could turn up a monitor a little too much and it could effect something I would never expect," says C. J. "There's so much sound and interaction of sound waves on stage that it can become a major problem controlling it." The positioning of on-stage monitors can be seen in Figure 3. The numbering of each monitor denotes the particular monitor-send channels.

The monitor system evolved. When the need arose, more speakers were added. Springsteen's monitors are built into the floor directly in front of and slightly off to the right of his microphone. In addition, two S-4s cabinets are positioned on either side at the front of the stage in case he jumped out onto the stage extension. The in-floor monitors are heavy at about 500

Hz, which has to be taken out by proper equalization. Steven Van Zandt and Clarence Clemons' monitors are also built into and below the level of the stage. All built-in monitors are covered with a metal grate to prevent accidents.

Mix changes require precise and sometimes split-second timing. "As soon as Clarence goes out in front to solo," C. J. says, "I have to have him up in the front monitors or else he's lost; he can't hear himself. The individual mixes are all different. If anyone walks out of their area, they hear a totally different mix and then wonder why they can't hear themselves!"

All eight monitor outputs from the Midas console are run through individual UREI Model 567 Processing Systems. The kick, snare and saxophones input channels are also processed through dbx Model 160 compressor-limiters, although some units only come into operation during loud passages.

"The limiters come in handy when I have to do a lot of mixes at one time, and I can't get them all at once," explains C. J. "It's good to know there's something there to keep things from getting out of hand until I can get to turning down the volume of a loud instrument or voice."

The dbx 160s listed as monitor limiters are actually used to control and read the Crown PSA2 amps powering the hanging side-fills. The limiting functions are dialed out, and the meter used to read output level of the amplifiers; the gain knob functions only as a volume control. Since the Crowns are placed behind C. J. and out of his direct line of sight, this arrangement is a matter of convenience.

The top half of the SAE half-octave equalizer in the effects rack to the left of the board is used on the S-4s monitors located on the front of the stage. The bottom half is used to smooth out Springsteen's vocal in the 2.5 kHz range, where his voice is very strong.

Any channel send or monitor mix can be routed through the White Instruments sound analyzer for instant analysis and rectification.

The 24 input channels to the Midas board are insufficient for all the required equipment. C. J. Patterson has added a Yamaha PM-180 sound reinforcement mixer to handle any extra inputs, the output of which is run through a single channel on the Midas. The PM-180 accommodates the Yamaha CS 80 synthesizer, wireless mike, Springsteen's acoustic guitar, and Clarence Clemon's percussion mike.

C. J. Patterson's equipment is referenced to his monitor desk and then, in turn, to the house desk, which is the only piece that's grounded; everything else has its ground lifted. The general scheme is to establish one reference point, so that there are no multiple grounds to cause ground loops. All the rack gear have chassis and electrical grounds coupled by means of a capacitor and switch, which allows the two to be tied together if desired. Direct-injects are tied to the on-stage guitar amps, and the shields lifted between the console and the D.I.

The intercom between the stage and house consoles is a Clear-Com system, with the control located at the monitor station. Crew members situated stage right and another at stage left, plus one of the roadies, are provided with headsets that run through the same system.

The trunk cable connecting the mike splitter box to the house console is a special Belden 40-pair run. Each line is two-conductor, and has its own separate Belfoil shield. Forty separate grounds are necessary for good isolation. The trunk cable attaches to the board by way of a 120-amp ZIF (zero insertion force) connector.

"As long as it's treated gently, it's very reliable," B. J. says. "Any abuse would cause us all sorts of problems. All the connections are crimp so it's very easy to interface flat cable; the console design uses all flat cable."

Figure 12: Clair Brothers' custom-built 32-in/6-out house mixing console. For ease of transport, the two sections are hinged along the center line, and fold together and down parallel with the sides of the board.

House Mixing

Bruce Jackson and Ron Borthwick (chief engineer at Clair Brothers) were the prime movers behind the design of the Clair Brothers house console. Quality sound with ease of operation, dependability, and portability were the design criteria (Figure 12).

There are no welding points or fixed sections in the board. It's all held together with tension rods, much the same way that several books would be held together by two hands if they were all lifted out from between two bookends at one time. This type of assembly is said to give the board strength and flexibility to absorb the shocks and rigors of the road. The board is presently equipped with 32 input channels, and will easily accept two more bays of eight channels each.

The console's power supply is all common point. To avoid power and ground interactions between a large number of components sharing common connections, a common-point technique was used instead of the conventional power-bus system. The problem can best be understood with the following example using a hotel with all the rooms taking their water from one long pipe. If you're enjoying a shower towards the end of the pipe and someone flushes a toilet in the middle, you get scalded, because they took away some of your cold water. A similar thing happens when many components share the one long common power bus. Since the bus has an finite impedance, various devices tend to interact with one another causing ground noise, oscillation, and more.

With the plumbing example, the answer is to run separate pipes from one common source to every room. This same theory applies to the Clair Brothers console. Each area has many ground and power supply wires running back in a stack of flat cable to one master common point, where all the shields for the rest of the system are also referenced.

The metering is referred to as a plasma display, which is basically neon gas, and gives two simultaneous readings — peak and average — each represented by a different intensity orange light. Each channel meter is about ¼-

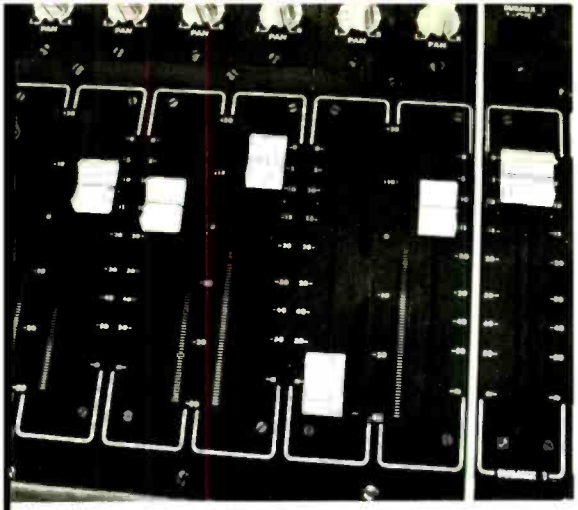


Figure 13: Detailed view of the house mixing console, showing bar-graph meters situated beside each channel fader. The six pairs of sub-mix faders can also be operated individually to provide 12 mono outputs.

inch wide, and runs the entire length of the Penny & Giles conductive plastic fader covering a 50 dB range in the half-dB steps (Figure 13).

Meters placed alongside each fader it represents is said to make locating a problem area almost foolproof, even with the house lights off.

"Plus there was just no room to put traditional meters on the board," offers Bruce Jackson. "If the console took up any more room, it would start to block off sight lines. We could have scrunched things up with the modules, but then it cuts down reaction time and accuracy. For example, using concentric pots is very time consuming and confusing to remember what controls what."

The thumbwheel routing switches were custom-made for Clair, and are basically stereo switches that assign a left and right signal to the appropriate combining busses. (Each bay of eight faders has a subsection combining network, and a master network combines all the subsection signals. Such a system is said to reduce the equivalent gain of the combining amp, and cuts down the noise. If all 32 channels went to one amp, the equivalent gain could produce noise and slew problems.)

Every channel has a thumbwheel which selects the submix fader to which that channel will be assigned. The thumbwheel has seven positions: 1 through 6 determine the number of the submix, plus a "zero" setting that bypasses the submix faders altogether and sends the signal directly to the master output fader. Each submix fader is a double or ganged fader; it can be used as a single fader or split and used for stereo. Panning is done at the original input channel with the pan pot. If stereo is not required, the six submix faders can be split, and used as 12 mono sends. Any combination of stereo, mono, or ganged can be selected.

"I rarely use the submixes," Bruce Jackson continued. "Some people really like them. I'm just as happy to move the individual channels faders but, just in case there's a panic in some area like vocals or drums, I have three submixes assigned. Once the energy gets up there, somebody may yell, 'How about a drum solo?' I can bring up the drum submix rather than all the separate faders.

Battling With Sound Leakage And Feedback

"There are certain acts that lend themselves to achieving good sound easily", says Bruce Jackson. "Then there are acts like Bruce who are good as far as the ballads go, but when they start to get loud on the rockers, you get leakage through the mikes and strange tonal characteristics from the guitar or other instruments. The intensity becomes very harsh, and it becomes a battle."

All of the stage microphones don't pick up leakage as full-range sound; the signal depends on where the cardioid mike is pointing and what it's hearing. Leakage usually yields a thin, unflattering sound. Of course, minimizing leakage can be accomplished by enclosing instruments like the Leslie and the glockenspiel; by rolling-off sound with high-pass filters; or accentuating useful areas and eliminating some problem areas with parametric EQ.

Bruce Jackson has put together a dynamic equalizer section for the console. As the overall volume gets louder and into a problem area, the dynamic EQ senses it and starts to take it out. The dynamic equalizer works in conjunction with a dbx "Over-Easy" compressor-limiter, so that the amount of EQ depends on the level of the problem area signal. The compressor-limiter is fed with a bandpass signal, and operates with a differential op-amp in conjunction with the parametric EQ. By varying the limiter's threshold, a mixing engineer can determine when the sound will be boosted or cut.

"You might want to wait for a certain level where there's an overall peak in the system in a particular range. A small slide fader selects the frequency and another tunes the bandwidth to dial in how much of the problem you want sucked out. I can use it on individual instruments like the saxophone, where a nice, pleasing sound at a lower level may turn into a harsh, obnoxious sound at a really high level. This EQ will automatically suck that harshness right out, or pass the signal unaltered if the problems don't exist." The console's EQ section can also be set to take out proximity effects on vocal mikes. (dbx, Incorporated is said to be working on a new product based on Bruce Jackson's prototype.)

Bruce Jackson had a lot of trouble getting even coverage in the Sports Arena: "Most artists wouldn't be aware, but Bruce walks all around the place." There may be one place where the highs are falling off, and pushing a particular frequency to cover that loss causes a too trebly situation in front.

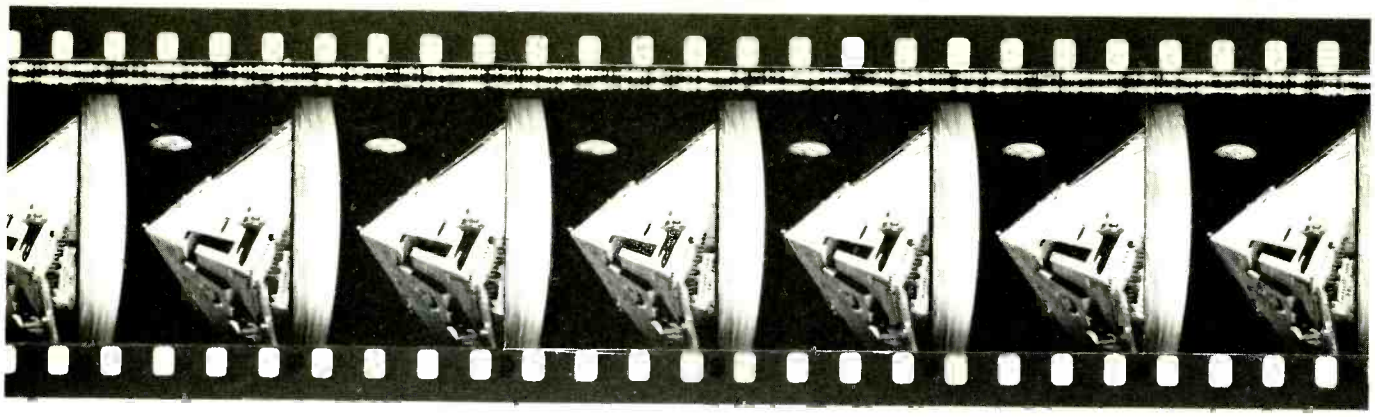
"There are certain big halls that can sound really decent. It all depends on their acoustic design. Smaller rooms can sound better; it can be easier to control the sound, but you don't get the same crowd excitement, and the reverb times become a little too short. It's nice to have a little of that reverb time, but not too much."

Often reverb time is not even over the entire audio spectrum. It may be very long at the low-end, and short at the high-end. If the low-end is pushed beyond its limit, the bass will reverberate forever and the highs will die.

"It was nicer for me when we just played front — not in the round — where the curtains would block off the back of the stage and damp the room down."

The tour is still in its evolutionary stage, however. The last Springsteen tour played 122 shows.

"This tour I'm sure will do even more," Bruce Jackson says. "It's hard to plan very far ahead, because Bruce likes to see the situation, and then make decisions there. He plays with different sets, and sticks with whatever works in that town. It's basically the same thing with the sound." □□□



Mixing Dolby Stereo Film Sound

by Larry Blake

The release in 1977 of George Lucas' *Star Wars* was to the Dolby Stereo System and stereo film mixing what *The Jazz Singer* had been to Vitaphone and film sound 50 years earlier: it simultaneously brought the system to the attention of both the film industry and the general public. The success of both processes marked — to the public at least — the unofficial beginning of work that had been quietly underway for several years. Experiments at Bell Telephone Laboratories created the first viable sound system for films; Dolby Laboratories went one step further and tried to improve the sound quality. The growth of Dolby Stereo in the past three years can best be summarized with a list of the highest-grossing films of that period.

Close Encounters of the Third Kind, *Saturday Night Fever*, *Grease*, *Superman*, and *The Empire Strikes Back* have all carried the Dolby logo, leading to the installation of Dolby cinema-sound processors in over 2,500 theaters world-wide by December 1980 — a number which grows at a rate of 50 per month in the USA alone. Over 150 films have now been released with Dolby-encoded sound tracks.

A less public side effect has been the installation of new stereo re-recording (dubbing) consoles at most major Hollywood sound studios, many of which had not been replaced since the advent of stereo dubbing in the Fifties.

Also during this time the complexity and practically limitless possibilities of stereo mixes has introduced film sound engineers to equipment and techniques that were pioneered in the recording and broadcast industries. Digital delay lines, SMPTE time-code interlock, noise-reduction processing and computer-assisted dubbing have now become an integral part of all film mixing. The blending of the recording and film industries was tangible in the immediacy of the live rock concerts captured for *The Buddy Holly Story*, *The Last Waltz* and *The Rose*, while *The Wiz*, *Hair*, and *Apocalypse Now* put pre-recorded tracks to similar use. All of these films have relied heavily on the fusion of state-of-the-art film and recording studio techniques.

This article will trace the history of stereo sound in motion pictures, the development of the Dolby Stereo System, and the steps involved in the recording, mixing and exhibition of a Dolby Stereo film.

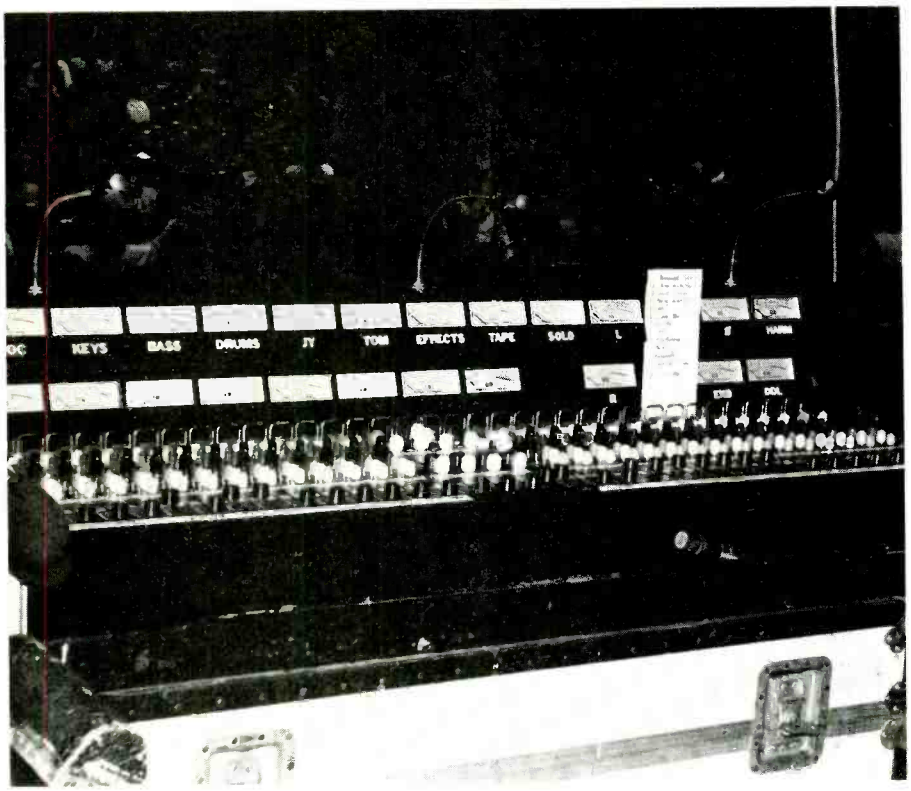
the author —

Larry Blake *hails from New Orleans, Louisiana, and currently resides in Los Angeles. He is interested in pursuing a motion picture directing career, and is currently writing a book on the history of film sound.*

The Early Years

In an excellent article in the February 1939 issue of the *Journal of the Society of Motion Picture Engineers*, W. H. Offenhauser, Jr., and J. J. Israel review early attempts at multiple-channel film sound, beginning with the 1911 patent of A. Rosenberg, whose "system" simply entailed recording sound from two microphones on two optical recorders. The authors go on to note that "other inventions may be classified as frequency characteristic variation (sic); still others have shown multiplicities of microphones, multiplicities of amplifiers, multiplicities of recording means, and multiplicities of loudspeakers; others disclose dummy heads and their equivalents with microphonic ears." (The interested reader is referred to the bibliography and patent references accompanying their 1939 article.) It is extremely doubtful whether any of the inventions had a life out of the patent office and the blackboards of their inventors.

— *continued overleaf . . .*



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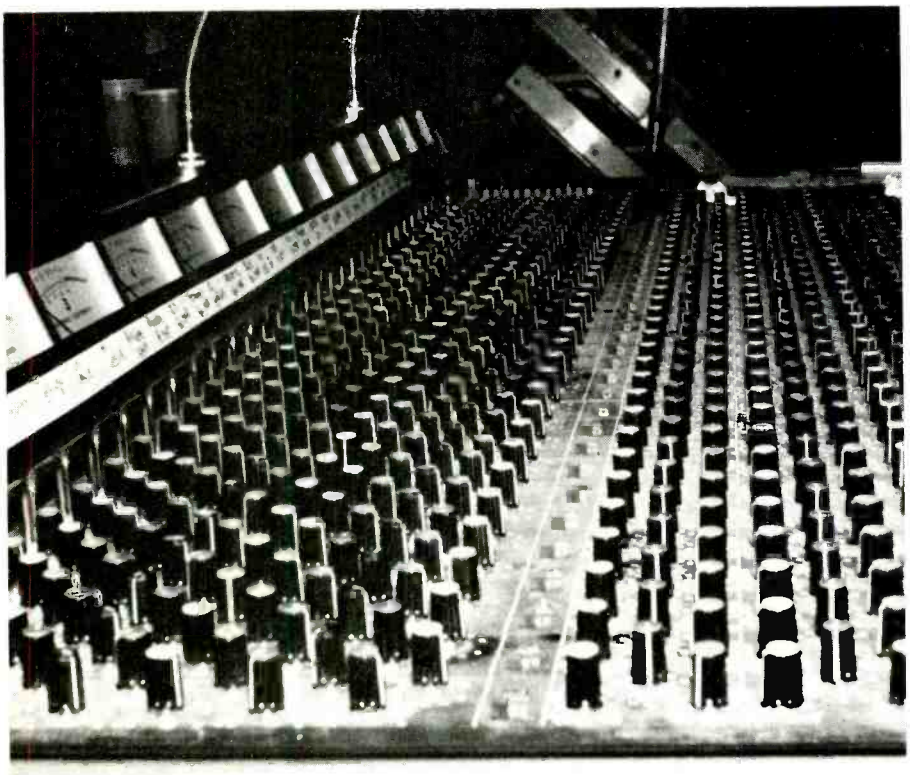

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These simple rugged heavy duty mixers stand up well under difficult operating conditions to give long life on the road. Modular construction and plug-in IC's permit easy servicing. Large illuminated VU meters with 30000 hour lamps are visible under all conditions. Foam lined Anvil trunks are optional.

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312-32X12A32L/NS

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These rugged, reliable Stage Monitors have become the standard of the industry and are used by many professional sound companies.

The 312L Stage Monitor is similar but adds three parametric equalizers, 12 send pots rather than 8, and a four inch slider attenuator to the input module, and is in a 308 frame. Slider Masters are an optional extra. The 312L system makes 12 output mixes.

Figure 1
A sample frame from a 1936 Blumlein stereo optical film, showing the use of two, variable-area soundtracks.

In all probability, the stereo optical soundtrack first saw the light of a projector in 1935, as recorded by stereo pioneer A. D. Blumlein. The sample frame in Figure 1 shows two variable area tracks.

On November 13, 1940, Walt Disney's *Fantasia* was released with a three-channel soundtrack on a separate film, running in interlock with the picture, to allow for double-width tracks. A fourth track carried control tones to increase (by up to 20 dB) the levels of the three main speakers, placed left, center and right behind the screen. Notching on the side of the soundtrack could place front information on either side wall or in the ceiling. Most of the music for *Fantasia* was recorded on eight optical recorders at the Academy of Music in Philadelphia. Six channels were devoted to individual sections, one to a balanced mix, and another to a distant microphone. This allowed for overdubbing a few bars of one section, if necessary.

In its original engagements, *Fantasia* was released in "Fantasound" to only 14 theaters, because the onset of World War II prevented the building of further sound systems, each of which cost $45,000 and weighed 15,000 pounds.

The premier of *This Is Cinerama*, on September 30, 1952, touched off the wide-screen and stereophonic sound sweepstakes of the Fifties. Cinerama's sound system utilized five loudspeaker channels behind the screen, and one on each of the side walls. The seven-track magnetic film ran in interlock with three projectors used to cover the 75-foot-long, 146 degree curved screen. Many film scenes were recorded with seven tracks of true stereophonic information, and it can safely be stated that this film was the first contact millions of Americans had with high-fidelity sound recording. The three-camera/projector system was cumbersome and expensive, however, and last used in 1963.

In the spring of 1953 Warner Brothers' two-projector 3-D film, *House of Wax*, utilized a three-channel magnetic soundtrack in interlock, a standard mono optical track on the right projector being used to feed surround speakers in the auditorium. The left projector contained a mono mix as emergency back-up.

Stereophonic Soundtracks

Composite stereo prints were first used in Twentieth Century-Fox's CinemaScope process, which is best known to the public for its wide-screen anamorphic[1] lens system. *The Robe* was the first CinemaScope film, released on September 16, 1953. Production dialogue was recorded originally in stereo with three cardioid microphones, each capturing sound for a third of the screen. This awkward system continued until 1958; thereafter mono dialogue was panned to follow the action. "Swinging" dialogue was standard practice in stereo films during the late Fifties and Sixties, but is not done much anymore.

Re-recording was done to four tracks, with three loudspeaker channels behind the screen, and one for the surrounds. Sprocket holes on release prints had to be made smaller to fit the magnetic stripes.

The cost of converting a theater for CinemaScope was approximately $5,000; many theater owners resented Fox's dictum of having to purchase the necessary sound system and high-gain screen to enable the lenses to project its films. Eventually these demands were lifted. Fox originally refused to release mono prints of CinemaScope films, and instead placed an optical track on four-track prints. Since the optical track was half-covered by magnetic striping, it was 6 dB lower in overall sound level and of poor quality. The 35 mm magnetic process fell into disfavor with many studios, who regarded the added cost of prints, complaints from exhibitors, and the cost of stereo dubbing as needless headaches.

Problems with magnetic prints became self-evident. Prominent among these is their higher cost (approximately double that of "conventional" film), since each print has to be individually striped, recorded and checked in a theater. The extremely tight wrap of film against the heads makes for rapid wear, causing high-frequency loss. Eventually the magnetic oxide will become worn down, with drop-outs and scrapping of the print an obvious result.

The third and most successful camera/sound system in the race was Todd-AO, first used on *Oklahoma!*, which opened October 13, 1955. Mike Todd, who was also invovled with the production of *This Is Cinerama*, wanted a process that would give the same effect as Cinerama, except that the image would "come out of one hole." The result of the American Optical (the "AO" of Todd-AO) Company's work was a photographic system employing 65 mm film whose frame size was 3.5 times the size of a standard 35 mm frame, making for brighter, sharper images.

Sound was mixed to six tracks, with five speakers behind the screen and, again, one channel for surround speakers. The 65 mm negative was printed on 70 mm wide stock, the additional space being used to accommodate wide magnetic stripes outside the perforations. (This system has never used optical soundtracks.)

From its inception, until 1970, this format was used on some of the biggest films Hollywood had to offer: *Ben-Hur, West Side Story, The Sound of Music, My Fair Lady, 2001: A Space Odyssey, Patton*, and so on. Its demise was caused largely by the studios' decision to no longer photograph in 65 mm, but instead to blow up 35 mm negatives to 70 mm prints. The added expense of the large format — approximately $200,000 for an average feature — was not deemed necessary; since 1971 all films released in 70 mm have been photographed originally in 35 mm.

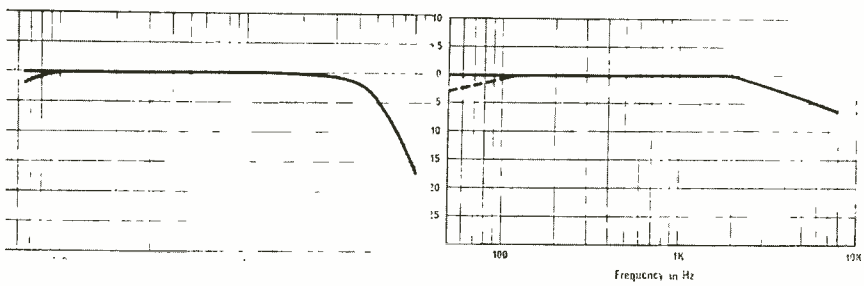
The foregoing reasons, and the severe losses incurred by most studios in the late Sixties, resulted in fewer 70 mm releases. As an economy measure, many 70 mm films were mixed in four-track stereo. Information for tracks two and four was created by combining the center channel 50/50 with left and right tracks, respectively.

Mixers of the period felt that this method was inferior to discrete six-track dubbing. We shall return to this matter in a different context later, but suffice it to say that from 1971 to 1977 almost all stereo films were recorded four-track for release in the four-track 35 mm, and/or six-track 70 mm magnetic formats.

— continued overleaf . . .

THE ACADEMY CURVE VERSUS WIDE-RANGE MONITORING

In 1938 the electrical monitoring curve shown in the left-hand figure was established by Hollywood to organize all studios and theaters to the same standards. Previously each studio used different high frequency roll-off to combat the optical noise revealed by modern speakers. Because the study was conducted by the Research Council of the Academy of Motion Picture Arts and Sciences, the response became known world-wide as the "Academy Curve."

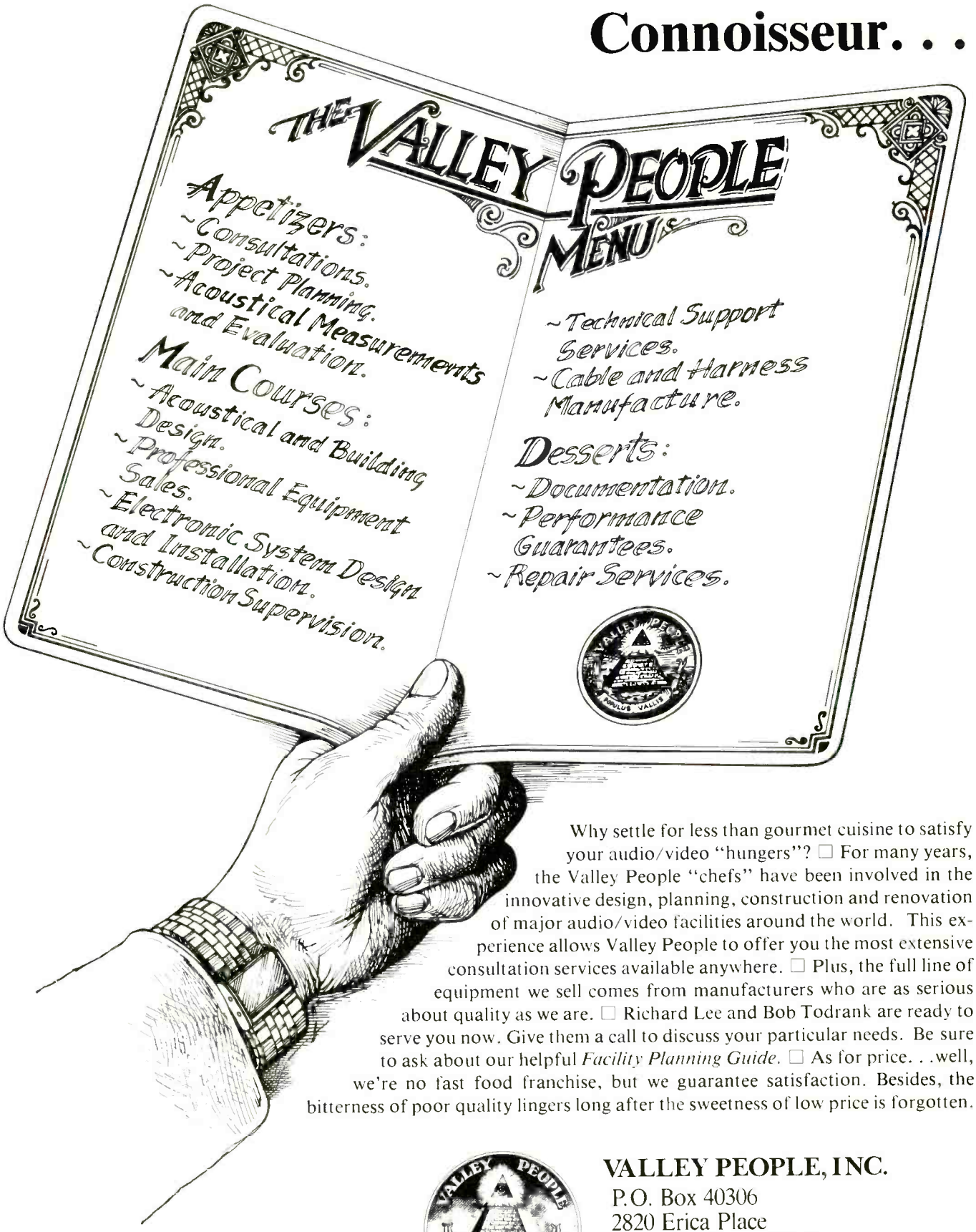


Since the days of CinemaScope, sound mixes for magnetic stereo release have been monitored without the Academy filter, although no specific curve was ever established. Dolby films since 1972 have used the curve shown in the right-hand figure, later standardized by the International Standards Organization (ISO) as the "X" curve in Bulletin 2969. The presence of 1/3-octave equalization in re-recording monitoring and in theaters allows the benefits of the extended curve to be realized, as Les Fresholtz, dubbing mixer at Burbank Studios, explains:

"When you did a CinemaScope stereo dub, you would remove the Academy filter, but the speakers still had certain deficiences in the room. These you would find and work against, knowing that the product wouldn't end up in another theater with those particular problems."

Curve "X" of 2969 specifies a roll-off of 3 dB per octave above 2 kHz, when the theater is measured with pink noise. Because this test procedure will show the direct signal from a loudspeaker, plus the reverberation component from the auditorium, the actual direct response from the loudspeaker is closer to a roll-off of 1 to 1.5 dB per octave above 2 kHz; subjectively this means that the response is down about 3 to 4 dB at 10 kHz.

For the Audio/Video Facility Connoisseur. . .



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Dolby Laboratories' beginnings in the motion picture field paralleled the growth of its A-type noise reduction: initial acceptance was confined, in the main, to Great Britain. Dolby noise-reduction had been used in the scoring of such films as *Oliver!* and *Ryan's Daughter*, with England's Rank/Pinewood Studios using the Dolby System to reduce noise build-up caused by generations of pre-mixes. Stanley Kubrick's *A Clockwork Orange* was the first film in which Dolby noise-reduction was used on all magnetic generations up to the final magnetic master. (The film was released with a standard Academy mono track.)

Around this time Ioan Allen of Dolby began a thorough investigation into the possible applications of A-type noise reduction to film sound. It was quickly discovered that much of the bad reputation of optical soundtracks was a function of the practical use, rather than the abilities, of the optical medium. Prominent among these factors was the degree of high-frequency boost needed to counteract the steep Academy roll-off equalization, and the resultant distortion. The panacea for such "ills" of optical soundtracks lay in widening the bandwidth and using Dolby noise-reduction to counteract the resultant rise in optical noise.

The first film produced with a Dolby-encoded soundtrack was *A Quiet Revolution*, which had been made to explain the system's benefits to exhibitors. At the time, in early 1972, the Model 364 Cinema Noise Reduction Unit was introduced to facilitate the playing of Dolby-encoded mono tracks.

Optical playback is achieved by shining light through a slit on to the soundtrack and finally to a photocell. The width of the slit is directly analogous to the gap of a magnetic head: the narrower the slit, the higher the frequency that can be resolved. The slit can only be made so small before reducing the output to unusable levels.

The Model E2 Cinema Equalizer was introduced in 1973 as a companion to the 364, providing compensation for the high-frequency roll-off in optical playback due to slit loss. The unit also included 1/3-octave equalization to improve loudspeaker response. Most sales of 364/E2 units were made in Great Britain and Canada. Approximately ten films were eventually released in Dolby mono.

The obvious next step for Dolby would be the application of the same techniques to stereo prints, and in late 1974 *The Little Prince* was shown with Dolby-encoded four-track magnetic release prints. Although a few other films, including *Nashville* and *The Song Remains The Same*, would be released in this format, work was already underway on the design of a stereo optical track.

Early Seventies: Two-Track Stereo

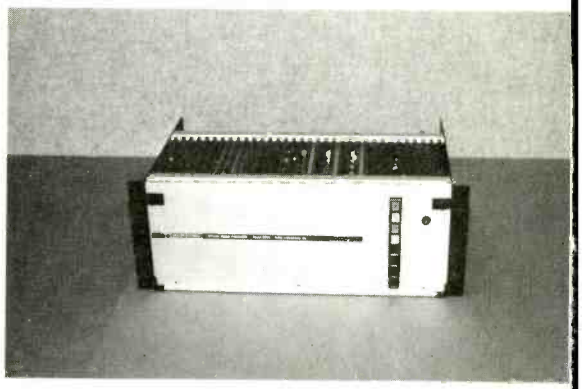
Eastman Kodak and RCA had begun work on a two-track stereo optical system in 1973. They were soon joined by Dolby Labs and its noise reduction and theater equalization techniques. At the November 1974 meeting of the Society of Motion Picture and Television Engineers, Dolby's two-channel Stereo Variable Area (SVA) soundtrack was first publicly demonstrated, using a test reel re-mixed from the Dolby mono film *Stardust*.

Release of *Tommy* in the Spring of 1975 coincided with the introduction of the CP-100 Cinema Processor for Dolby-encoded magnetic and optical stereo soundtracks.

At this point development of the Dolby system moved to Hollywood. 1976 saw the mixing of the first Dolby Stereo optical film in America — *The River Niger*. Later that year *A Star Is Born* took over the lead from *Tommy* in the release-print format championship by being distributed in six systems: 35 mm four-track and 70 mm six-track Dolby and non-Dolby magnetic prints, Dolby SVA, and standard Academy mono.

The release of *Star Wars* in the spring of 1977 saw two significant changes in Dolby Laboratories' approach to film sound. First, the six-track spread from four-track masters would only involve adding low-frequency information below 200 Hz to channels two and four. Additionally, these tracks are used only when required to augment music and effects and, as the theater equipment contains low-pass filtering, are not Dolby encoded. According to Dolby literature, the purpose of this method — dubbed "baby boom" — is "to subjectively extend the bass response of the theater sound system." (Altec A-4 loudspeakers, commonly found in 70 mm houses, roll-off steeply below 80 - 100 Hz, especially as many theaters now have no room for speaker wings. "Baby boom" is designed to help compensate for this low-frequency deficiency.)

The second change was the ending of Dolby's regular involvement with 35 mm four-track magnetic prints, in October 1976, with the introduction of the CP-50 Optical Sound

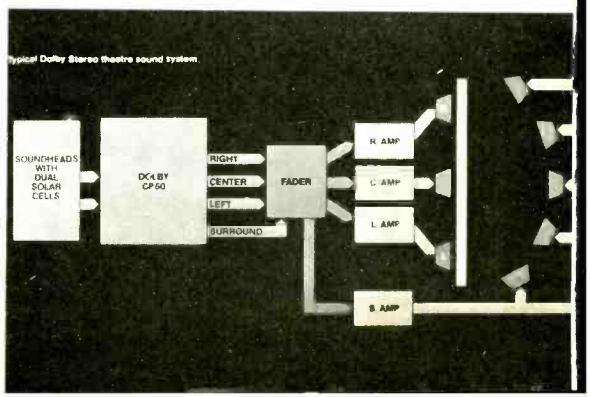


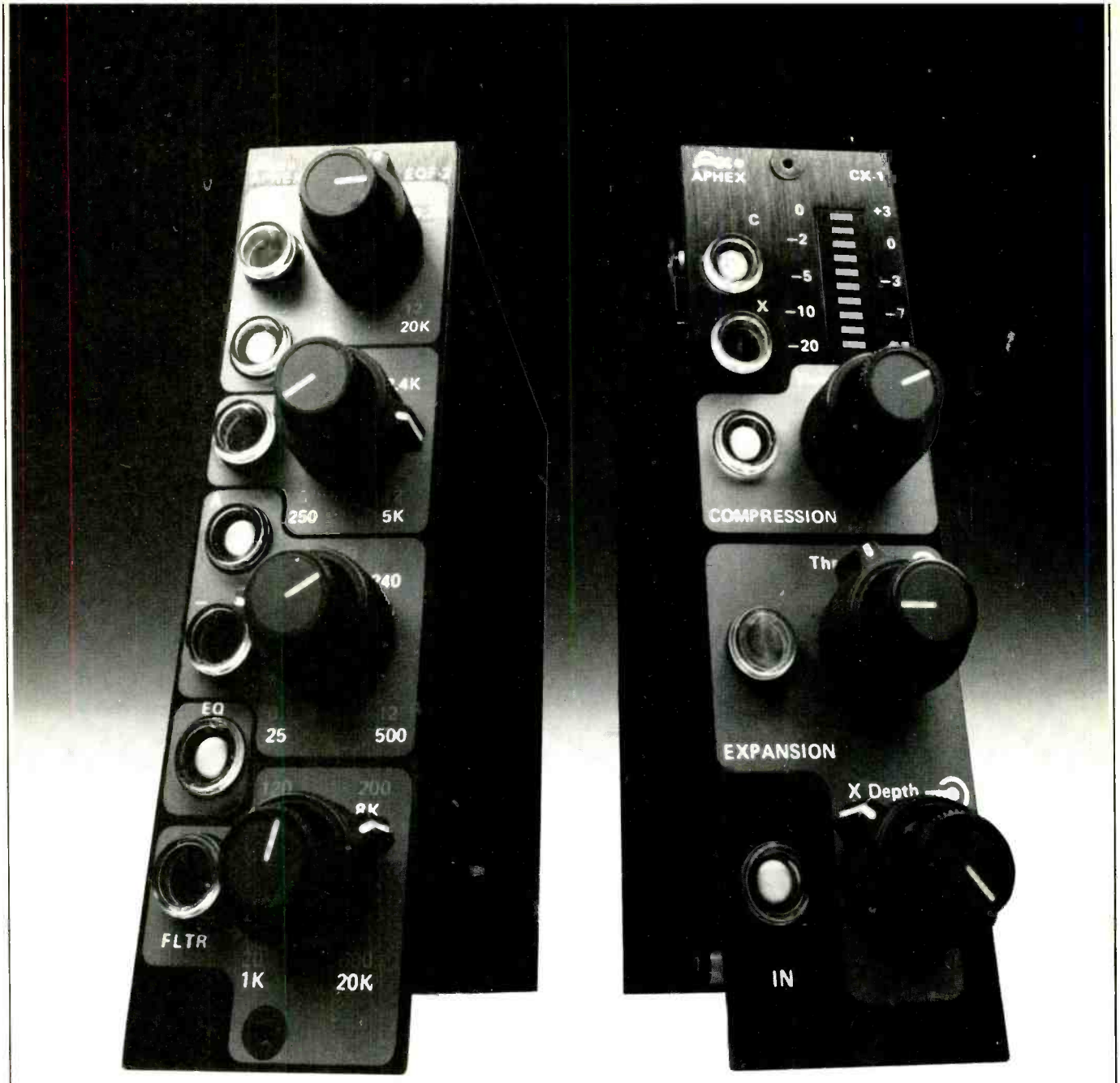
Processor. This unit cannot process magnetic prints, but still gives theater owners a simple and inexpensive method of exhibiting Dolby Stereo optical films. Thus, the success of *Star Wars* established the commercial viability of both the "baby boom" and SVA formats.

Thirteen films were released in Dolby Stereo during 1977, a figure that increased by ten in each of the next two years until 1980, when over 60 films carried the Dolby logo. A few films originally released with Academy mono tracks, such as *The Exorcist*, and *American Graffiti*, were re-mixed and subsequently re-released in Dolby Stereo format.

Dolby Stereo Film Sound

Beginning with *A Star Is Born* and ending in the Spring of 1979, Dolby SVA prints had surround information encoded using the Sansui





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QS Matrix, in addition to techniques designed to reduce crosstalk from the front speakers. The center channel had been derived by a logic circuit which analyzed the differences between the left and right track signals. Separation between channels was of the order of 6 to 8 dB.

Hair and *Hurricane* were the first films to be mixed with a new "center channel and surround derivation card" which allows much greater separation between channels. The workings of the matrix will be discussed in detail below, but for now let's find out why a matrix is used in the first place, and why Dolby doesn't make a four-channel optical system.

Dolby marketing vice president Ioan Allen: "The narrower you have the tracks, the closer you are to being at the mercy of what I call the 'laboratory glob factor' — the dirt or whatever can happen to the track. As you reduce the size of the track you are fundamentally risking very surprising things happening in theaters. It would be nice to use discrete tracks, and have left, center, right and surround channels, but it's a darn sight safer to encode the material on two tracks."

Other reasons stated include the fact that having more than two tracks means that printer misalignment and projector weave become more critical. Not only do two tracks have a better inherent signal-to-noise ratio than three or four, but Ioan Allen also considers them to be superior with regard to compatibility with standard mono projectors.

It should be noted that two systems are currently being considered which indeed do have four discrete tracks: Vistasonic Sound, developed by Paramount Sound systems, and Comtrack (which was explained fully in the February 1980 issue of *R-e/p*). Vistasonic Sound had its debut in December 1980 at special engagements of *Popeye*. Only five theaters — two each in Los Angeles and New York, and one in Chicago — played the film in the Paramount System.

Level And Phase Relationships

Don Digirolamo, Dolby sound consultant, explains: "If a signal is sent to the left channel, it will appear in the Left total (Lt) track at unity gain and in phase. Similarly, right channel information will appear in the matrix as Right total (Rt) at unity gain and in phase. Information in the center channel will appear in both the Lt and Rt at 3 dB below unity gain. It is not placed 6 dB down, however, which is where it would be to add up straight across, because if it added up at equal level the decoder wouldn't be able to tell left from right from center in terms of power, since there wouldn't be a discriminating gradient.

"The surround information is recorded 3 dB down on both Lt and Rt, and phase-shifted so that one channel is plus 90 degrees and the other minus 90 degrees relative to the front information. The surround component to Lt, versus the surround component to Rt, is almost but not quite 180 degrees out-of-phase (see Figures 2 and 3).

"Anything that is on Lt only becomes left-channel information, and anything on Rt only becomes right-channel information. Anything that is on both, in phase, goes to the front center, and anything that is out-of-phase between them goes to the surrounds. On playback, information placed in the center channel will appear at -15 dB on both sides. Anything placed into the left will be 15 dB down at the center, 'infinitely' down on right, and vice versa.

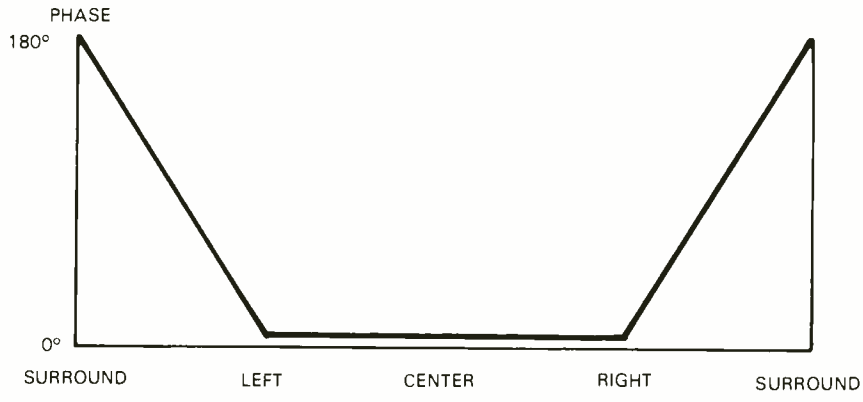

Figure 2: Phase/Orientation relationships for the Dolby Stereo matrix-encoding process.

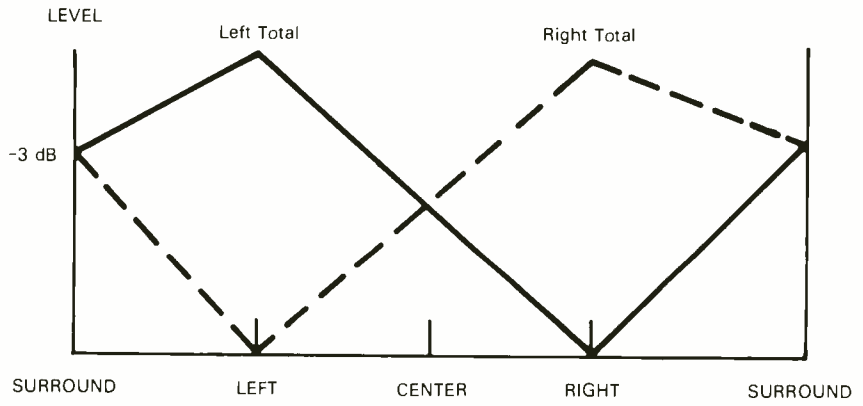

Figure 3: Level/Orientation relationships for the Dolby Stereo matrix.

"There is 'infinite' separation across the circle (Figure 4) so that center and surround are mutually exclusive, as are left and right. Problems begin when one is dealing with adjacent channels, because obviously there is not infinite separation between adjacent points on the circle. Separation varies dynamically with program material."

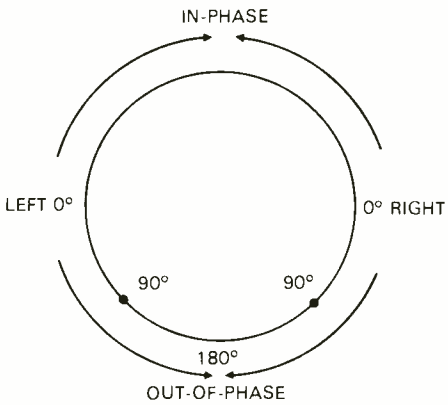

Figure 4: Phase/Orientation relationships for the Dolby Stereo matrix, shown in polar coordinate form.

Mixing For Dolby Stereo

A Dolby Stereo mix requires more of a dubbing studio than just a stereo console, golden ears and capable maintenance. The difference lies in the wide-range monitoring and the permission it gives the matrix to expose the slightest maintenance error. Studios with little experience of Dolby Stereo rely on Dolby's sound consultants to see that technical areas are up to snuff, and enable mixers to trust the mysterious box in the corner that is constantly analyzing their taste.

According to Don Digirolamo, "A Dolby sound consultant ends up being the one person usually whose only task is to run interference between the labs, the studio, the product, the producer, Dolby equipment and what-have-you, in terms of the technical quality of the sound. On the engineering end, presumably the studio will already have the Type-A noise reduction. They will need to get 1/3-octave equalization for the monitor speakers, which usually comes from either a CP-50, 100 or 200 Cinema Processor, or from individual 1/3-octave equalizers."

Although Bill Varney deals with Dolby Stereo from the console (Stage D at the Samuel Goldwyn Sound Facility at Warner Hollywood, where he is the lead re-recording mixer in a team with Steve Maslow and Greg Landaker) and not the machine room, his engineering background and long list of Dolby films make him a capable judge of the system's technical parameters: "Pretty close is not OK with the Dolby process; everything has got to be dead on and there is no room for error, in terms of equalization of machines or levels. In the Academy process you sometimes get a chance to hide bad dialogue and bad music. With Dolby you don't get that chance; it's all hanging out there. If something is wrong, you're going to hear it."

All tracks of *Star Wars* were Dolby-encoded, but this was the exception that proves the rule, since usually only music goes to the dubbing stage encoded. Bill Varney would like to see this situation changed: "I would like to see everything Dolby-encoded the first time it is transferred to magnetic film; anything that you can do to cut the noise helps. The only

Chet Atkins
Nashville, TN

Lindsey Buckingham
Fleetwood Mac. Hollywood. CA

Bob Siebenberg
Supertramp. Los Angeles, CA

Quad Tech Studios
Hank Waring. Los Angeles. CA

Russian Hill Recording
Jack Leahy. Bob Shotland. San Francisco CA

Soundtrek
Ron Ubel. Kansas City. MO

Lincoln Center for the Performing Arts
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drawback is the danger of having material recorded at various studios with different Dolby levels. Most often, though, the place that does the dubbing has also done the transfers.

"However, it is not absolutely necessary to encode the tracks. I've heard people say, 'I'd love to do the final re-recording of my picture in Dolby, but none of the elements are Dolby-encoded.' People in this business still don't know what Dolby is all about. There are still people who think that it's some magic encoding process and if it hasn't been done, then you can't use the material."

Mixing Through The Stereo Matrix

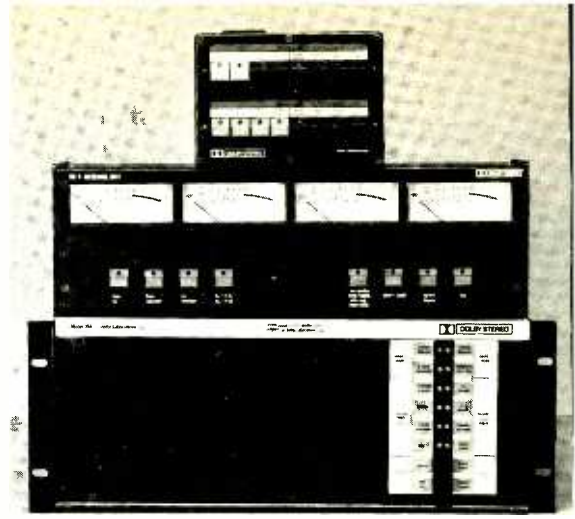
To assist in the dubbing of Dolby Stereo films, an encode/decode monitoring and recording unit, the DS-4, was introduced in late 1979. This portable unit allows mixers to hear exactly what will be reproduced in the theater; it encodes the four channels of information into a simulated two-track release print, and then decodes it back into four channels in much the same as happens in a theater. The flick of a switch will place into the center channel a combination of the left and the right tracks, remove the Dolby decoding, and insert into the monitor the Academy filter. In addition, the DS-4 contains a function whereby a stereo mix can be monitored discretely — without the matrix — to check how it will sound on 70 mm prints.

Bill Varney: *Grease*, my first Dolby film, was monitored in a four-track discrete manner. In the early days, the Dolby representatives, who worked closely with us on the sound stages, had the attitude that we should do it this way because, basically, the matrix is going to recreate this same sound imagery once we get to the theater. When we finished that film and reduced it to the matrixed two-track stereo format, and decoded it back to four, I found that it was a completely different picture. The stereo width had narrowed down tremendously, among other things. We had to re-dub it and, by re-balancing, try to get back the width we had lost.

"Monitoring through the matrix, we are now in the position to deal with all of the dynamics and spatial effects, and hear what will ultimately be heard in the theater. We can make all the compensations necessary to make the mix work and there is no guesswork. It's a simple way to go."

Usually only a few 70 mm prints are made for any film, and they play in New York, Los Angeles, Chicago and other large markets.[2] In these cases, the large majority of stereo prints will be in 35 mm stereo optical; hence, the importance of monitoring through the matrix. In the spring of last year, however, Bill Varney found himself in a unique position during the mix of *The Empire Strikes Back:* "Ben Burtt [the supervising sound editor], the crew and I decided that since we were going out with over 125 70 mm six-track prints as our initial release, the best thing to do was to make sure that those prints were going to work and work well, and to deal with the Dolby matrix later for the 35 mm secondary release. So we monitored the film in a discrete format all the way and, once the six-track was done, went back and put it through the 4-2-4 monitoring. We were pleasantly surprised, and had to do very little in the way of correction; the picture moved into the Dolby Stereo mode easily.

"The two areas where you have to be careful, and they are hard to predict, are the boom channels — speakers two and four — and, more importantly, the surrounds. The idea was to make the film work on the front speakers without any surrounds or booms at all. We mixed the film by recording on just channel one, three, and five. We then went back and added the surround channel and the boom on the other tracks. The advantage to that is that when the film goes out in Spearfish, South Dakota, and the surround speakers and boom channels are not working, at least you know as mixers and creative people that the film is going to play and play well — with just the front speakers working."



The Dolby DS-4 Studio Monitor and Transfer System comprises three units: a processing system (bottom); metering unit (center); and remote control (top). The system enables dubbing mixers to monitor the transfer and mixing process at various points in the signal path from the original four-track master tapes, through the dubbing console, to the optical or magnetic soundtrack master. Four meters are provided for monitoring left, right, center and surround channel levels; the meter ballistics can also be set to either VU (average) or peak-reading. A variety of record and monitor modes can be selected via the remote control unit.

Surround-Channel Delay

Surround speakers are also a factor in determining 35 mm and 70 mm capability, as Steve Katz, Dolby consultant to all early Dolby stereo films, explains: "A delay is built into the Dolby Cat 150 cinema decoder card for a specific reason: it minimizes the perception of breakthrough of information — such as dialogue — from the front speakers to the surrounds. If the surround is delayed by 60 msec., then it will arrive just after the front information. The delay is adjustable from 20 to 100 msec., so you can match it to each theater. In the days of discrete stereo mixing, they would print the surround information with a second pass, delayed a frame-and-a-half, or 60 msec. That was considered a fair approximation, as most theaters are around 100 feet deep.

"The rule of thumb is that sound travels about a foot per millisecond in free air, depending upon temperature, humidity, etc. So if you're 80 feet away from the screen with a surround speaker near your seat, and the same information is fed into the surround and stage speakers, the surround information will reach your ear in 10 msec., and from the screen speakers 70 msec. later.

"You run into a problem when you plan to release the film in both stereo optical and 70 mm which, of course, will not be played through the matrix. If you record your delay on the stage — and with digital delay lines there's no reason to stagger the tracks — then you will wind up with a doubling of the delay time on stereo optical prints. Which is the opposite of the original problem, in that sound will now come out of the surrounds much later than it will from the fronts.

"I recommend that all Dolby films be monitored through the matrix, even if there will be a 70 mm release. That way you can check that you have no problems with phasing, that the surround you're putting down is getting through, and that the pans are working. When you take the matrix out and listen discrete, it widens it out. If you're happy with what you have through the matrix, you'll be thrilled with what you have discrete.

"If you monitor discrete, then put a delay in the monitor, but don't record it. When you make your 70 mm printing master, you re-introduce the delay, and this time you actually record it on the surround track."

Dialogue Mixing

An oft-repeated criticism of the Dolby Stereo system is that it emphasizes sibilant dialogue. Here are two "explanations" of that problem.

First, **Don Digirolamo**: "I rant when I hear that 'Dolby Destroys Dialogue.' The only way I can answer to that is by tracing a Dolby film through production. The music tracks have been recorded in 24-track, or three-track 35 mm; the musicians are playing in a quiet environment and it sounds great. You take it to the dubbing stage and play it through the wide-range monitor and it sounds beautiful; everything is fine.

"You have your effects, some of which are taken from production tracks, and you take a lot of care and get library effects that are wide-range. All of these little things go to make one effect sound right. You play them and they sound great.

"Then you take your production dialogue, which has been recorded oftentimes with radio mikes buried in the clothing on the person somewhere, so that it has several layers of cloth between it and the person's voice. It usually picks up chest-cavity resonances, or whatever, and sound completely unnatural and equalized. There's a fair amount of background noise on the stage — anything from camera noise to air conditioning to whatever. You record this and play it back on the dubbing stage through the wide-range monitor and it sounds like . . . a lot of background noise, air conditioning, clothes rustle . . .

"With the Dolby System you can hear that your effects and music are beautiful and clean . . . and that your dialogue is pretty nasty. In an Academy situation you take your beautiful effects and music and play them through an Academy filter. When you do that to your dialogue, too, it all sounds much more similar in quality. When you don't run any of that stuff through an Academy filter, the differences are much more apparent. Hence, the opinion that Dolby Destroys Dialogue.

"I call the Academy filter 'The Great Equalizer,' because it makes everything sound the same. The Dolby System doesn't do that and consequently the dialogue stands out as the weak link in the chain."

Steve Katz, in his role as the original Dolby consultant in Hollywood, had to face the same question, and here is how he attacked the problem on the dubbing stage: "I built a de-esser and found that by using high- and low-pass filters with gentle — 6 dB per octave — slopes, and shelving rather than peaking equalization, you can minimize the sibilance. I will take a pass with the de-esser on each generation, because you can take so much out at a time without dulling the whole track.

"Sibilant distortion usually falls at around 3 kHz and 6 kHz, and on the Dolby track 3 kHz is as flat as a pancake. An Academy track is 2.5 dB down at 3 kHz, and 8 dB at 6 kHz. The thing is that many Academy pictures are incredibly sibilant — the 3 kHz breaks through like crazy.

"Some mixers are so crazed about stripping a bit of camera noise or hiss or hum that they are willing to destroy the sonority of the dialogue for the sake of a little noise. Meanwhile in the background there's a car crash or a thunderstorm!"

Mono Compatibility

The soundtrack area of standard mono films and Dolby Stereo optical prints are very similar. Both contain two tracks, which in mono are identical and in Dolby contain Lt and Rt information. Thus Dolby Stereo prints are physically compatible with standard mono projection equipment, and it was originally claimed that they would play equally well in stereo and mono. Experience has shown that physical compatibility is not sufficient, however. As we shall see, the *mix* on the stereo tracks determines how well they will play in mono.

Lately, distributors have been increasingly interested in the economy of a single-inventory release — that is, supplying only stereo prints to mono and stereo theaters. (Such films as *Star Trek*, *The Empire Strikes Back*, and *The Jazz Singer* are good examples of this sort of release.) Although mono mixes were made for foreign language dubs, stereo prints are in general domestic circulation.

Compromises in dynamic range and stereo width must be made in the stereo mix, to insure compatible mono replay of stereo prints. Here are some thoughts on the matter, first from Bill Varney: "I find that when you play a Dolby two-

track Stereo optical print on a mono projector, the sides tend to pile into the center. If in the dub you have a lot of high-energy material working out there on the sides, in stereo it may not in any way encumber the dialogue or whatever is coming out of the center, because of the spaciousness of what's happening. It might, however, do it in mono.

"There also seems to be a severe loss in the high-end, and I notice a relatively large increase in the low end. These two factors tend to make it sound very muddy. The fact that you are working with a Dolby-stretched signal is not, generally speaking, quite enough to counteract the sharp Academy roll-off."

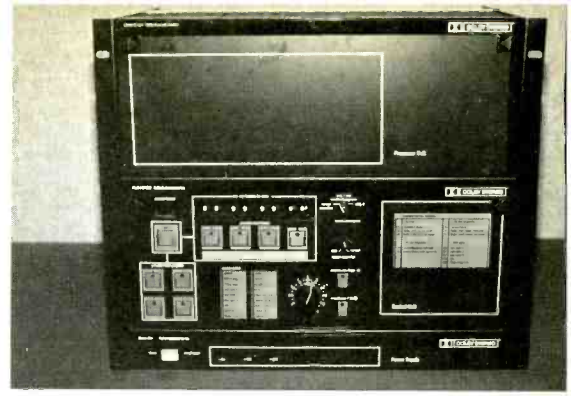
Dolby film consultant Tom Scott notes the similarities between making mono compatible record and film mixes: "If your stereo film mix is intended to be mono-compatible, you have to follow somewhat the same rules that you do when you're making a mono-compatible stereo record. You need to be careful of anything placed exactly in the phantom center. For example, on a stereo record you may have the bass, snare drums, and vocal exactly in the center and everything else panned to various places across the two channels. When you add the two channels together, material that is in the phantom center will combine and be 6 dB louder electrically. This changes the balance of the phantom center information to the rest of the mix.

"Center information will pop up in mono, which can actually help in films. In general, to get a good mono-compatible mix the dialogue needs to be a little louder in the mono theater; since dialogue is in the center, it will get louder when played in mono. Whether it gets loud enough for a *good* mono is the question. If you have common information on the two sides, it will try to come out of the center channel anyway; when you add them together that will also get louder."

Ioan Allen feels that "what controls compatibility is not how low the lowest sounds are, but how loud the dialogue is compared to 100% on the track. The monitor level is tied directly into how loud the voices will be made, and how the effects and music are spaced into the room you have left over the voice. If you have set up your meters and monitors so you have only 3 dB left to go over the voice level, then the effects will be very low compared to the voice. If you have 20 dB to play with above the voice, then it will be 20 dB louder. By setting the monitor level lower, you force the voice higher. In other words, if your monitor is high, the dialogue is lower and your mono compatibility goes down." When played at the standard relatively soft level used in most mono theaters, low-level dialogue on stereo mixed with excessive volume range may be unintelligible.

General Considerations

Like most *R-e/p* readers, many of the people working in Dolby's film division have experience in the world of recording studios. Here's Don Digirolamo's assessment of the differences in mixing styles between the film and recording industries, and his opinion of how the Dolby matrix responds to a standard album mix, and processes it into four channels. "If you take an album mix and feed it as left and right into the matrix, it will take anything that's equal in voltage and phase and feed it into the center channel. This is usually kick drum, snare, bass and lead vocals. Left and right stay left and right, and anything that's out-of-phase ambient information will tend to go to the surrounds.



The Dolby CP200 Cinema Processor will handle all current Dolby Stereo formats, including two-track, optical and six track magnetic soundtracks, for both 35- and 70 millimeter releases.

"Mixing styles are quite different in the two fields, especially in terms of panning, equalization, echo, and loudness of the vocal. In a record mix, the vocal will certainly be there, but will be tucked back among the instruments. Movie music mixes tend to have the music considerably further back, and the vocals much more up-front.

"There is a lot less echo used on a movie mix. A movie theater is a much larger environment than someone's living room, and will generate its own ambience for the most part. Most dubbing stages will also contribute their own ambience during the course of the mix. As a result, less actual reverberation in terms of tools or devices is added at the time.

"In terms of panning, recording people will have a two-channel panpot, and they'll place, say, four left-to-right sources for a drum kit, at 10 o'clock, 11:30, 1 and 2:30. In terms of movie sound, things are assigned to specific channels much more, but drums will tend to be more in the center. If you spread it in the theater it will be 60 feet wide — the largest drum kit in history — which is not to say that it isn't done. But you have to be careful.

"In terms of monitor EQ, music studios are usually voiced brighter, flat to 6 kHz, and rolled off 3 dB per octave in terms of pink noise out of the monitor. Film dubbing theaters and movie houses on the Dolby system are voiced flat to 2 kHz, and rolled off 3 dB per octave.

"On a technical level, one of the things that music people never tend to do, but which film people always carry out, is to use pink noise as a frequency-response record. Generally speaking, recording studios would put 1 kHz for level, plus 10 kHz and 100 Hz for EQ adjustment. You get azimuth from 10 kHz, and those three points would be the only ones you could use to optimize frequency response. Whereas in film you tend to use a level tone, and pink noise for everything else. You can do azimuth and optimize the response of the whole chain with it.

"Anybody who's recording music in a music studio that is going to end up as film product should send along pink noise, since it facilitates checking all the generations of transfers one goes through."

Although the film sound business is in need of technical standardization in many respects, one area in which progress seems to have been made recently is that of monitoring levels. In the recording world there are no standards per se, but obviously product for AM radio will not have a wide dynamic range. In any event, the producer and engineer have no control whatsoever over the choice of playback levels.

When people go see a film, however, they pay money to have the sound set *for* them, and compromises must be made with regard to level. Not only because of patrons who like films loud or soft, but also because of similar restraints to

those that apply to TV and radio. Steve Katz explains: "The biggest danger in a theater with motion picture sound is the same one you have in mixing or broadcasting for car radios — the actual environment has very little dynamic range. I define dynamic range in the theater as the distance between the little old ladies with umbrellas and popcorn noise. The danger is that the theater manager will find the loudest piece of music, bring the level down to where his patrons are happy with it, and half the show will disappear.[3]

"People who think, 'Ah, ha, Dolby gives me 10 dB of noise reduction, why don't I take those 10 dB out on dynamic range,' pay the price at the theater. Because an optical track doesn't have the headroom and saturation capability of magnetic tracks — it has hard clipping — you must be *very* careful. You especially do not want dialogue to explode into the red, or over 100% modulation; peak meters are essential in this respect. They are very useful for film because of the nature of the environment: you're in a dark room, and have to concentrate not only on the faders in front of you, but on the cue sheets, footage counter and the picture on the screen."

Multitrack Techniques

Mono mixes for motion picture are made on three tracks, with one each devoted to dialogue, music and effects. Not only does this facilitate easy repairs, as only one section needs to be repeated, but it also creates minus-dialogue information for foreign language dubbing. Stereo mixes, on the other hand, are almost always tied together on one piece of film. Of course, minus-dialogue mixes must be made for foreign stereo and mono release.

A domestic stereo master is useless for such purposes, and all music and effects tracks must be re-mixed, -EQ'd, -reverbed, etc. Automated mixing is, of course, a help, but is unable to recreate the contribution of outboard equipment, at the very least. Bill Varney has given much thought to these problems: "On *Empire* we recorded our six-track master and on another recorder generated a four-track sound effects-only, by sub-bussing. We took that and added back music to create the stereo foreigns. Ultimately I would like to see us being able to use a 16- or 24-track format exclusively, where four channels would be designated for dialogue, four for music and four for sound effects, plus a few more for SMPTE time code and sync information. From that master we could ping-pong over all the various formats we use: two-track Dolby Stereo printing master; Academy mono; foreign minus-dialogue stereo, and so on. I almost feel that we could get as much flexibility out of the two-inch multitrack, as we could out of computerized mixing.

Two-Track Master

Dolby recommends that final mixes be made four-track, and that a two-track printing master be made for transfer to optical. According to Don Digirolamo: "If you have to fix the two-track, effectively you have to have all the elements up, and fix all four channels at the same time. Whereas if you're fixing a four-track, and you just have to replace one line of dialogue and there isn't any music or important effects, you can do just that one channel alone."

At the present time there are only four Dolby Stereo optical cameras in the world: Phil Boole Recording Services (PBRS) in Burbank, California; and one each in England, Japan and Germany. A few Dolby negatives are made for each film, to allow for mishandling during high-speed printing.

It is recommended that sound-only test negatives and prints be made during re-recording to ensure the smoothest transfer to the optical medium, much as one cuts reference acetates during the disk-mastering process.

Dolby decoding level of the SVA prints is matched in the field to a standard alignment film provided by Dolby Laboratories. The same film also contains pink noise to align the optical preamplifiers to flat response, which usually extends beyond 12 kHz. Alignment of Dolby 70 mm prints is a trickier matter since, until recently, every studio that produced magnetic prints used different recording equalization. Therefore, a 70 mm test roll containing pink noise and Dolby tone is a necessity for each feature.

Conclusion

No recent motion picture system has risen as quickly as the Dolby Stereo system, being elevated to a position of industry prominence within a few short years. It is hoped that this article has made clear the reasons for such growth.

Now, for two closing remarks. First, Ioan Allen: "I am not interested in coming up with a soundtrack format that only sounds good in Hollywood or New York. We want to get stereo to as many people in this country at consistently good quality. The only way we can do that is to give the theater service engineers a format that they are capable of maintaining. Give them more than that, and we are all wasting our time.

"All Dolby-equipped theaters are supposedly equalized to the wide-range monitor curve. A peripheral benefit is that not only do the loudspeakers sound better but, for the first time ever, it is possible to take a film from the dubbing theater, to a first-run house in Hollywood, to the boondocks, and it will sound the same in all three locations. We haven't gotten to that point yet, but at least the equipment makes the dream possible."

Bill Varney: "In the final analysis, Dolby is doing what it's supposed to do — make films sound better. It should make *all* films sound better. There is no reason why any motion picture produced anywhere in the world should not be released in this format. I don't see any reason why if it's a quiet, dramatic film that the Dolby process can't enhance it even more. The music sounds richer and more beautiful, the sound effects take on a more life-like feel and the dialogue will just be that much brighter, crisper and nice. There's really no argument against not using it."

□□□

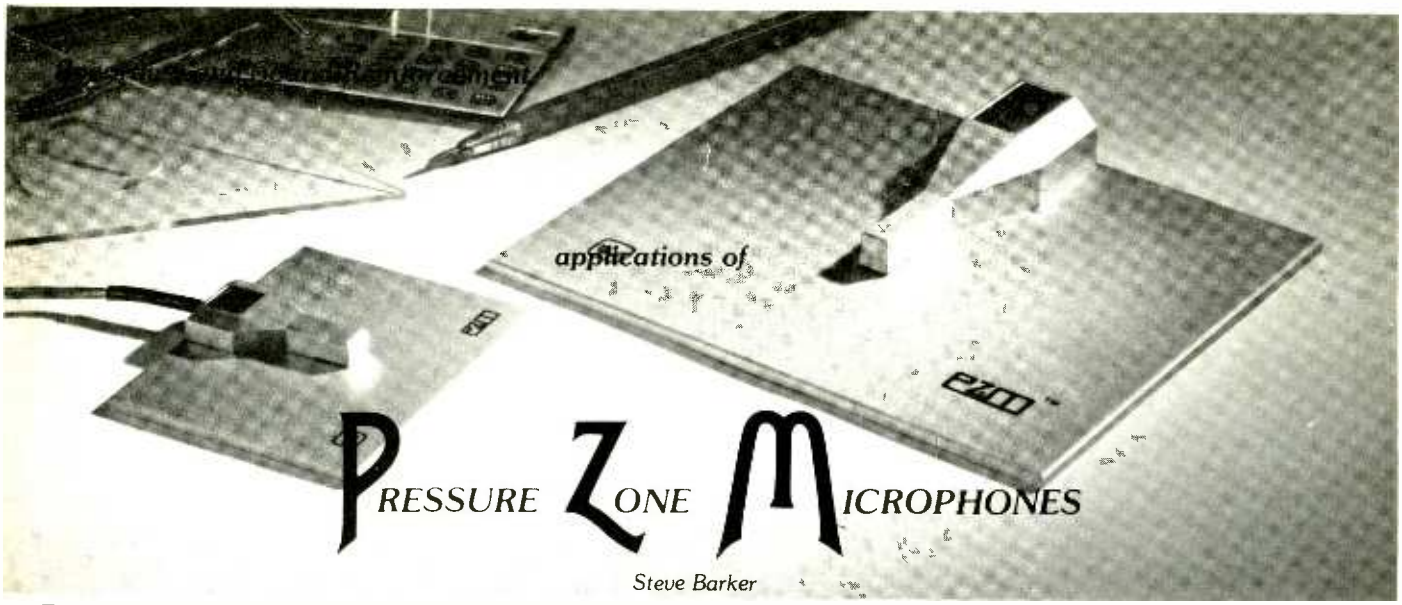
Footnotes:

1 - Anamorphic lenses compress an image horizontally by a given factor during photography, and expand it to the same degree when projected. Thus the aspect ratio — the relationship of the width to the height of the screen — is doubled. In this manner, material photographed with standard anamorphic lenses (2:1 compression/expansion) is 2.35 times as wide as it is high, versus the 1.17 aspect ratio of the image area on each frame. Fox's CinemaScope lenses are no longer in use; the most popular anamorphic lens systems today are Panavision and Technovision.

2 - A 70 mm print of an average-length feature film costs around $14,000, versus $1,000 for a standard 35 mm print.

3 - Printed at the head of *The Last Waltz* was the notice: "This Film Should Be Played Loud!"

4 - Out of the 13,000 "hard-top" screens — i.e., non-drive-in theaters.



PRESSURE ZONE MICROPHONES

Steve Barker

The PZM™ as we know it today is the practical application of the PRP™ process introduced at a Synergetic-Audio-Concepts class in early 1978 by Ed Long and Ron Wickersham. The original system utilized a specially modified 1/2-inch diameter B&K measurement mike, and was quite expensive to produce. At that time, Don Davis, head of Synergetic-Audio-Concepts, challenged the class and graduates via their newsletter to produce a practical and inexpensive mike device to utilize the PRP principle.

In early 1978, Ken Wahrenbrock rose to the challenge and created the first workable PZM. It wasn't particularly pretty, but it was effective, inexpensive to produce, and it did work. In early 1980, Crown International Corporation, Elkhart, Indiana, announced to the public that it had contracted with Synergetic-Audio-Concepts and Ken Wahrenbrock for the world licensing rights to produce the PZM, with Ken Wahrenbrock acting as production consultant.

When Crown began manufacturing the PZM, it standardized on the 150 dB SPL performance characteristic (the original Wahrenbrock PZMicrophones were available in versions handling first 130 dB and then 150 dB SPL), and assigned model numbers that gave an indication of the back-plate size. Currently available are Models 30GP (a 5- by 6-inch back-plate, general-purpose version); 6LP (2½- by 3-inches, low-profile); and 31S (5- by 6-inches, silver-colored with enhanced bass response). Soon to be unveiled is a lavalier version, Model 2LV. (Incidentally, a choice of gold or black finish is available for the 30GP, 6LP and 2LV models.) The power supplies introduced by Crown do not directly correspond to the power supplies used by Wahrenbrock, since all Crown power supplies provide a bi-polar voltage output to the microphone capsule.

Footnote:

PZM,™ PZMicrophone™ and *Pressure Zone Microphone™* are trademarks of Crown International, Inc. The Pressure Recording Process™ (PRP™) is the basis for the PZMicrophones™ originally manufactured by Wahrenbrock Sound Associates, Ltd. Crown PZMicrophones™ are now manufactured under license from E. M. Long Associates and their agent Synergetic-Audio-Concepts.

Low-End Frequency Response of PZM Microphones

It is currently assumed that the low-frequency transition point of a PZM boundary plate is approximately a quarter wavelength of the lowest frequency to be reproduced. At this point the output from the PZM microphone will drop by 6 dB, and then remain flat until the low-frequency cut-off point of the mike capsule is reached, as shown in the figure below.

Mathematically, the following equation represents the transition point at which the output is attenuated because of boundary effects:

$$D = V/4F$$

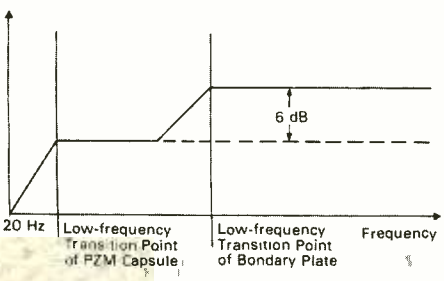
where

D = Side dimension of backing plate
V = Velocity of sound (= 1,130 ft./sec.)
F = Cut-off frequency

Substituting appropriate values into this formula results in the following expression, relating the minimum backing plate dimensions for a required cut-off frequency:

$$D = 282.5/F \text{ feet}$$
$$\text{Or, } D = 3320/F \text{ inches.}$$

For example, if a frequency response is required to extend to 30 Hz, the backing plate should be at least (282.5/30) or 9.4 feet on a side; in practical terms, however, a backing plate at least 4-foot square should provide adequate bass-frequency response.



Basic Principles

What is a Pressure Zone Microphone? A PZM is a device built with a pressure-calibrated capsule oriented in such a way that it can never see a sound source at zero-degrees incidence, and placed within a few thousandths of an inch of a boundry — i.e. its mounting plate — so that the instantaneous pressure surrounding the diaphragm is everywhere uniform, and the wave velocity zero. This phenomenon occurs primarily within cavitites. A PZM microphone satisfies this condition by utilizing the mounting plate as one exterior wall of the cavity, the diaphragm of the mike as another wall, and the viscosity of the surrounding air as the side walls.

A side benefit of this arrangement is that there are no response anomalies generated between the direct sound and reflected sound caused by the mike's physical presence; and, since the mike is arranged in such a manner that its normal high-frequency response peak for zero-degree incident sound is no longer a problem, the full benefits of the extremely small size and wide response range of the cartridge can be realized. It should be noted at this time that within the hemispherical pick-up pattern of the mike, both amplitude and phase responses remain virtually flat throughout the passband of the device (approximately 50 Hz to 15 kHz). In other words, the microphone's response varies very little as a function of either *angle* or *distance* from the sound source.

Single-Instrument Miking Techniques

Before entering into a discussion of microphone placement, it should be cautioned that when affixing a PZM to a body that might tend to vibrate, the mike should be secured as rigidly as possible. This prevents unwanted vibratory sounds caused by the PZM mounting plate rattling against the surface to which it is affixed from entering the system.

Piano Miking

Pianos come in two basic forms: upright and grand. If leakage is not a problem, the best way to mike both types of piano is to place a PZM either on the floor or on a wall in the vicinity of the instrument. In the case of a grand piano, the PZM may be placed in the center of a 4- by 4-foot sheet of plastic, oriented so that the mike is out from the piano approximately six to eight feet, with the lid on full stick. For a conventional spaced pair stereo pick-up, two mikes can be used approximately four to eight feet apart,

Ask Eventide:

Q: There are lots of digital delays around. Why is the Eventide H949 Harmonizer different?

A: Look closely at the H949's digital readout. You'll notice that it's calibrated not in "delay" but in "PITCH RATIO." This symbolizes the unique features that set Eventide Harmonizers apart from ordinary "special effects" digital delay lines. Here's why:

Although "pitch ratio" is a mathematical concept, it has a very real meaning to the recording engineer. In effect, changing pitch is equivalent to retuning a musical instrument. This true pitch change, as produced by the H949 is far different from common ring modulator effects because Eventide Harmonizers preserve all harmonic ratios. As a result, even at wide pitch-change ratios, the modified signal still sounds musical. Pitch-changed signals can be mixed with the original to create chorus and harmony effects. You can change the perceived speed of a tape without changing the running time, or vice versa, and you can create continuous "doppler shift" effects (will that train whistle ever go by?)

True pitch change is also a far cry from the pseudo-pitch change which other digital delays obtain by changing the clock frequency. Any DDL can do this for a very short time (milliseconds at most.) But it does this at the expense of continued operation. For instance, raising pitch implies reading data out faster than they are read in. That's easy; just speed up the clock. Except that to maintain pitch, you have to keep doing it. The DDL quickly runs out of data and then where's your signal? Eventide Harmonizers contain circuitry to allow audio to be "read in" and "read out" at different rates. This provides the ability to set your output pitch up to an octave up or two octaves down with precision on the H949.

Q: What are glitches? How can I get rid of them?

A: If you followed the above answer, you'll realize that something must be done when reading data in and out at different rates, or there will be too much or too little data! What we do, in effect, is to "splice" literally removing or adding very short segments of program to make up for the missing or extra data. And, just as you would when splicing a tape, the Harmonizer makes a "diagonal cut."

While the diagonal cut eliminates sharp transients, it's still possible to get minor imperfections, known as "glitches" in the output. Depending upon the pitch ratio, the program material, and the prominence of the buried in the final mix (i.e. lead vocal or single horn) this "glitching" can range from objectionable to unnoticeable. Eventide's research has developed ways to substantially eliminate the pitch-change glitch. We do this by carefully selecting each "splice" point, much as a human tape editor tries to match the signal or silence before and after his cut. This important development (the "De-glitch card option") is now available on new H949 Harmonizers, and can be retrofitted to all H949's.

Got a question about digital effects? Write to "Ask Eventide" 265 West 54th Street New York, N.Y. 10019. Questions of general interest will be answered in this column. If we use your question, we'll send you an Eventide T-shirt, so include your size.

either on the floor or mounted on 4- by 4-foot plastic sheets oriented up towards the lid of the piano. For single-point stereo pick-up, tape two PZMs, one on either side in the center of a 4- by 4-foot piece of plexiglass, oriented perpendicular to the open lid of the piano. This arrangement should be oriented so the mike is a good eight to 10 feet from any other surfaces, to avoid the problems of early reflections which could cause comb-filtering and wide-band anomalies in the pick-up (Figure 1).

Where ambient noise or leakage from other instruments is a problem, in the case of an upright piano simply tape a PZM to the inside of the upper lid on each end of the piano (Figure 2). A single PZM could be used in this application,

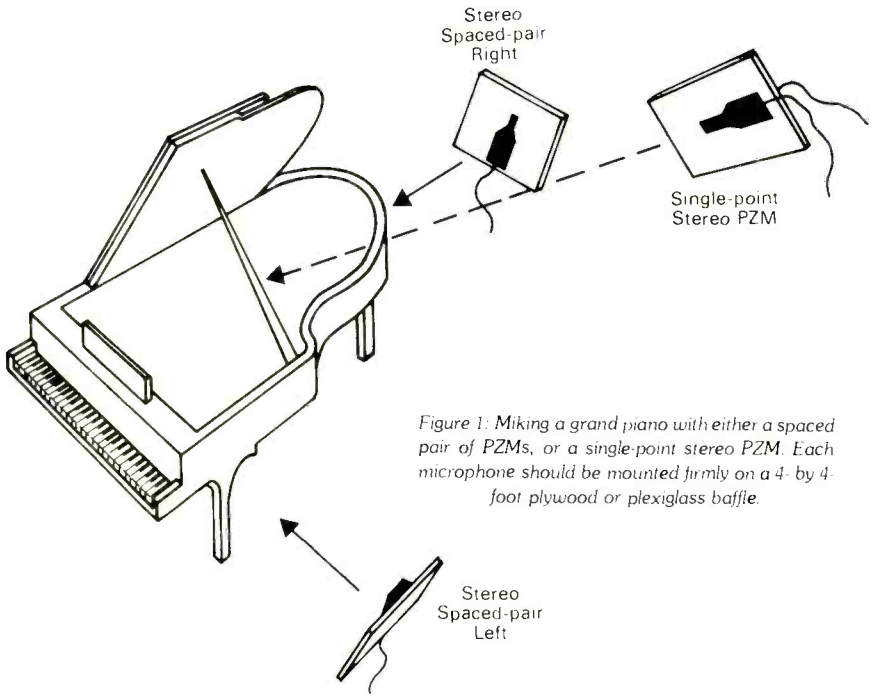


Figure 1: Miking a grand piano with either a spaced pair of PZMs, or a single-point stereo PZM. Each microphone should be mounted firmly on a 4- by 4-foot plywood or plexiglass baffle.

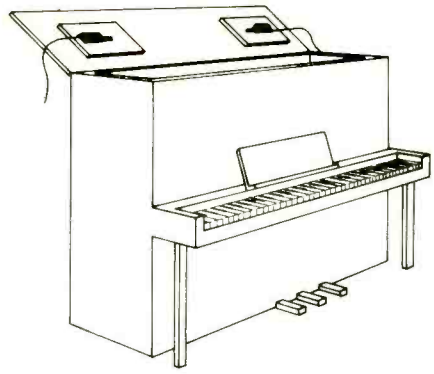


Figure 2: Where ambience and sound leakage are a problem, the best way to mike an upright piano is to attach two spaced PZMs to the inside of the lid.

but it has been the experience of this author that it rarely yields a satisfactory balance between the low and high register notes of the piano. For a grand piano, a single PZM can be taped either to the lid — approximately at the point where the low- and high-frequency strings cross one another — for single mike pick-up, or two mikes can be taped to the lid: one oriented over the low-frequency strings and the other over the high-frequency strings for stereo pick-up (Figure 3).

In a situation where you wish to mike a grand piano for which the lid has been removed, the two mikes can be taped to the side of the piano that generally faces the audience: one near the front and the other near the tail. This arrangement also seems to yield fairly satisfactory results. However, due to the rather obvious lack of the lid, which would have normally been closed to seal out external

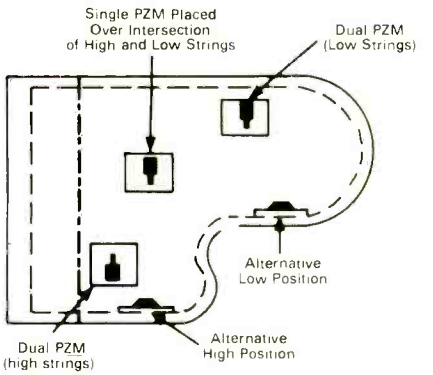


Figure 3: Close-miking positions for a grand piano. If the lid is still in place, a single PZM may be taped over the intersection point of the high and low strings. For stereo, a pair of spaced PZMs should be placed over the low and high strings as shown. If the lid has been removed, a pair of mikes can be taped to the inside of the frame.

sounds, it does not have the advantage of sound isolation from either ambience or other instruments.

Drum Miking

The simplest and easiest way to mike a drum kit is to tape a single PZM mike approximately at the center of a 4- by 4-foot piece of plywood or plexiglass, and place it a foot or two in front of the kit. Conversely, the mike can also be laid on the floor two to three feet in front of the kit. This system tends to yield a fairly reasonable mono balance of the entire kit. In stereo, the pair of mikes can either be placed six to eight feet apart on either side of the kit on the floor, or flown on either side of the kit on 2- by 2-foot plexiglass baffles placed just above the level of the tom and snare drums. Very often this system will need to be supplemented by a third PZM placed inside the kick drum, and utilizing the wall of the kick drum as its primary boundary (Figure 4). For single point stereo miking, two PZMs should be affixed to either side of a 2- by 2-foot sheet of plexiglass, placed parallel to the axis of the drum kit. This system may also require a supplemental mike placed inside the kick drum.

Figure 4: Spaced pair miking for a drum kit. If necessary, a third PZM may be located on the inside surface of the kick drum. The spaced pair of mikes should be taped firmly to 12- by 12-inch baffles.

String Miking

The first instrument we will examine is the acoustic guitar. General miking methods for a guitar are the same as applied to the drum kit. Close miking can be accomplished by taping a low-profile PZM — or clipping a lavalier model — to the body of the guitar between the sound hole and bridge. This tends to yield excellent results, and provides some degree of isolation from other instruments.

Violins and violas can be similarly close-miked by clipping a lavalier PZM to the bridge under the strings. Alternately, these instruments can be effectively miked by clipping a PZM lavalier to the clothing of the performer just beneath where the instrument rests between the shoulder and chin. The disadvantage of this system is that any noises made by the performer are picked up just as effectively as instrument sounds. (The advantage, however, is that you do not risk damaging a $2,000 Stradivarius violin with little alligator teeth marks from a clip mike.)

Cellos and basses can be close miked very effectively by placing a PZM lavalier mike inside their f-hole underneath the highest strings. It is recommended that a piece of stiff paper be placed between the clip of the mike and the body of the instrument to avoid damage to the finish (not to mention damage to the engineer inflicted by an enraged string player!). This miking method tends to reproduce the string instrument reasonably effectively, and afford a fair degree of isolation from other members of the orchestra. It should be borne in mind, however, that no close-miking method will ever capture the full body and tone of an instrument as effectively as a mike placed some distance away, where the sound has been allowed to develop.

Horn Miking

For most member of the horn family — trumpet, trombone, tuba, etc. — the technique of PZM miking is identical to that for drums. The tuba, however, because of its pattern, would require a 4- by 4-foot baffle with a PZM affixed to its center, and oriented somewhere over the

area of the bell. One interesting miking method for saxophones has also been developed over the years. Some sax players use a plastic plate to reflect part of the instrument's sound back to them. The author found that by clipping a PZM lavalier to the end of this reflector a superb full-bodied sax sound could be reproduced.

An interesting way of miking an entire horn section is to have the ensemble face the control-room window, and tape a PZM directly to the surface of the glass facing the horn section. This allows an excellent sound to be obtained, and at the same time provides slap-back so that the musicians can hear themselves.

Another interesting possibility when using hard-surface gobos to separate one family member of a horn section from another is to tape a PZM to the surface of the gobo facing the various sections. This enables not only the family members of the sections to be isolated from one another, but also allows the utilization of one of the primary advantages of the PZM — when mounted on any large surface, a Pressure Zone Microphone is immune from first-order reflections from that surface.

Ensemble Miking

Orchestra

Thus far the best way to stereo mike an orchestra that the author has found is to fly two, 4- by 4-foot sheets of plexiglass, with PZMs taped to their centers. These should be positioned approximately 20 feet apart, 15 feet up and 15 feet out in front of the orchestra, and oriented approximately 10 to 20° down toward the orchestra. This arrangement seems to work better than placing the mikes on the floor in front of the orchestra, due to the fact that most of the orchestra's projection tends to be oriented upward rather than downward. An exception to this was found for sound-reinforcement work, where a mike placed in the air tended to pick up unwanted reverberation and other free-field anomalies, which were effectively cancelled by a floor placement of mikes (Figure 5).

The author has also tried the use of a single-point stereo-plate PZM oriented perpendicular to the center line of the orchestra. Although the system produced a reasonably accurate stereo image of the orchestra, it tended to lose the instruments in the middle, due to the fact that the pattern of a stereo PZM plate is very similar to placing two cardioid mikes head-to-head, with their tails oriented at 180° from one another. The solution to this problem would be to place a second baffle perpendicular to the 4- by 4-foot plate, and mount a PZM at the boundry of the two baffles. This, however, produces a microphone so large as to be impractical for most applications.

It should be cautioned at this point that spaced-pair miking techniques can produce mono compatibility problems, as well as

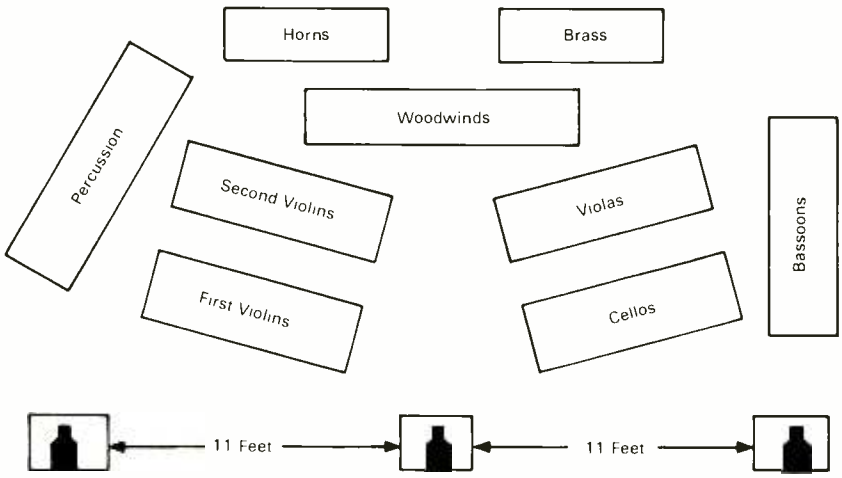


Figure 5: In situations where microphones placed in the air would tend to pick up unwanted reverberation, an orchestra can be miked by placing three PZMs on the floor at the front of the stage.

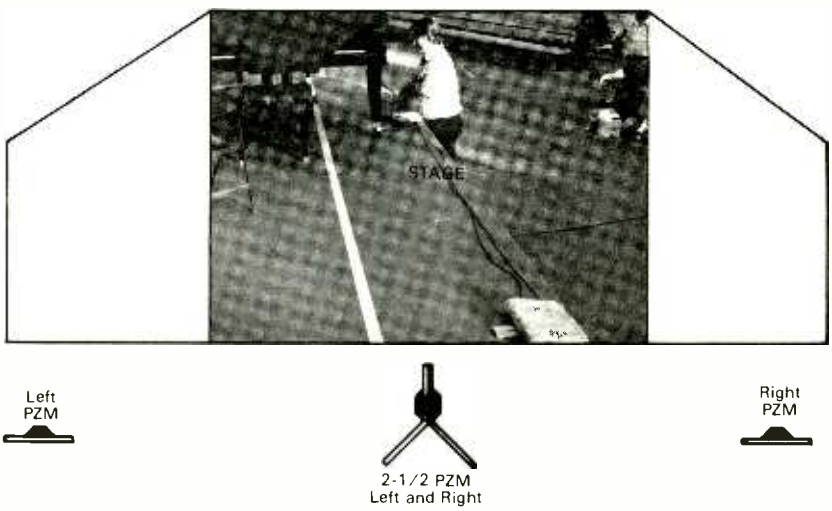


Figure 6: Stereo miking of operatic or theatrical performances can be improved by replacing a single center PZM with a pair of Wahrenbrock 2½ microphones placed back-to-back.

excessive vertical modulation problems during the subsequent disk-cutting process. Therefore, when recording with spaced pairs one should not only periodically monitor the results in mono, but also observe the results on an oscilloscope to ensure that the anti-phase components of the signal caused by arrival-time differences are kept at a minimum.

Opera And Theatrical Miking

A general starting place for these two forms of miking is simply to place three PZMs across the front of the stage at equal distances. This technique works reasonably effectively in mono, but as you usually have to contend with either an orchestra or members of the audience sitting in front of the stage, it is advisable to attenuate sound arriving from that direction. The simplest way to achieve this is to take a piece of heavy shag carpet, approximately 2-foot square, and fold it over itself with the nap facing outward. (Black carpet is advised, since once laid on the stage it virtually disappears.) The piece of carpet is then laid over the rear of the mike, and will attenuate sound coming from that direction by nearly 20 dB. Another approach is to place a piece of Sonex acoustic foam behind the mike, with the wedges of the foam facing the mike itself. This has the same effect of carpet laid over the rear of the mike, and to some is more visually appealing.

One drawback to such an across-the-stage miking method is that, to someone listening at either of the outer edges of the audience, a performer oriented between either of the outer mikes and the center mike sounds as if he or she is leaping from speaker to speaker as they move their head from side to side. This phenomenon occurs because the outer mikes only feed either the left or right channel, while the center mike is simultaneously connected to both channels at an equal level. The problem can be corrected by replacing the center mono mike with a pair of Wahrenbrock PZM 2½s, placed back to back and oriented left to right (Figure 6), with the left-hand mike feeding the left speaker, and the right-hand mike feeding the right speaker. This tends to hold the stereo imaging quite accurately for an individual standing to the left or right of the center of the stage. It will also produce a perfect center image for an individual standing in the center of the stage, who will be picked up equally by both capsules placed within ¼-inch of one another.

If need be, the orchestra sound can be supplemented by affixing a single PZM to the wall of the orchestra pit behind the conductor. Alternatively, for stereo a pair of PZMs may be spaced approximately 20 feet apart, placed equidistance from the center line of the orchestra and affixed to the wall of the pit.

Individuals who may be called upon to deliver lines too far upstage for them to picked up by the front mikes can be miked with PZMs taped to pieces of scenery, or flown overhead either on a 2- by 2-foot plastic baffle or in the apex of a 1- by 1- by 1-foot pyramid. It should be cautioned at this point that a PZM placed on a boundry that is smaller than the wavelength of the lowest frequency sound to be picked up, will exhibit some frequency discrimination at the lower frequencies due to inadequate boundary size.

If all of the above general miking areas fail to reproduce a performer because his or her voice is too weak to project above the noise of the orchestra or other action on stage, or because the blocking and/or choreography requires that they be too far from any fixed mike location, a last resort alternative may be to use a PZM lavalier connected to a radio pack.

Sound Effects Miking

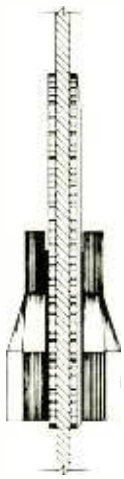


Figure 7

An area in which the stereo microphone plate seems to prove itself particularly effective is in stereo sound effects miking. The author has spent the last several years recording just about everything — from basic thunderstorms to the drip of condensation from stalactites in caves — utilizing a pair of PZMs bolted to each side of an 18- by 24-inch piece of plexiglass (Figure 7). These recordings seem to have realism and depth unattainable by any other miking method used to this date by the author. As most of such recordings have been made on a high quality portable cassette deck, the author decided that conventional PZM power supplies reduce the output of the microphone capsule below an acceptable level. Figure 8 shows a very simple stereo battery power supply for feeding PZMs directly into the medium- or high-impedance, unbalanced input of a consumer-type tape recorder.

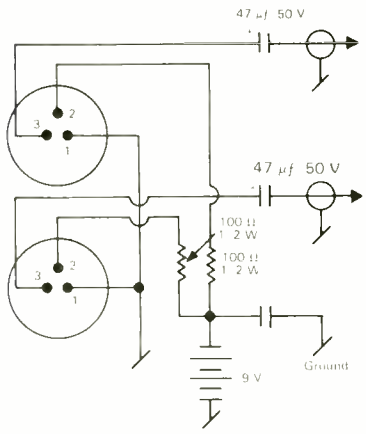


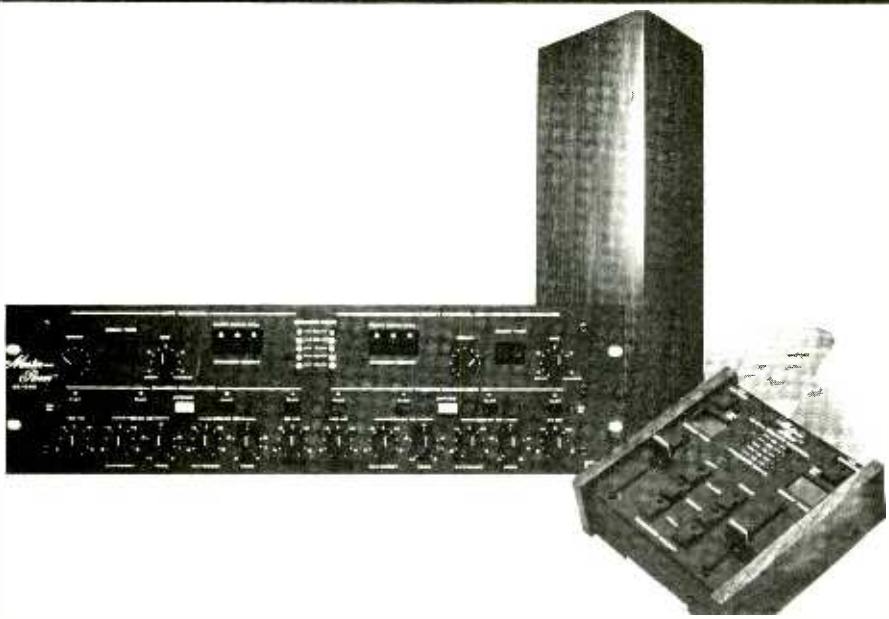
Figure 8

Conclusion

Although this article has proffered many tasks to which the Pressure Zone Microphone can be applied, the PZM is not a panacea that will cue all ills. There are many applications for which the PZM is not suitable, and many for which at this moment its applicability has not been thoroughly explored. However, the PZM concept is still in its infancy. Unlike conventional miking methods, which have had 50 years to develop to their current state, the art of PZM miking is still relatively obscure, and can only be advanced by the cross pollination of ideas from the many people who use them. To facilitate this, Murray Young of Crown International, Inc., has set up a procedure whereby questions and solutions regarding the PZM applications from the field can be channelled through Crown International, Inc., 1718 W. Mishawaka Road, Elkhart, Indiana 46517; telephone: (219) 294-5571.

Hopefully, this article will provide sufficient basic information to get the reader well on the way to proficient PZM miking. If the reader has any questions or comments concerning this article, they should feel free to contact the author at: (213) 681-6593. □□□

New Products



MICMIX MASTER-ROOM XL-500 REVERBERATION SYSTEM

Described as a unique new concept in reverberation, the new system incorporates technological advancements that stem from research into the specific reverberation qualities and properties in live chambers, plates, and concert halls. According to MICMIX, both digital and analog technology are combined in a unique balance that achieves maximum performance from each type of circuitry. An exclusive circuit design (patents pending) incorporates state-of-the-art electronic components in a modular construction pattern.

The XL-500 offers three operational modes in full stereo that synthesize the reverberation characteristics of a live chamber, plate or concert hall. Any of these three modes can be easily selected from either the main or remote control unit. The plate mode offers a bright, clean sound with exceptionally high echo density and the instantaneous diffusive qualities of a plate-type reverberator. The room mode incorporates the most desired characteristics found in some of the most popular live chambers in use by the recording industry. The hall mode provides the reverberation characteristics of a concert hall that can be varied in apparent size and sonic character.

Control parameters allow a wide number of variations in each of the three modes to specifically tailor the reverberation environments, providing a wide range of creative freedom. The continuously variable decay is easily adjustable from 1 to 6 seconds, and the decay time is displayed by a two-digit numeric display on both the main and remote controls. Importantly, no change in tonality occurs when the decay time is varied.

Versatility is further enhanced by the extensive equalization on each channel. The chamber equalization contains fixed low- and high-frequency controls, as well as two sweepable mid-range controls, all with 12 dB of boost or cut. Each frequency section also contains its own bypass switch, in addition to a master bypass switch for the entire equalizer. A set of LEDs display the chamber drive level on both the main and remote units to indicate signal level.

The main control unit is housed in a 5¼-inch rack mount package. All control functions are contained on the front panel, and all XLR signal connections are located on the rear panel. Inputs and outputs are electronically balanced, and will automatically adapt to unbalanced operation when used with single-ended equipment. A transformer-balanced option is available upon request.

The remote control unit is provided as a standard feature with the XL-500, and includes a 25-foot cable that interconnects with the main unit. The remote unit is small enough to be located comfortably on any console.

The chamber unit is housed in a rosewood finished cabinet. Recessed handles are provided for ease in moving, and the unit contains a 50-foot inteconnecting cable.

Suggested user price of the XL-500 System is $4,750.

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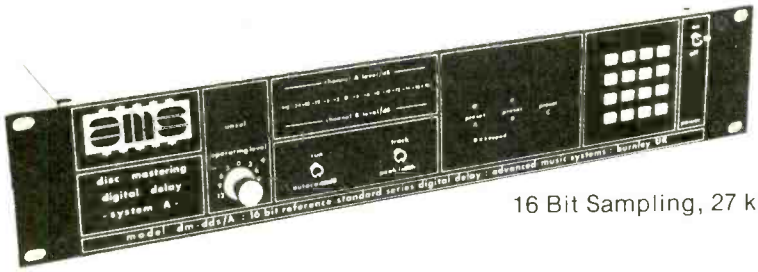

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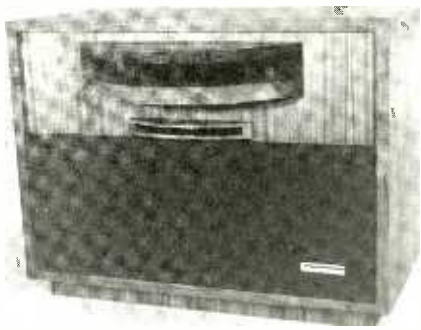
While production of the HR-1 Studio Reference Monitor continues as the state-of-the-art for high-powered monitors (4-way, Quad-amp), Westlake has received many requests for sound quality of the HR-1 at a



reduced cost and complexity. Thus the new TM-3 and TM-4 utilize the HR-1 mid- and high-frequency horn technology at moderate price. Power and bandwidth are similar to existing TM-1 or HR-1 systems.

While not quite an HR-1, sound quality is claimed to be subjectively improved over the older TM-1 Monitor, now going into its second decade of production.

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REPLACEMENT STUDER A-80 OUTPUT AMPLIFIER CARD AVAILABLE FROM KDISC

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The result, Kdisc reports, is an amplifier with measurably improved low-frequency response and high-frequency detail.

Technical data:

Frequency response: +0 dB, -0.2 dB, typical, 30 Hz to 15 kHz; +0 dB, -0.4 dB, typical, 20 Hz to 20 kHz.

Distortion: 0.005% THD and 0.0035 IMD, typical, at 1 kHz and -4 dBm output level.

Signal-to-noise ratio: 88 dB, typical, unweighted, -4 dBm output.

Slew rate: 16 V per microsec.

The Kdisc 2572 card is being distributed by:

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PRO-ONE SYNTHESIZER FROM SEQUENTIAL CIRCUITS

Described as a low-cost monophonic synthesizer, the Pro-One offers the following features: two VCOs with sawtooth, square and pulse width wave shapes (oscillator B also has a triangle waveform); 24 dB low-pass filter with its own 4-stage envelope generator; extensive modulation and double modulation capabilities; and a C-to-C 3-octave keyboard.

A built-in digital sequencer with two sequences and up to 40-note storage between them is also provided, together with a standard 1 V per octave CV and fate in/out (which can also be used for an external clock on the sequencer and an arpeggiator).

An audio input with pre-amp for using microphones, guitars, other keyboards and instruments is available, with its own special gate generator that can trigger the envelopes, advance the sequencer, etc.

A unique "automatic" glide mode allows selective glide between notes, while an internal *digital* interface facilitates hooking the instrument up to most home computers.

List price of the Pro-One is $645.00.

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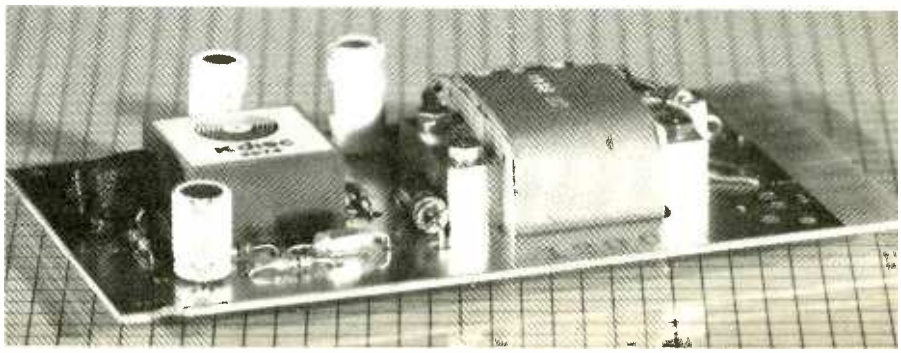

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Comb filtering is a side effect of that design that cannot be eliminated. Every Bell-design microphone demonstrates frequency response anomalies because of an inability to satisfactorily combine direct and reflected signals. Phase-induced amplitude cancellation and reinforcement are the inevitable result.

Crown PZM microphones eliminate comb filtering from the primary boundary because they detect sound according to a new principle, the Pressure Recording Process.™ As a sound wave approaches a boundary (wall, table, floor) a pressure field four or five millimeters deep forms at the boundary, within which the direct signal and its reflection from the boundary add coherently and remain in phase.

The Crown PZM™ places a small pressure transducer into the primary boundary pressure zone, eliminating the possibility of phase-induced interference. The PZM concept thus provides a significant improvement in signal quality. Its small profile also improves microphone aesthetics.

The PZM pickup pattern is hemispheric, with no "off-axis" position.

Singers and speakers can move more freely around the PZM. Gain related to distance will change, but not tonal quality.

The PZM responds accurately to SPL up to 150dB. You can put it right inside a drum, a bass fiddle, or a piano.

The PZM hears whispered conversations in an ordinary room at thirty feet. In certain situations where undesired ambient noise can't be eliminated, or in halls with poor acoustics, the PZM probably should not be used – it will pick up everything.

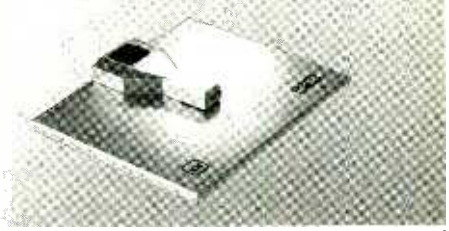
Singers, orchestra conductors, pianists, percussionists, broadcasters have all tried – and praised – the PZM.

Recording engineers find that the PZM suggests new miking techniques. For small groups it now seems that the best place for a PZM is on the floor! Recording and reinforcement may well require fewer PZM mikes.

Several PZM models are now available, including a clip-on and recessed model for permanent installation.

The PZM is changing ideas about how a microphone ought to sound, look and be used. Find out for yourself how it might improve your own recording or reinforcement systems.

Write for information on the PZM. Or call us at 219/294-5571.



crown

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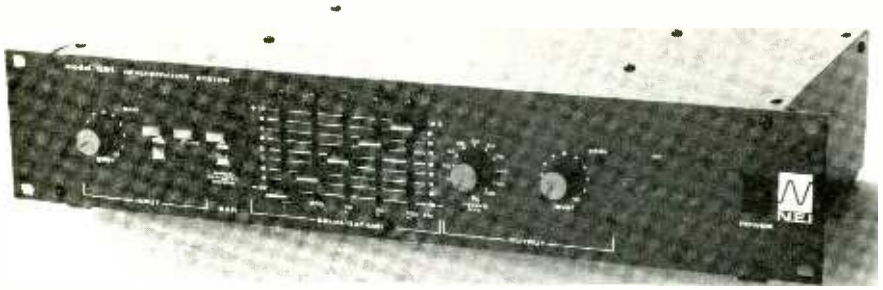
For additional information circle # 68



MODEL 351 REVERB SYSTEM FROM NEPTUNE ELECTRONICS

NEI's Signal Activated Reverb™ (*SAR*), along with special spring drive circuitry, is said to reduce and eliminate spring slap, feedback, and rumble due to impact and vibration caused by high SPLs in the new Model 351. (SAR is user-defeatable via a front panel switch.)

The Model 351 includes a five-band graphic equalizer and mix/pecentage control for the precise duplication of the reverb characteristics of almost any room, or the creation of reverb effects for voice or instrument. Slide controls on the equalizer section are center detented for easy return to a "flat" position.

Input and output gain contols with peak LED indicators mean the 351 can be used in virtually any effects system. Self-pad gain controls put the engineer in control of distortion, it is claimed, while peak LED indicators give visual warning of signals that could cause problems. A mute switch momentarily interupts the unit's input signal for easy comparison of wet and dry signals, as well as reverb decay.

Manufacturers quoted retail price is $329.00.

NEPTUNE ELECTRONICS, INC.
934 NE 25th STREET
PORTLAND, OR 97232
(503) 232-4445

For additional information circle #69

NEW MELKUIST AUTOMATION SYSTEM AVAILABLE FROM EMPIRICAL AUDIO FOR TRIDENT CONSOLES

Available with all Trident TSM and Series 80 recording remix desks, the Melkuist automation package is said to mark a giant step forward in console automation technology for recording studios. The floppy disk-based storage system is interlocked with the multitrack machines(s) using Melkuist originated SMPTE code, to retain a permanent "lock" between the automation data and the music tracks. This technique eliminates any cumulative update error when successive mix passes are created.

The interactive multi-processor system inquires of the mixer what he wishes to do at any particular point, and the user oriented VDU-CRT is the communication port for computer and operator. The Melkuist system is reported to be unique to all other automation systems in that the VCA may be bypassed on each individual fader module, ensuring that audio only passes through a resistive fader element. The Melkuist system is available as full fader-with-computer package, or as an Automation-only package. The Automation-only package can be connected to any existing Valley People Fadex system, or other consoles capable of operating on the Allison 65 K Programmer.

Prices start at about $35,000.

EMPIRICAL AUDIO
141 CROTON AVENUE
OSSINING, NY 10562
(914) 762-3089

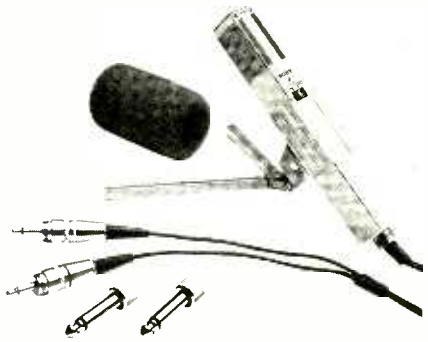
For additional information circle # 70

SONY ECM-949T STEREO MICROPHONE

By combining a bi-directional back electret capsule with a cardioid directional capsule, the ECM-949T is said to provide remarkably clear and responsive stereo characteristics. The microphone has directional capabilities while still maintaining distinct left and right channel clarity.

Measuring less that five inches in length and weighing just over four ounces, the ECM-949T stereo microphone comes complete with the unique Sony "Unimatch" plug — a threaded mini-plug with ¼-inch phone plug adaptor, making it compatible with most semi-professional recording equipment.

A directionality control for varying the recording image from cardioid mono to a split-channel stereo image is available as an optional



extra. The MRU-90 control unit allows remote control of the stereo properties of the microphone, and also includes EQ functions for varying bass and treble pick-up.

Suggested retail price of the ECM-949T is $135.00.

SONY CORP. OF AMERICA
9 WEST 57 STREET
NEW YORK, NY 10019
(212) 371-5800

For additional information circle #71

SPHERE SYSTEM 1604 SATELLITE MIXER

The new unit is a compact, fully-professional 16 x 4 mini-console, that occupies just 7 inches of 19-inch rack space. Modular in construction, the mixer consists of 16 inputs and one submaster module. It can operate as an independent unit, or as part of a submixer network to feed larger production consoles.

Input modules incorporate the following features: 48 V phantom power on/off; mike/line

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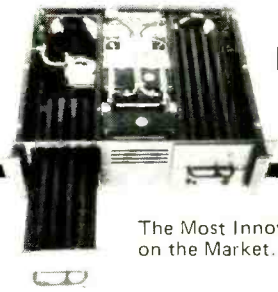

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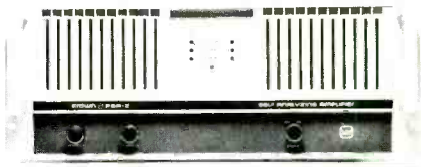

ORBAN

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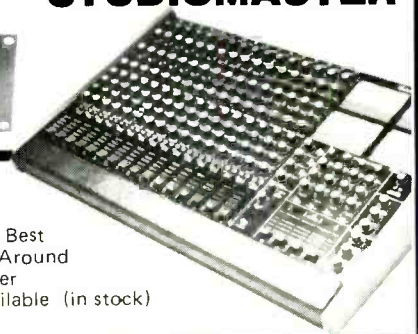

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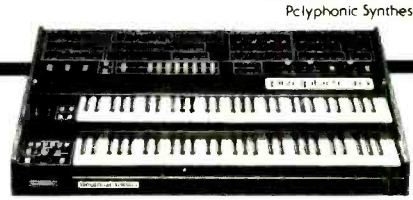

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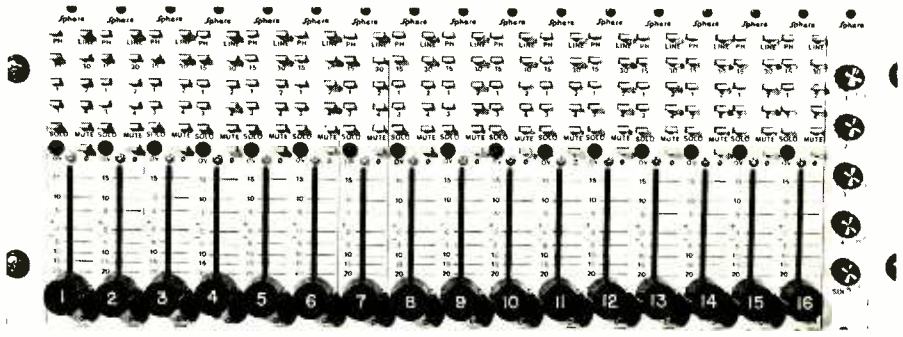
For additional information circle #73



input select; input attenuation pads; output bus select matrix; monitor solo that can operate internally, or as part of a larger main solo system; channel mute with on/off LED; channel overload LED; phase reverse; and 60-mm conductive plastic fader.

Sphere engineering has built an element of ruggedness into the overall design of Satellite, to insure the "roadability" that is common to all the company's consoles.

Other members of this "system" will be introduced in the near future, including a rack of 16 parametric equalizers to complement the basic unit and stereo modules.

SPHERE ELECTRONICS, INC.
20201A PRAIRIE STREET
CHATSWORTH, CA 91311
(213) 349-4747

For additional information circle #75

UPDATED VERSION OF KLARK-TEKNIK DN27 GRAPHIC EQUALIZER

New features of the DN27A include a rear-panel ground lift switch to separate 0 V from the mains ground, and a system bypass relay that connects the input socket directly to the output socket when either the power rails or the mains goes down. The relay also allows the power supply to stabilize before bringing the EQ into circuit, thereby eliminating turn-on clicks or thumps.

Power rails have been increased from ±15 V to ±20 V, thus raising the output clipping level to +23 dBm. A new plug-in balancing card provides facility for special requirements, such as high-pass or low-pass filters. Price of the new DN27A Graphic Equalizer is the same as the DN27: $850.00.

KLARK-TEKNIK ELECTRONICS, INC.
262A EASTERN PARKWAY
FARMINGDALE, NY 11735
(516) 249-3660

For additional information circle # 76

MINIATURE BEYER MCE-5 BROADCAST QUALITY CLIP-ON MICROPHONE

Less than an inch in length and weighing only 6.5 grams, the Beyer MCE-5 nonetheless offers a frequency response from 20 Hz to 20 kHz, together with a 65 dB signal-to-noise ratio. Its non-reflective black surface passes virtually unnoticed in "on-camera" applications, and the mike can be powered either by a 9 - 18 V battery, or a 12 or 48 V phantom supply. For outdoor applications a detachable mesh windscreen is included.

Electrical impedance is 700 ohms balanced (minimum 2.5-kohm input recommended), sensitivity -47.5 dBm (-141 dBm EIA), and maximum input level 116 dB SPL. Professional user price: $160.00.

BEYER DYNAMIC, INC.
5-05 BURNS AVENUE
HICKSVILLE, NY 11801
(516) 935-8000

For additional information circle #77

NEW AUDIO ACCESSORIES FROM AUDI-ENCE

Audi-Ence, Inc. has introduced three new professional audio accessories for studio, sound reinforcement and broadcast applications. These are the TDB™ Transformer Direct Box, HDB™ Headphone Distribution Box, and the AZT-1™ Active Impedance Transformer-type Direct Box.

All three units are said to incorporate rugged cast alloy construction, with quality industrial-grade components for extended life and to withstand rugged treatment. The direct boxes feature PAD-LOCK™ locking switches for safety in critical applications.

The TDB™ lists for $89.50; the HDB™ lists for $99.50; and the AZT-1™ lists for $117.00.

AUDI-ENCE, INC.
3325 VISTA OAKS
GARLAND, TX 75043
(214) 226-2189

For additional information circle # 78

LOW-COST FREQUENCY DIVIDING SYSTEM FROM BROOKE SIREN SYSTEMS

A new series of frequency dividing units has been developed that are said to offer all the established features of the MCS200 Series, but in a very cost effective, non-modular package. The FDS200 is a two-channel, two-way system designed for use in studio monitoring, sound reinforcement and stage monitoring applica-

tions.

All terminations are via XLRs, or equivalent, with inputs electronically balanced. Limiters are provided on all outputs, inserted halfway through filter chain to maintain accurate control. Continuously variable level controls for each band enable up to 12 dB of adjustment. Frequency and slope are set by programming cards, as per the MCS200 Series.

Other features include individual electronic section mute switching and status LEDs, and two-point LED level and limit indicator for each section, adjustable from the outside. Output transformer balancing is available as an option.

BROOKE SIREN SYSTEMS
92 COLNEY HATCH LANE
MUSWELL MILL
LONDON N10 1LR, ENGLAND
01-444-7892

For additional information circle #79

NEW CONDUCTIVE PLASTIC "ROTARY-SLIDER" ATTENUATORS FROM PROTECH AUDIO

The patented design features two sealed conductive plastic rotary potentiometers driven by a rugged slide mechanism, and is suitable for stereo or mono applications. The "Rotary Slider"effectively combines the advantages of linear motion with sealed "coffee and Coke proof" rotary fader elements, and is said to be engineered to meet the need for reliability in professional audio mixing consoles.

A cue microswitch is optional, and includes resistors for deriving a mono cue bus from left and right stereo channels, while maintaining stereo channel separation of program channels. A standard-size front panel (1½- by 7-inches) features a black anodized finish with etched scale.

Standard impedance is 1 kohm (log audio taper), suitable for most applications using IC op-amp circuitry. A 10 kohm linear taper is also available for DC remote-control applications.

Audio attenuation range is at least 70 dB before cue; 85 dB or better at full off. Tracking between channels is ±1 dB, and maximum power handling capability ½ watt/channel. Transient resistance changes (noise) are said to be extremely small initially, and even less after normal use.

PROTECH AUDIO CORPORATION
FLOWERFIELD BLDG., #1
ST. JAMES, NY 11780
(516) 584-5855

For additional information circle # 80

HARMONICOMPUTER EFFECTS UNIT UNVEILED BY DELTALAB RESEARCH

Also designated DL-5, the Harmonicomputer™ pitch-shifting special effects device generates an output that harmonizes by shifting the frequency of the input signal and mixing the result with the input. Designed with the musician in mind, the DL-5's front-panel controls are laid out in the form of a keyboard, which allows the user to select any standard musical interval within its two octave range (one octave up and down). The DL-5 also has a fine tune control for critical tuning.

By using state-of-the-art delta modulation and other advanced engineering techniques DeltaLab has designed the DL-5 to be glitch free. There is said to be no audible splice-glitch normally associated with some other types of harmonizing effects units. The Harmonicomputer™ also features feedback and vibrato controls for creating additional effects, as well as a full patching facility to allow interfacing with delay lines to create virtually any time domain related effect imaginable.

DELTALAB RESEARCH, INC.
27 INDUSTRIAL AVENUE
CHELMSFORD, MA 01824
(617) 256-9034

For additional information circle #81

SMS VOICE 400 PROGRAMMABLE LEAD SYNTHESIZER

Fully programmable controls are said to ensure ultimate ease during live performance and in the studio. The user may set up and store sounds in 32-memory locations, and recall them

by simply selecting the desired program. The unit comes complete with a build-in analog delay line for effects.

The Voice 400 may be used with any 1 V per octave synthesizer or, instead of a keyboard, it may be played by many acoustic instruments in conjunction with a pitch-to-voltage converter.

The unit contains 32 presets of all syntheizer functions including delay and flanging, and is designed to interface easily with most commercial equipment. Price: $1,980.00.

SMS
P. O. BOX 40267
SAN FRANCISCO, CA 94140
(415) 824-4837

For additional information circle # 84

TELEX/MAGNECORD DEVELOPS NEW TAPE TRANSPORT

Identified as the 3000 Series the completely new Telex/Magnecord transport is a three-motor unit that accepts reels up to 10½-inches with NAB type A or type B hubs, and fits standard equipment racks. The new transport is available in 3¾- and 7½-ips, or 7½ -and 15-ips and in 120V/60 Hz or 240V/50 Hz versions. The

3000 Series is compatible with the Telex RP85 record/play preamplifier and may be ordered as a complete recorder/reproducer package or as a separate item. One, two and four channel systems are available and include the transport, amplifier(s), cables and rack mount adapter.

The 3000 Series transport features transformer isolated CMOS logic tape motion controls. Computer-grade push buttons with adjacent LEDs clearly indicate the operating mode at any given time. An automatic cycling feature makes the 3000 suitable for various automated operations. Cycling is controlled with an infrared optical end-of-tape sensing circuit. The Automatic Cue Release (AQR) is a three position switch controlling the tape lifters to provide assistance in cueing and more efficient editing.

A variety of interchangeable head configurations from half-track, single channel to quarter-track, four channel are available and are easily mounted on a heavy gauge assembly plate which will accommodate up to four heads. The snap-on head cover contains a mu-metal shield to isolate the heads from external electromagnetic or RF fields. The 3000 Series transport is designed with a hinged rear panel that provides quick access to plug-in PC boards and plug-in connectors. Suggested user prices for the 3000 Series transport begin at $1,950. The unit is made in the U.S. by Telex.

TELEX COMMUNICATIONS, INC.
9600 ALDRICH AVENUE SOUTH
MINNEAPOLIS, MN 55420
(612) 884-4051

For additional information circle #85

AUDIO & DESIGN ANNOUNCES D'ZAP! SHOCK HAZARD DETECTOR

Audio & Design Recording has introduced D'ZAP!, a combination shock hazard detector and cord checker (phase and continuity). The device measures just 4 x 1½ inches, and is battery powered. D'ZAP will check all aspects of most 2- and 3-conductor cords used by musicians, recording, film and video people. It

will also detect voltage leakage, improper grounding and other dangerous situations often found on today's stages, and in recording and video facilities. The unit, which has been extensively field tested in both the U.S. and Europe, costs $49.95.

AUDIO & DESIGN RECORDING, INC.
P.O.BOX 786
BREMERTON, WA 98310
(206) 275-5009

For additional information circle # 86

NAKAMICHI UNVEILS 700ZXL AUTO-CALIBRATION CASSETTE DECK

The new Model 700ZXL cassette recorder features the A.B.L.E. Auto-Calibration processor, which automatically sets azimuth, bias, level, and equalization prior to recording. The results of the A.B.L.E. procedure (except for azimuth setting) can be stored in any of four tape memories. Also stored in memory are the playback equalizer and noise-reduction settings used. After A.B.L.E. alignment, frequency response is a quoted 18 Hz to 24 kHz, ±3 dB (20 Hz to 20 kHz, ±1.5 dB).

Also featured is a true *R*andom *A*ccess *M*usic *M*emory (RAMM) that subsonically encodes up to 15 programs per side, and has a capacity of 30 playback program commands. The deck performs a high-speed, bi-directional search for the next program in the queue, and sets the playback equalizer and noise-reduction system properly for that program.

Optional accessories include the RM-300 remote control unit, which controls record, playback, pause, rewind, fast forward, stop, cue, and mute, and allows remote RAMM

operations — manual and automatic coding, and playback programming. The RM-300 also has a 4-digit electronic tape counter with reset.

A companion NR-100 Dolby-C noise-reduction processor allows simultaneous encoding and decoding of a stereo signal for off-tape monitoring. The new Dolby-C technique operates over a wider bandwidth than Dolby B, and is claimed to afford twice the noise-reduction potential. Signal-to-noise ratio is improved by 20 dB in the 2 to 8 kHz region without pumping or breathing. The processor is powered via the recorder's remote-control socket.

NAKAMICHI USA CORP.
1101 COLORADO AVENUE
SANTA MONICA, CA 90401
(213) 451-5901

For additional information circle #87

OB-Xa POLYPHONIC SYNTHESIZER FROM OBERHEIM

The OB-Xa retains all the capabilities of the OB-X, while adding the features most requested by professional musicians. Highlighting these additions is a split keyboard function with programmable split location and balance, allowing one sound to be played on the lower half of the keyboard and another sound on the upper half. Also new is a doubling mode,

allowing two sounds to be played with one key.

Other features include two-pole and four-pole filters, programmable transposition of either half of the keyboard, improved noise generator, filter envelope generator, pitch modulation of VCO 2, and a hold footswitch. Also, included is a new modulation and bend assembly with independent LFO boasting sine and sawtooth waveforms.

Available in four, six and eight voice models, the OB-Xa is priced at $4,995, $5,595 and $6,195 respectively.

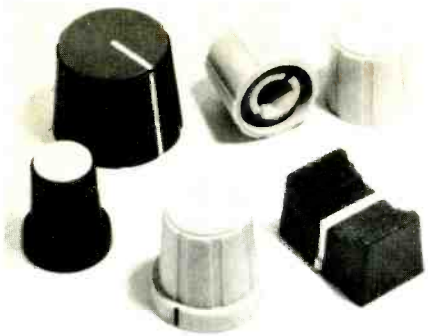
OBERHEIM ELECTRONICS
1455 19TH STREET
SANTA MONICA, CA 90404
(213) 829-6831

For additional information circle # 88

SELCO INTRODUCES LINE OF LOW-COST PUSH-ON KNOBS

The new line of matte-finish push-on knobs are said to be especially suitable for audio consoles and accessories, as well as for electronic systems and instrumentation. An important feature of the push-on knob is a snap-on cap. When in place, the cap and knob form a tight, vibration-free assembly.

Caps can be obtained in gray, black, red, green, blue, yellow, and orange with or without



indicator spots and lines.

Selco push-on knobs are configured to fit "D" shape shafts, shafts with two parallel flats, or split serrated shafts. Several exterior shapes are available, some with integral nut covers and others with a recessed region to cover the shaft-fixing nut.

SELCO PRODUCTS COMPANY
7580 STAGE ROAD
BUENA PARK, CA 90621
(213) 921-0681

For additional information circle # 90

news

KEPEX AND GAIN BRAIN "REBORN"

Bob Todrank, Executive V.P. and Marketing Director of Valley People, Inc., has announced the "death" of the original Allison Research Kepex and Gain Brain Signal Processing equipment. After almost 12 years in production, Valley People is discontinuing the Kepex, Gain Brain and CM-001 console mount unit as of June 1, 1981. Customers will be able to purchase these units until that date. The RM-160 and LX-100 power supply units will be discontinued as of March 15, 1981.

DAVID HADLER APPOINTED DIRECTOR OF MARKETING FOR ROLAND STUDIO SYSTEMS

David Hadler comes to newly formed Roland Studio Systems with extensive professional experience. His background includes not only long experience doing live PA sound for groups such as The Doobie Brothers, J. Geils Band, and Traffic, but also professional equipment sales — most currently as National Sales Manager for Quad-Eight Electronics.

In addition, his articles in *Recording Engineer/Producer* and *Sound Arts* magazines have been a clear, concise contribution to the entertainment industry.

GERRY BLOCK TO HELM SIGMA STUDIOS NEW YORK

Gerry Block, well-known studio engineer and inventor of the revolutionary Compudisk disk mastering computer, has been appointed general manager of Sigma Sound Studios' New York recording complex it was announced recently by Joseph D. Tarsia, president. Tarsia also announced that Jay Mark, who has helmed the New York operations for the last two years, will be stepping out of his management role to specialize in his primary fields of interest — engineering and producing.

"I am elated," said Tarsia, "that we have been able to satisfy Jay Mark's desire and at the same time fill the position with a highly respected professional and old friend, Gerry Block. Sigma is very much indebted to Jay," Tarsia continued, "for his major accomplishments since 1978, a period which has witnessed the studio's greatest success."

Gerry Block *Jay Mark*

Jay Mark's engineering achievements include a Grammy for *Disco Inferno*, as well as numerous gold and platinum record awards. He has worked with Stevie Wonder, Teddy Pendergrass, Stephanie Mills, Paul Williams and Frankie Valli, and is a ten-year veteran of Sigma Sound Studios.

Gerry Block was Sigma's first New York employee and was heavily involved in the conception and implementation of expanding Sigma from its Philadelphia origins into the New York market in 1976. As an engineer Block earned Sigma/New York's first gold album, *Village People*. Block departed Sigma in 1978 to complete development of the Compudisk system. Having finalized a licensing arrangement he is now able to return to Sigma on a full-time basis.

NEW BOOKING SERVICE FOR STUDIOS WITH SLACK CAPACITY

Session time at a top recording studio for half the normal price? That's the idea behind a new company called Reel Time. Walter O'Brien, president of the company, explains that due to unbooked time and cancellations, many major recording studios have "left over time." What Reel Time offers to the studio is a service of booking left over time to its clients. As a result, engineers remain busy and the studio can still make money.

Says O'Brien of his new venture: "The aim of Reel Time is to offer the same facilities that are available to a major band, but for half-price. This will generate more business for the studio and enable high standards of recording to be maintained."

To the client, this new service is said to be invaluable. If a band, artist or producer is willing to be booked at short notice, the same high-quality studio with all its services could be available at half the normal price. The client registers his studio needs with Reel Time, and as soon as a studio notifies Reel Time of time available, the company can book their clients right in.

These services could also be used by bands and songwriters needing demos but who couldn't afford high studio rates; new bands who wished to record in high quality but can't afford present studio rates; and jingle producers and free-lance producers who need recording or mixing time.

REEL TIME
1697 BROADWAY
NEW YORK, NY 10019
(212) 765-2053

dbx INTRODUCES PRE-RECORDED ENCODED CASETTES

Twelve titles are being released initially, eight of which were derived from digital master tapes. The initial releases appear on the Connoisseur Society, Varese Sarabande, Crystal Clear, Chalfont, M&K Real Time, and Mushroom labels. Many additional record labels will soon be represented in the dbx Cassette library, including MMG, Vox, Orion, Sine Qua Non, Pausa and Nautilus.

The decision to introduce the encoded cassettes at this time was primarily motivated by the success of the dbx Encoded Disc Program and the increased licensing of dbx noise reduction technology to other audio electronics manufacturers, including Technics, TEAC, Marantz and Yamaha.

The first set of releases in the dbx Cassette library are being produced using real-time duplication techniques provided by In Sync Laboratories in New York, under the supervision of Alan Silver. A major benefit of dbx Cassettes is that cassette tape hiss is reduced to virtually inaudible levels. Another advantage is that the full dynamic range of the original musical performance is preserved. The cassettes can be played back using any dbx Type II noise reduction system or decoder. Suggested retail price of the new dbx Cassettes will be $20.00 each.

3M TO SHOW SYNCHRONIZATION OF ITS ONE—INCH VTR AND DIGITAL AUDIO RECORDER AT NAB

A Model TT-7000 one-inch, C-format video tape recorder will be synchronized with a 3M four-channel digital audio recorder to demonstrate SMPTE compatibility for the first time at the forthcoming National Association of Broadcasters Convention in Las Vegas. The SMPTE-compatible system will utilize a standard BTX 4600 controller, and a small prototype VCO interface box designed by 3M.

The demonstration is said to be in response to increasing interest in linking the high quality of digital audio with video for television program, spot commercial, audio-visual, and movie soundtrack production.

LOS ANGELES TV STATION FIRST WITH DIGITALLY RECORDED SIMULCAST

The first television program simulcast with digitally recorded audio, the musical program *All That Brass*, was broadcast last Christmas from KCET-TV, the Los Angeles PBS affiliate, with stereo audio broadcast on radio station KPFK. The Modern Brass Quintet was conducted by Donald Waldrop in works by Bach, Elliot Carter, Erik Satie and Scott Joplin.

KCET has long been a pioneer in stereo simulcasting and this first venture into digital sound is a significant event. Jerry Zellinger, sound mixer and engineer at the Los Angeles TV station, commented, "Since the Sony digital system utilizes videotape recorders, we thought it might be an interesting way of not only getting good quality audio, but also of integrating it into our video editing system."

Recording of The Modern Brass Quintet was done using the Sony PCM-100 Digital Audo Processor. Zellinger commented favorably on his first experience with the system. "I was very surprised . . . we hooked up a couple of connectors and we had it installed. I thought there would be more to it." The Sony digital system can handle approximately 50% more dynamic range than conventional analog

recorders. After the program, Zellinger mentioned, "I found that I wasn't even driving the unit as hard as I could have. Digital is quieter; there is an absence of tape hiss . . . but the first thing that hits you with digital is the clarity. It just blows you away with how clean the sound is . . . and the high frequencies are very crisp."

SCHARFF GOES DIGITAL WITH 3M MASTERING SYSTEM

In a joint venture with Audio Video Rents of San Francisco and Record Plant West in Los Angeles, Scharff Communications, Inc., will rent the 3M Digital System throughout the United States and Canada, with exclusive rental rights in the Eastern time zone. The 32- and 4-track recorders will be housed in a special showroom at SCI's Manhattan headquarters. Audio Video Rents will also keep a factory-trained engineer in New York to maintain the digital equipment.

Carson Taylor, VP/GM of Audio Video Rents, commented that Scharff's reputation in the audio industry convinced him to go with SCI. "We looked around for a long time to find someone in New York," said Taylor. "SCI has the technical knowledge, dependable service and first-rate staff that we were seeking." Taylor also said that Peter Scharff's experience in classical music was helpful, "as that is where the equipment has been used most widely." Scharff was formerly Associate Producer of the Emmy Award-winning "Live From Lincoln Center" series on Public Television.

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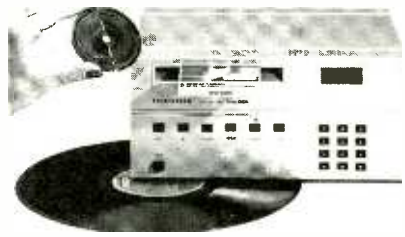
TELEFUNKEN AND TELDEC DEVELOP DIGITAL AUDIO RECORD

The two companies recently demonstrated their "MD" (Mini-Disk) System before the Digital Audio Disk Conference (DAD) in Tokyo. The conference was convened for the purpose of writing a standard for a digital phonograph record format. DAD is an organization of about 50 international audio equipment and phonograph record manufacturers, and Telefunken is the sole German entertainment electronics company that belongs to this organization.



The standard proposed by Telefunken/Teldec permits one hour of stereo to be recorded on each side of a 135-mm (5.3-inch) record, turning at 250 revolutions per minute. The standard, furthermore, permits up to four discrete wide-band channels to be accommodated in a single groove.

Of the eighteen different formats originally proposed to this DAD Committee, most have now been abandoned in the course of deliberations. Following the Telefunken/Teldec presentation in Tokyo last October there remains but two systems under consideration.

It is reported that the DAD Conference is of the opinion that no further system formats are to be admitted for consideration. This would allow any future standard formats to be based on the two European systems which have been proposed: the optical playback system, and the "MD" System from Telefunken/Teldec.

SPARS ANNOUNCES NEW MEMBERS; NASHVILLE CONVENTION

Five new members have been approved by the Society of Professional Audio Recording Studios (SPARS):

Advisory Associate Members — Ampex Corporation/Magnetic Tape Division, Richard Antonio; and MCI, G. C. "Jeep" Harned.

Affiliate Member — Strawberry Jamm Recording Studio, Bob Curlee, West Columbia, South Carolina.

Associate Members — Hamilton H. Brosious of Audiotechniques, Stamford, Connecticut; and Vipin Sahgal of V. Sahgal & Associates, Beverly Hills, California.

Plans have also been formalized for a major SPARS Convention, slated for Nashville, Tennessee, from Thursday, August 27, through Saturday, August 29, 1981. Titled "Partners For Profit & Progress," the event will be held at the Opryland Hotel, and will feature exhibits of video and audio manufacturers, record companies, and recording studios.

In addition, seminars will be presented by some of the most respected figures in the audio and video industries. A significant keynote speaker will kick off activities with an overview of "What The Record Company Looks For From The Recording Studio." Succeeding seminars will address a myriad of subjects, including video sweetening, computers, production, engineering, microphone techniques, equipment financing, legal aspects, remotes, marketing, and merchandising concepts.

APRS '81 EXHIBITION MOVES TO NEW VENUE

The 14th Association of Professional Recording Studios' Exhibition will be the first for which the event moves from its long-established venue in London's Connaught Rooms to a new site at the Kensington Exhibition Centre and Exhibition Centre and Rainbow Room, in London's fashionable and easily accessible Kensington High Street. The 1981 dates are: June 10, 11 and 12.

Apart from its situation near an underground station, numerous good hotels, banks, pubs, taxi stands, high-class shops, and car parking, the new exhibition site has the added advantage of offering even more floor area than ever before — all on one flat level.

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APRS ELECTS NEW CHAIRMAN

Peter Harris, Director of the Wembley Music Centre, London, has been elected to succeed the late Jacques Levy as Chairman of the Association of Professional Recording Studios.

Claiming to have entered the recording business "by accident," Peter Harris was interviewed for a position in a recording studio just because he happened to be accompanying a friend who was looking for such a job. As a result Harris spent seven years with IBC Studios in London, acting both as deputy chief engineer and mixer on mobile radio show recordings.

He moved to CTS Studio in 1961, working first on the technical, then the managerial side. When CTS moved to the Music Centre in Wembley, North London, in 1972, Harris went with it. He became a director of CTS, then of De Lane Lea Music, and in 1978 was made MD of the Music Centre.

MICMIX PRESIDENT JOHN R. SAUL, DEAD AT 49

The late John R. Saul was widely known for his outstanding business ethics, warm personality, and inventive mind. He will be deeply missed by the entire audio industry. He is survived by his wife, Babs Saul, and his daughter, Teresa.

John Saul was a member of the Audio Engineering Society, National Association of Broadcasters, Society of Broadcast Engineers, Society of Motion Picture and Television Engineers, and was a mechanical engineering graduate of the University of Notre Dame.

Mr. Saul worked as a senior project engineer for LTV Corporation, and resigned in 1972 after 20 years of service. In 1972, MIXMIX Audio Products was incorporated, and John assumed the position of President.

MICMIX has long been known for the Master-Room reverberation sytems. Mr. Saul was indeed a pioneer in reverberation technology, having recently applied for several reverberation-related patents. The very popular XL-Series of Master-Room reverberation systems is the result of an intense research program led by Mr. Saul, and has established MICMIX as the leader in spring reverberation technology. The company is involved in a substantial growth period, having recently increased its manufacturing facilities as well as adding a number of new employees.

□□□

views

. . . continued from page 22 —

A DECADE OF "AUDIOPHILE" RECORDS

releases (priced in excess of $10 apiece) became available, the emphasis shifted back a bit to artist, repertoire, and performance. Now they sense the pendulum beginning to swing the other way again.

All of this can be read, they believe, as a gradual education of the consumer as to what he can and should expect from a record. If this is the case, consumer expectations should rise far beyond what the major record companies routinely provide as "good sound." Once the consumer has become acclimated to *truly* good sound, presumably he won't forget.

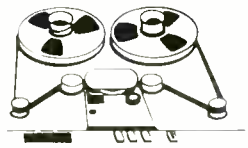
To The Future

The majors have taken note of the audiophile manufacturers' successes, and have raced off in directions intended to close the gap. Chances are they won't manage it. Production techniques, as they've evolved, are just too dissimilar. In the audiophile-record world, excessive multimiking on jazz and classical sessions is fatal, because customers will hear it and object vehemently. For the most part multitracking is impossible, overdubs are out, and "fix-in-the-mix" procedures can be forgotten. What you get when the band plays is what you've got — forevermore — and these are conditions with which the usual big-time recording teams just cannot cope. (I have heard them try. Disaster.)

On the other hand, the sort of music that is created during mixdown sessions is unlikely to be infringed upon by the audiophile movement. A number of the audiophile producers would seem to have an aversion to recording hard rock. After they've gone to such lengths to eliminate inadvertent distortion, deliberately introduced distortion appalls them. They've also found that many rock musicians cannot adjust to the "play it, play it right, and then go home" form of studio work. And they find it especially difficult to bridge the communication and economic gaps. Production of 250,000 disks is nothing to a musician who is reaching for platinum, and the financial compensation can never be what his agent considers appropriate.

So it appears that the big labels and the audiophile contingent are fated to travel on side by side for awhile. Will the sheltered audiophile group therefore swell in numbers? It's hard to say, but on the basis of past experience the answer is: No. The hard realities are that the hi-fi stores are no longer the obliging outlets for audiophile records that they once were, having been swamped by albums that took up space and were not suited as products to their form of salesmanship; that more conventional paths of distribution require a financial base to see you through a long dry spell until invoices are finally paid; that name talent which might embellish your label is likelier to turn to an audiophile-record manufacturer with an established track record; that keeping up with technology is going to be costly; and that economically pressed consumers are not going to be able to keep up with $15-plus records indefinitely. For the time being, perhaps we should cherish the audiophile-type manufacturers we have now, in order to learn from their mistakes, study their successes, and observe how they deal with their markets. If we don't, they might just disappear in time.

But if they do, here's betting that they will be back. □□□



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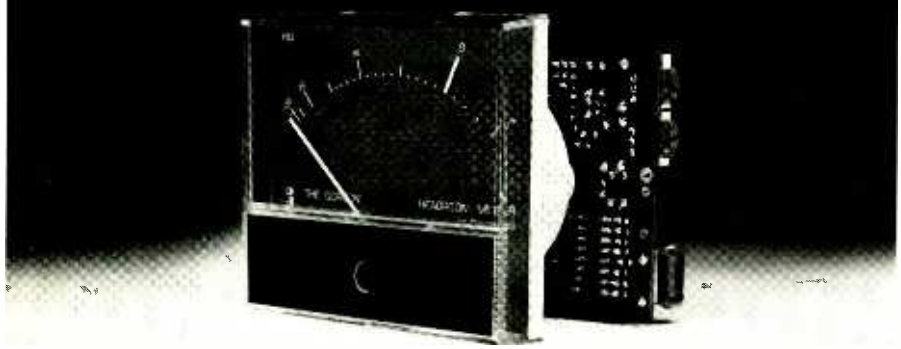

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STUDIO UPDATE

Northeast:

■ **CBS RECORDS** (New York City) has taken installation of a new Neve 8108 32-channel mixing console equipped with NECAM automation; time on the new console has been booked by, among others, producer **MIKE BERNIKER. ERIC PORTERFIELD** is CBS' Director of Recording Engineers. *New York, NY.*

■ **ELH PRODUCTIONS** (Albany, New York) is a new location recording enterprise featuring an 8-input system mixed to 4-track. The company is owned and operated by **EVAN L. HENDRICKS,** and just released it's first record by country singer **MIRANDA LYNN.** *155 Dove Street, Albany, NY 12202. (518) 449-5124.*

■ **MASTER SOUND PRODUCTIONS** (Franklin Square, New York) has taken delivery of a new Trident TSM automated console with 48-inputs and 32-monitors, giving the panel a full 80-channel remix capability. Custom features include a 48-position meter overbridge with stop clock assembly, and the ability to separately access the quad/stereo bus from either the input section or the monitor section. The desk is being operated with an Allison 65 K Programmer and Fadex modules, and feeds Ampex MM-1200 24- and 16-track machines. Equipment supplier for the new installation was Empirical Audio, of Ossining, New York. *921 Hepstead Turnpike, Franklin Square, Long Island, NY.*

■ **MCE RECORDING STUDIOS** (Schenectady, New York) has opened the doors of its new 8-track facility, which features a TEAC/Tascam 80-8 with dbx, a TEAC 35-2 with dbx, Ashly and dbx limiters, MXR DDL, TAPCO EQ and reverb, and monitors including JBL 4311s and Auratones powered by Crown amps. Mikes are by Electro-Voice and Shure, and services include record pressing and tape duplication. **MARK C. ERNST** is the owner and resident producer with chief engineer **CHARLES NORLING.** *463 State Street, Schenectady, NY 12305. (518) 372-1762.*

■ **POWER STATION RECORDING STUDIOS** (New York City) has acquired a new Audio-Kinetics QLOCK 3.10 SMPTE synchronizer system for its studios. The unit was supplied by Empirical Audio, of Ossining, New York. *New York, NY.*

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STUDIO UPDATE

■ **TURTLE BEACH RECORDING'S** (York, Pennsylvania) owner **ROY SMITH** reports the installation of a Tangent Model 3216 console supplied by Dimension Five, Inc. Other improvements to the facility include the installation of a new vocal booth, an Omni-Craft gate rack, and a Vox Continental organ. **BILL HATFIELD** and **DAVE LONG** handle the assistant engineer and maintenance engineer jobs respectively, while the studio has played host to **ATLANTIC CROSSING, BOB KRAUT,** and **BRAINFOOD.** *1912 Alcott Road, RD #22, York, PA 17402.*

— ACTIVITY —

CELEBRATION RECORDING STUDIOS (New York City) finds the new band **BBC** in the facility working on their first album with producers **JONNY MANN** and **TONY CONIFF.** For the sessions **PIERS PLASKITT** was behind the console, assisted by **HOLLY PETERSON** and **HOWARD BOWLEG.** Also recording is **KAPELYE** for their first LP for Flying Fish Records with engineer **MICHAEL FARROW.** Other work of late at Celebration includes dates by **RICHARD PERRY** working on the **MARVA KING** album for Planet Records with Plaskitt engineering, and a project by **THE LENNY ROBERTS BAND** engineered by **MARK HOOD** for Warner Records. *2 West 45th Street, New York, NY 10036. (212) 575-9095.* □ **FRANKFORD/WAYNE MASTERING LABS** (New York City) announces the completion of its newly remodeled Studio B mastering facility. **TOM STEELE,** the lab president, adds that the new room's design centers around an Advanced Music Systems Disk Mastering Delay Line. The AMS unit, which will be interfaced with a new **COMPUDISC** computer for cutting the masters, was supplied by Empirical Audio, of Ossining, New York. *New York, NY.* □ At **MINOT SOUND** (White Plains, New York) **DAVID SANBORN** is recording his new LP for Warner Brothers with **MICHAEL COLINA** and **RAY BARDANI** producing. The same team layed down the tracks for Sanborn's current LP, *Hideway,* also recording at Minot. Other activity has included **GARRETT MORRIS'** R&B release for MCA, **THE SILENCERS** new album on Precision Records produced by **TOM COSSIE** with **RON CARRAN** engineering, **STAR POINT'S** latest on Casablanca, and **SOUTHROAD CONNECTION'S** on United Artists — the last two projects both produced by **LIONEL JOB** with **RAY BARDANI** at the console. *19 South Broadway, White Plains, NY 10601. (212) 828-1216.* □ **SIGMA SOUND STUDIOS** (Philadelphia, Pennsylvania) is involved in the early stages of an album by **LOCKSMITH** on the Arista label, with **WAYNE HENDERSON** producing and **PETER HUMPHREY** behind the console assisted by **VINCE WARSAVAGE.** Meanwhile, **BLUE MAGIC** is finishing up their Capitol Records project with producer **NORMAN HARRIS** and engineer **ARTHUR STOPPE,** and **CHARLES MANN** is doing overdubs and mixing on a single produced by **DAVE CRAWFORD** and engineered by **JIM GALLAGHER.** Warsavage has also been assisting on the latter two projects. *212 North 12th Street, Philadelphia, PA 19107.* □ **SIGMA SOUND STUDIOS** (New York City) reports that **GLADYS KNIGHT & THE PIPS** are in the studio working on a new CBS album with **ASHFORD AND SIMPSON** producing. Behind the console are engineer **MICHAEL HUTCHINSON** and assistants **MATTHEW WEINER** and **CRAIG MICHAELS.** Also at Sigma, **THE SPINNERS** are cutting tracks and mixing their upcoming Atlantic LP with **MICHAEL ZAGER** and **JERRY LOVE** producing, and Hutchinson turning the dials assisted by Weiner. Mixing is proceeding as well on the new **STAR CITY** release for Quality Records of Canada. **JOHN DRISCOLL** is producing the project with **JAY MARK** engineering assisted by **JOHN POTOKER.** *1697 Broadway, New York, NY 10019.* □ **STARFLEET BLAIR, INC.** (Boston, Massachusetts) utilized its Mobile Unit B for a live concert broadcast of **THE KINKS** from The Paladium in New York City. Starfleet's **BOB DEMUTH** handled the mix in the 24-track van, with production assistance from company vice-president **JIM SLATTERY** and executive director **HARRIET BELLUSH.** Co-production credit was shared with The Kink's Renaissance Management and **ELLIOT ABBOTT.** The live-cast went out over 52 FM stations in the . . . *continued overleaf* —

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STUDIO UPDATE

U.S. and Canada via the Starfleet Stereo Network, and was later broadcast from tape in Britain and Holland. Other European broadcasts are scheduled. *535 Boylston Street, Boston, MA 02116. (617) 262-0220.* □ **TROD NOSSEL RECORDING STUDIOS** (Wallingford, Connecticut) has been recording sessions with **MARY MUNDY,** produced by **LEW HANSON,** as well as work by **NICK APOLLO, THE ANCIENT MARINERS,** and **EXPERIENCE, INC.** The studio has also been involved with some audio-visual work for **GALLERY WEST FILMS.** *10 George Street, Wallingford, CT 06492. (205) 265-0010.*

Southeast:

■ **BRT RECORDING STUDIOS** (Fort Lauderdale, Florida) have opened in its new location with a multitrack console feeding a Scully 12-track recorder and Ampex mono and two-track machines. Outboard gear includes a Delta Lab Acousticomputer, EXR Exciter, EMT echo-plate, Kepexes, Gain Brain, and an assortment of limiters and reverbs. Mikes are by Neumann, AKG, Shure, and Sennheiser, and monitors are by JBL and Auratone. The instrument list includes 12 keyboards headed by a Steinway grand piano. **NORMAN LITCOMB** is the chief engineer. *275 East Oakland Park Boulevard, Fort Lauderdale, FL 33334. (305) 564-2655.*

■ **GROUNDSTAR LABORATORIES** (Nashville, Tennessee), a division of Ronnie Milsap Enterprises, has taken delivery of a Neve 8078 44-channel recording console with NECAM automation. The desk was built primarily for Milsap's work on his new album, and Rupert Neve, Inc., provided an instruction manual in braille with the installation. *Nashville, TN.*

■ **LIVE OAK SOUND RECORDERS** (Norfolk, Virginia) has opened its new 7,500 square foot complex. Studio A is operational and features an MCI 24-track recorder with Autolocator coupled to an MCI console. The control room and studio were designed by **JIM MIKLES,** and the booth offers Crown and BGW amps powering Westlake monitors, JBL 4311s and Auratones. Studio B, a four-track room, is currently under construction, and plans are being drawn up for Studio C, which will accommodate two 24-track recorders. Several music productions synched to video were recently completely under the in-house music division, and other activity finds **WAYLON JENNINGS** in doing voice tracks for *The Dukes of Hazard,* and PM Magazine shooting a segment featuring **NANCY SINATRA'S** producer, **BILLY STRANGE. SCOTT CHANCE** is the studio manager, and **STEVE DEPPOS** Live Oak Sound's president. *110 College Place, Norfolk, VA 23510. (804) 627-5545.*

■ **MIDDLE TENNESSEE STATE UNIVERSITY** (Murfreesboro, Tennessee) announces the purchase of a Harrison Systems Series 2824 console for its Department of Communications. The new panel, along with an Allison 65 K Programmer, will be utilized in the University's Recording Industry Management program, a four-year degree course of study in all aspects of the recording industry. *Box 21. Murfreesboro, TN 37132.*

■ **SOUND STAGE STUDIOS** (Nashville, Tennessee) has taken delivery of a fully automated Trident 40-input, 32-monitor TSM console. *Nashville, TN.*

■ **TANDEM RECORDING STUDIO** (Bristol, Virginia) recently upgraded to 16-track with the installation of an API console previously employed in **CHET ATKINS'** private studio in Nashville. The desk accompanies a new Scully 16-track recorder with remote and digital counter. Tandem is equipped with AKG echo, Altec monitors, MacIntosh amps, and a Baldwin grand piano. *13 Moore Street, Bristol, VA 24201. (703) 466-8675.*

— ACTIVITY —

Brown . . . Banks . . . Brown . . . Brooks

At **ARDENT RECORDING** (Memphis, Tennessee) **HOMER BANKS** and **CHUCK BROOKS** are producing an album for **RANDY BROWN** on the Casablanca label, with **WILLIAM BROWN** and **ROBERT JACKSON** engineering the sessions. **POINT BLANK** is also in Ardent recording their new LP for MCA, with producer **BILL HAM** and engineer **TERRY MANNING,** while **ALLEN JONES** is producing a new LP for **EBONEE WEBB** on the Capitol label. Brown and Jackson are in the control room with Jones. Mastering at the facility has been completed by **LARRY NIX** for such artists as **JESSE WINCHESTER, PAUL BUTTERFIELD,** and **WILLIE MITCHELL.** *2996 Directors Row, P.O. Box 30012, Memphis, TN 38130. (901) 396-8700.* □ **ARTISAN RECORDERS** (Fort Lauderdale, Florida) is currently supplying its 24-track mobile recording truck for bassist **JOE PASTORIUS,** who is recording an upcoming solo album for Warner Brothers in his hown in Deerfield Beach, Florida. Artisan president **PETER YIANILOS** is engineering the project with **RICHARD HILTON** assisting. Artisan also provided its truck to record **ART BLAKEY AND HIS JAZZ MESSENGERS** in a live appearance at Bubba's in Fort Lauderdale. Blakey, Yianilos, and producer **BOB SCHACHNER** remixed the tapes at Triad Studios. Schachner is producing a series of live jazz albums with the Artisan truck recording the sessions at Bubba's. In addition, the Mobile Unit recorded audio for the **POINTER SISTERS'** upcoming HBO Cable Television Special, live at the Attic Nightclub in Greenville, North Carolina. **CARMEN MC RAE** also used the Artisan bus recently to record a live album at Bubba's in Fort Lauderdale, produced by Bob Schachner. The mobile facility was also utilized for a recent **WAYNE NEWTON** TV

STUDIO UPDATE

special taped at the Frontier Hotel in Las Vegas. Yianilos was again at the console. *5077 North East 13th Avenue, Fort Lauderdale, FL 33334. (305) 491-3132.* □ **BEE JAY RECORDING STUDIOS** (Orlando, Florida) reports that **THE OUTLAWS** were in mixing their King Biscuit Flower Hour concert with **KURT KINSEL** and **DANA CORNOCK** at the console in Studio B which, along with Studio A, was also used by **MOLLY HATCHET** for sweetening some live tracks to be released as a special "airplay-only" album. Currently in Studio A, **PAT TRAVERS** is completing work on his upcoming album produced by **DENNIS MACKAY** and engineered by **ANDY DEGANAHI. JIM KATT** is the vice-president and general manager of Bee Jay. *5000 Eggleston Avenue, Orlando, FL 32810. (305) 293-1781.* □ **CRITERIA STUDIOS** (Miami, Florida) reports **THE POLICE** taking a break from their current U.S. tour to record Spanish and Japanese versions of their latest single, "De Do Do Do, De Da Da Da," with their producer **NIGEL GRAY**, who was in Criteria at the time working with **WISHBONE ASH.** Gray engineered assisted by staff member **CHUCK KIRKPATRICK** on the A&M project. Meanwhile, **THE MARSHALL TUCKER BAND** is mixing their forthcoming Warner LP, *Dedicated*, with **TOM DOWD** producing and **KEVIN HERRON** engineering with second **JOE FOGLIA. DR. HOOK** is also in Criteria doing vocal overdubs for their upcoming album produced by **RON HAFFKINE.** Engineering is being handled by **JERRY MASTERS** assisted by Foglia. Due back into the studio shortly is **ART GARFUNKEL** to complete work on his CBS album produced by **ROY HALEE,** who is also engineering with assistant **DENNIS HETZENDORFER.** *1755 North East 149th Street, Miami, FL 33181. (305) 947-5611.* □ **dbp STUDIOS** (North Miami, Florida) reports that **FANTASY** is in the 24-track studio working on their latest album with producer **GREG KIMPLE** and engineer **TED STEIN. JEFF DEAN** is assisting. Also in the facility, **THE ITCH BAND** is laying down tracks with **CLIFF GUEST** engineering. *1975 North East 149th Street, North Miami, FL 33181. (305) 940-6999.* □ **SINGLETON SOUND STUDIOS** (Nashville, Tennessee) reports that **RODNEY LAY** was in recently to complete an album project, with **BOOMER CASTLEMAN** producing and **DAVID ROYS** and **BRENDA DAMRON** engineering. Singleton Sound is equipped with an MCI JH-416 console, liked to synchronized Ampex 8- and 16-track machines. *3106 Belmont Boulevard, Nashville, TN 37212. (615) 385-1960.* □ **SOUND EMPORIUM** (Nashville, Tennessee) finds **CHRIS WATERS** finishing up his latest single for Rio Records. The tune was produced by Waters along with studio president **JIM WILLIAMSON,** who also engineered the sessions. Also in the studio is MCA artist **DON WILLIAMS** working on his new album, the thirteenth recorded at the facility. Williams produced with **GARTH FUNDIS** while **GARY LANEY** engineered. Another recent session for MCA was booked for the new **B. J. THOMAS** album, with **LARRY BUTLER** producing and **BILLY SHERRILL** behind the console. Other artists at work include **JOE STAMPLEY** mixing his new Epic LP with Sherrill engineering, and **SONNY JAMES** working on an independent project with Laney at the board. *3102 Belmont Boulevard, Nashville, TN 37212. (615) 383-1982.* □ **STRAWBERRY JAM STUDIOS** (West Columbia, South Carolina) has just completed an LP with jazz singer **MAXINE SULLIVAN,** with production chores handled by **GEORGE BUCK** and **BOB CURLEE** engineering. *3964 Apian Way, West South Columbia, SC 29169. (503) 356-4540.*

South Central:

■ **RAMPART STREET RECORDING STUDIO** (Houston, Texas) has upgraded its monitoring system with a pair of JBL 4333 units. In addition to the two Crown D150 power amps, a DC300A was also installed to handle the low-end of the bi-amped system. The crossover is also by Crown, and the room has been voiced with a pair of White Instruments passive equalizers. Other new gear includes a Lexicon DDL, a Technics cassette deck, and a Rhodes electric piano. Current projects include a new single by the **MOORE BROTHERS** engineered by **DAN YEANEY.** *6105 Jessamine, Houston, TX 77036. (713) 772-7277.*

■ **RIVER CITY RECORDERS** (Baton Rouge, Louisiana), a subsidiary of Royal Shield, Inc., has appointed **LEE PETERZELL** to the position of chief engineer, according to assistant vice-president **JOHN LOWRY.** Peterzell has engineered at a number of southern studios, including Pyramid's Eye and Studio in the Country; his

STUDIO UPDATE

credits include work with such artists as **NEIL YOUNG, THE ALLMAN BROTHERS,** and **DOUG KERSHAW.** River City is equipped with an MCI 24-track recorder with AutoLocator III, fed by a Harrison 2824 console with an Allison 65 K Programmer. Monitors are bi-amped JBL 4331 units, Altec Big Red 604s with Mastering Lab Crossovers, and Auratones. Signal processing gear includes Eventide Harmonizer, Instant Flanger and Omnipressor, Lexicon Prime Time DDL, Orban De-Esser, and reverb from EMT and AKG. Noise reduction is by Dolby and dbx. Mikes include AKG, Sennheiser, Shure, and Electro-Voice units, and the instrument collection boasts a Yamaha grand piano, Prophet 5 synthesizer, a Ludwig Natural Maple drum kit, and an assortment of guitar amps and percussion instruments. *1251 North Acadian Thruway, P. O. Box 3157, Baton Rouge, LA 70821. (504) 383-8671.*

— ACTIVITY —

REELSOUND RECORDING COMPANY (Manchaca, Texas) provided its 24-track remote services at the Armadillo World Headquarters in Austin, Texas, recording such artists as **MARIA MULDAUR, JOE ELY, JERRY JEFF WALKER, COMMANDER CODY,** and **ASLEEP AT THE WHEEL.** The project was produced by Armadillo Records with **MALCOLM HARPER, JR., MASON HARLOW,** and **MARK GITTERLE** engineering. Reelsound has also recorded performances of **THE CHARLIE DANIELS BAND** at the Austin facility. Harper is the owner of Reelsound. *P. O. Box 280, Manchaca, TX 78652. (512) 472-3325.*

Midwest:

■ **ACME RECORDING STUDIOS** (Chicago, Illinois) is celebrating its seventh anniversary with the addition of a Kimball Bosendorfer 6' 9" grand piano. New outboard gear includes an Orban Parametric 622B EQ, Electro-Voice Sentry 100s, and Interface-A Series 3 monitors, three dbx 155 noise-reduction units, and two Shure SM-81 microphones. *3821 North Southport, Chicago, IL 60613. (312) 477-7333.*

■ **AFTER DARK RECORDING** (Parma, Ohio) has added two Trident Parametric equalizers, an EXR Exciter, and a Pultec EQP-1A tube limiter. In the studio taking advantage of the new gear has been **JIMMY ZERO,** formerly of **THE DEAD BOYS,** recording for Sire Records, with **KIRK YANO** handling the production and console chores. **THE PAUL POPE BAND** is at work with **ROB HAMMER** and Yano engineering, while **SONOMA COOK** is laying down tracks for a project on the Epic label, with **JON BRINSON** producing and **WAYNE WESTON** engineering. *5510 Pearl Road, Parma, OH 44129. (216) 845-5455.*

■ **GERIM STUDIOS** (Chicago, Illinois) formerly Chess Records, announces the opening of its new studios. Studio A is a 24-track facility, featuring in the control room an MCI recorder, UREI 813 Time-Aligned™ monitors, and a Master-Room XL-305 reverb. The studio area is equipped with E-V Sentry III monitors, a portable drum riser with isolation capabilities, a 12- by 14-foot isolation booth for strings and horns, and instruments including a Knabe grand piano and a Hammond B-3 organ. Studio B is a 16-track room designed for demos and less demanding situations. **GERALD SIMS** is the owner/operator of the complex which, as Chess Records, entertained such artists as **THE ROLLING STONES, B. B. KING,** and **CHUCK BERRY.** *2120 South Michigan Avenue, Chicago, IL 60616. (312) 326-5450.*

■ **SOUNDSMITH RECORDERS** (Indianapolis, Indiana) announces the opening of its newly re-designed and equipped Studio A with acoustic design by Michael Ebert, late of Sierra Audio. New Equipment includes a Neotek Series III 28 x 24 console, Lexicon Prime Time, Audio & Design's expander/gates, de-esser, auto-panner, parametric and equalizer modules, plus mikes by AKG, Shure, Sony, and Beyer. A new active cue system was also installed by JDM Industries of Cincinnati. The studio is owned and operated by **MARK** and **MARGARET COPENHAVER** and **MARK** and **WANDA DODD.** *5210 East 65th Street, Indianapolis, IN 46220.*

■ **STUDIO WEST** (Chicago, Illinois) has added a TEAC/Tascam 85-16 16-track recorder to its two-studio operation, according to owner/head engineer **DON MUELLER.** The facility has provided services for educational, industrial, musical, and on-air spot business for such clients as The National Black Network, Playboy Enterprises, and Science Research Associates. *540 North Lake Shore Drive, Chicago, IL. (312) 828-9180.*

Studio West, Chicago

■ **HERB STREITZ RECORDING** (New Ulm, Minnesota) has announced the completion of its truck reconstruction project. A Tangent 3216 24-channel console was chosen from AVC Systems of Minneapolis. UREI 811 Time-Aligned™ monitors are powered by a McIntosh 2200 power amplifier. Updated outboard gear includes a SCAMP rack with compressor/limiters, dynamic noise filters/gates, dual noise gates, parametric equalizers, and a MICMIX XL-305 reverb. A large complement of mikes available include AKG, Neumann, Shure, and EV models. Upcoming dates include a Mid-West tour recording the jazz-vocal ensemble **THE FANFARES,** with **PHIL MATTSON** directing from Foothills College, Los Altos, California. *P.O. Box 247, 527 South Franklin, New Ulm. MN 56073. (507) 345-8572.*

■ **SOONER SOUND LAB** (Oklahoma City, Oklahoma) has added a new 24-track

Otari MTR-90 to be interfaced with the operation's MCI console. The facility was formerly known as **THE PRODUCER'S WORKSHOP.** *3604 N. W. 58th Street, Oklahoma City, OK 73112. (405) 947-8094.*

■ **UNITED SOUND** (Detroit, Michigan) has ordered a 32-channel Neve 8108 master recording and mixdown console with NECAM automation. The panel features a microprocessor-controlled central assignment system with instant interrogation. **JIM VITTI,** is United Sound's studio manager. *Detroit, Michigan.*

— ACTIVITY —

FIFTH FLOOR RECORDING STUDIOS (Cincinnati, Ohio) is currently laying down tracks for **THE OHIO PLAYERS'** upcoming single on Boardwalk Records, with **GARY PLATT** engineering. *517 West Third Street, Cincinnati, OH 15202. (513) 651-1871.*

Mountain:

■ **LUXURY AUDIO WORKSHOP** (Las Vegas, Nevada) has added a Lexicon 224 digital reverb, and also expanded its 24-track studio room to 1,000 square feet. Studio manager **LEE WATTERS** has been producing a debut album for **SANTA FE.** *2570 E. Tropicana, #19, Las Vegas, NV 89121. (702) 451-6767.*

— ACTIVITY —

ASPEN RECORDING SOCIETY (Aspen, Colorado) is mixing a tape of **THE DIRT BAND** for an upcoming Canadian TV appearance, with **BOB EDWARDS** at the console. Meanwhile, **JOHN MCEUEN** is finishing his first solo album with **RICHIE CICERO** co-producing with the artist. **GIORGIO MORODER** is producing some demos with Cicero engineering, and **JOHN DENVER** is mixing his live performance with the **ASPEN FESTIVAL ORCHESTRA** for his upcoming television special. Cicero is again at the console. *P. O. Box 1915, Aspen, CO 81611. (303) 925-8411.*

Southern California:

■ **AUDIO ENGINEERING ASSOCIATES** (Pasadena, California) has taken delivery of a Studer A80/RC-2/2VU Mark II master recorder, with vari-speed and remote control. AEA has also added a new dbx 900 Series modular signal processing system, featuring de-essers and noise gates. Other equipment includes Studer and ReVox tape recorders, the Ecoplate, and KEF Reference-Series monitors. A Steinway baby grand piano is also available. In addition, the company has been contracted by California Radio Music Network to do its location recording. Recently, **DUDLEY MOORE** was recorded in concert with The Los Angeles Philharmonic Chamber Music Society for this series, which is written and produced by the Network for broadcast on NPR stations. *1029 North Allen Avenue, Pasadena, CA 91104. (213) 798-9127.*

■ **CIRCLE SOUND STUDIOS** (San Diego, California) has now opened Studio B, its new 16-track facility. Equipment includes a custom 16-track console, Stephens 16-track tape machine, Ampex 440 two-track, Ampex 350 mono, Otari MX-5050 two-track, ReVox A77, Nakamichi cassette, Crown D150 amps, AKG BX10 reverb, LA-3A limiters and JBL 4311 monitors. A complete selection of microphones is also available, and all equipment is wired to a 5,000 square foot ballroom for recording. *3465 El Cajon Boulevard, San Diego, CA 92104. (714) 280-7310.*

■ **QUAD TECK STUDIOS** (Los Angeles) has finished renovations of Studio 8's control room, which is now centered around a Neotek Series III 32 x 24 console with six sub-groups feeding two 3M M79 24-track machines. A pair of 3M M79 2-tracks are used for mastering, and all tape machines have the latest circuitry updates. Studio 7's remodeling will be completed this year, and will feature the main studio, an overdub room, and a drum booth. The control room will be equipped with a Neotek console, 3M and Ampex machines, and a variety of outboard gear. *4007 West 6th Street, Los Angeles, CA 90020. (213) 387-7999.*

■ **SKYLIGHT EXCHANGE** (Granada Hills, California) now offers 16- and 8-track recording and record packaging, as well as record producing services. *P. O. Box 3173, Granada Hills, CA 91344. (213) 363-8151.*

■ **SOUNDTRAX RECORDING STUDIOS** (San Diego, California) announces the acquisition of an audiophile high-speed cassette duplicator. The system can accommodate ¼- and ½-inch masters recorded at either 7½ or 15 ips, and offers a frequency range of 30 Hz to 18 kHz (±3 dB) with less than 0.1% wow and flutter. This new unit is in addition to the full-service production facility already housed at Soundtrax. **JAMES PAPAGEORGE** is the company president. *8170-U Ronson Road, San Diego, CA 92111. (714) 560-8449.*

■ **TWILIGHT RECORDING STUDIO** (Laguna Hills, California) has announced the opening of their new 16-track facility equipped with a TEAC/Tascam 85-16 recorder fed by a modified Model 15 24-input console. The 19' x 28' x 13' studio offers a Yamaha C7 grand piano, Fender Jazz bass and a Gibson Les Paul guitar. Studio designs were by acoustician/designer Stephen W. Desper, and session work of late has included dates by jazz musician **DALE JACOBS, COBRA, BLIND MAN'S HOLIDAY,** and **BLANCO NEGRO.** Twilight is owned and operated by **ELLIOTT PETERS, WALTER PETERS,** and **KERMIT MOORE.** *23342 Soputh Pointe Drive, Laguna Hills, CA 92653. (714) 951-5052.*

STUDIO UPDATE

Southern California continued . . .

■ **VILLAGE RECORDER** (Los Angeles) has named **JOEL FEIN** to the position of Manager of Studio and Video Operations. Fein is an Academy Award nominee for his work on *The Buddy Holly Story*, and an Emmy Award winner for Special Achievement in Audio for his contribution to the National Geographic Special, *Dive to the Edge of Creation*, for PBS. Before joining the staff at Village, Fein served in the post-production sound departments of 20th Century Fox, Todd A-O, and Goldwynn Sound Studios. He will handle the new post-production and audio-video facilities recently aquired by Village Recorders. The announcement was made by executive vice-president **DICK LAPALM.** *1616 Butler Avenue, West Los Angeles, CA 90025. (213) 478-8227.*

■ **W.E. STUDIOS** (Redondo Beach) has opened after a re-design, including many control room alterations. New gear includes a TEAC/Tascam 80-8 with full dbx, a Tascam Model 5B console, a Technics 1/2-track machine, DeltaLab DDL, dbx compressor, TAPCO stereo reverb, Bi-amp graphic equalizer, and AKG mikes. The new outboard equipment was acquired from ACI/Filmways, Hollywood. A set of Fritz Frequency custom mini-towers and studio monitors have also been installed. **DENNIS HAGEMAN** and **MICHAEL BARTLETT** are the studio owners, while Sound Masters graduate **FRANCIS BUCKLEY** is chief engineer. *612 Meyers Lane, #15, Redondo Beach, California 90503.*

WAVES' Mike Love

■ **WAVES** (Santa Barbara) is **BEACH BOY, MIKE LOVE's** latest audio venture. WAVES is an acronym for Western Audio-Visual Entertainment Services, and is a moblile recording service that can also be utilized at Love's oceanside retreat in Santa Barbara. the operation combines audio and video capabilities, including a 32 x 32 Neve console, Studer tape machines, and an extensive selection of inboard and outboard gear. Clientel already taking advantage of WAVES include **JIM MESSINA** laying down vocal tracks for his upcoming Warner Brothers LP, and **SUSAN LYNCH** working on her debut album for Johnston/CBS Records with produce **TERRY MELCHER. WENDY FORMAN** is WAVES' studio manager. *101 Mesa Lane, Santa Barbara, CA 93109. (805) 966-2291.*

— ACTIVITY —

CHATEAU EAST SOUND PRODUCTIONS (Anaheim, California) has been recording a number of local acts, including the newly-formed swing quartet, **BARTALK,** featuring **BOB RICE, WALLY YOUNGER, FRANK FARILLO, KIETH VIZCARRA** and **HUGH DEVANEY.** Other bands in the studio include **THE MECHANICS, THE VECTORS** and **HOT TIP,** the latter engineered by **STEVE HAGER.** Composer **DAVE GIBNEY** has also been utilizing the facility for the soundtrack of the upcoming horror film *The Witch. 1040-R North Grove Street, Anaheim, CA 92807. (714) 630-0145.* □ At **CIRCLE SOUND STUDIOS** (San Diego, California) **JERRY RANEY AND THE SHAMES** are recording with producer **JIM MC GINNIS. JOEL EDELSTEIN,** from Precious Stone Productions, has also been recording a movie soundtrack with **STEVE PENACHO** engineering. Producer **DAVE MISCIONE** is presently working on a project with New Wave Productions, **HOWARD OWSTRO** engineering. The group **PARAGON** is also working on a project, while the **CARDIAC KIDS** are putting the finishing touches to their EP. *3465 El Cajon Boulevard, San Diego, CA 92104. (714) 280-7310.* □ **DAVLEN SOUND STUDIOS** (Universal City, California) has been recording **MAC DAVIS'** new single for Casablanca, with **RAY BUNCH** and **RICK HALL** producing and **DOUG RIDER** engineering, while **MIKE STONE** is in producing the group **STORM** for Capitol. Stone is also engineering the project. Also in Davlen, European singer **ANNE BERTUCCI** is working on a project for international release, with **ERICH BULLING** producing and **HUMBERTO GATICA** engineering. *4162 Lankershim*

STUDIO UPDATE

Boulevard, Universal City, CA 91602. (213) 980-8700. □ **ELDORADO RECORDING STUDIO** (Hollywood, California) was the site of a recent jam sessions featuring **BOBBY KEYES** and **KEITH RICHARDS,** and reports that **RAY MANZAREK** is in producing **THE ZIPPERS.** Eldorado was also the facility used for the latest LP by **THE TALKING HEADS.** Chief engineer **DAVE JERDEN** was at the console for all these sessions. *1717 N. Vine Street, Hollywood, CA 90028. (213) 467-6151.* □ **FILMWAYS AUDIO GROUP** (Hollywood, California) has **JERRY KNIGHT** in mixing his album on which he is co-producing and engineering with **DAVID KERSHENBAUM. TCHAD BLAKE** is assisting, while down the hall **ROCKY BURNETTE** is finishing up his forthcoming LP with **BILL HOUSE** and **JIM SEITER,** Burnette's manager, co-producing, and **BIFF DAWES** engineering assisted by **DENNIS MAYS.** Filmways also recently provided mobile recording facilities to tape **MARVIN HAMLISCH** at the Dorothy Chandler Pavilion in Los Angeles; **GROVER HELSEY** engineered with **PAUL SANDWEISS, MIKE CARVER, CHRIS MC NARY,** and Mays assisting. **LES HABER** and **KEN WEINSTOCK** produced the project which will be aired over pay TV. Similar services were also supplied for **MELISSA MANCHESTER'S** recent dates at the Fox Wilshire theater in Beverly Hills. The recordings were produced by **MICHAEL LIPPMAN,** with engineering handled by **BART CHIATE** assisted by Mays and **ROY PAHLMAN.** *6363 Sunset Boulevard, Suite 200, Hollywood, CA 90025. (213) 466-5474.* □ **KENDUN RECORDERS** (Burbank, California) is supplying its Studio D to the Japanese jazz ensemble **CASIOPEA** for the group's first U.S. release on Alfa Records. The sessions are being recorded on 3M's 32-track Digital System with **HARVEY MASON** producing and **PETER CHAIKEN** engineering assisted by **TERRY H. MORE.** Prior to this booking, Studio D was utilized by **TANGERINE DREAM** to record music to the soundtrack of **JAMES CAAN'S** upcoming film *The Thief.* **MICHAEL MANN** produced with **RALPH OSBORN** behind the board. **RUFUS,** meanwhile, has been in Studio 1 finishing up mixes for their next release on MCA. The group is producing the album along with engineer **JOHN STRONACH,** who also handles the console chores assisted by **RON ALVAREZ.** *721 S. Glenwood Place, Burbank, CA 91506. (213) 843-8096.* □ **MUSIC GRINDER RECORDING STUDIO** (Los Angeles) reports that **THE TREMBLERS** featuring **PETER NOON** are in preparing their upcoming album on CBS' Johnston label, while **MELISSA MANCHESTER** is in recording with **DAVID SHIRE** producing and **GARY SKARDINA** engineering. Also, **JACKIE CLARK,** late of **THE DIRT BAND,** is in recording with **JOHN KOVAREK** at the panel and the new-wave band **WALDO & THE RED DEVILS** is in laying down tracks with Kovarek and Skardina handling the engineering chores. *7460 Melrose Avenue, Los Angeles, CA 90046. (213) 655-2996.* □ **NSP STUDIOS** (Hollywood, California) is nearing completion of **BEN TAYLOR'S** new LP, with **ARCHIE WRIGHT** producing and **KEVIN T. WRIGHT** engineering assisted by **BORIS V. THOMPSON. THE WRIGHT BROTHERS** are also recording their second album with the same control-room team. *6362 Hollywood Boulevard, Suite 215, Hollywood, CA 90028. (213) 462-6524.* □ **RUSK SOUND STUDIOS** (Hollywood, California) reports that **DONNA SUMMER** is in mixing her new Warner Brothers single with **GIROGIO MORODER** and **PETE BELLOTTE** producing, and **JUERGEN KOPPERS** engineering assisted by **STEVEN SMITH** and **DAVID CLARK.** Also, **BLONDIE** has been mixing a television appearance with Moroder and Koppers again in the control booth, assisted by **MARK ZAREK.** Smith, Zarek, and Clark have all been assisting Koppers and producer **CRAIG SAFAN** on the mixing of the film *Thief* for Mann-Cann Productions. *1556 North La Brea Avenue, Hollywood, CA 90028. (213) 462-6477.* □ During its first month of operation **SKYLIGHT EXCHANGE** recorded artist **JOHNNY C. FARRAH,** completing tracks for his upcoming debut album; **TONY BUTALA** of the Lettermen producing. **MERL OLDS** produced for his Top Hat record label with a band line up including veteran players formerly with the Louis Armstrong, Bing Crosby, Les Brown and Stan Kenton bands. The studio also plans to install a Lexicon 224 digital reverb and a Scamp rack. *P. O. Box 3173, Granada Hills, CA 91344. (213) 363-8151.* □ **SOUNDCASTLE RECORDING STUDIOS** (Los Angeles) reports that **ALTON MC CLAIN AND DESTINY** have been in laying down tracks for Polygram, with **SKIP SCARBOROUGH** producing and **BILL BOTTRELL** engineering, while down the hall, **PETER BERNSTEIN** is mixing **THE CRETONES** latest album for Planet Records with **GABE VELTRI** engineering. Also in Soundcastle, **MIKE FLICKER** is producing and engineering basic tracks for **DOLLARS** first album on CBS. *2840 Rowena Avenue, Los Angeles, CA 90039. (213) 665-5201.* □ **STUDIO SOUND RECORDERS** (Hollywood, California) recently had **GEORGE TOBIN** and **MIKE PICCIRILLO** in doing final mixdowns on the new **SMOKEY ROBINSON** album for Tamla/Motown. **HAROLD BEATTY** is

STUDIO UPDATE

also producing **THE 2ND GROUP** for Holland-Dozier-Holland Productions. Songwriter **JACK LEE** *(Hanging' On A Telephone)* has been working on his first LP for Maiden American Records. **BARRY WHITE** was producing the first duet album featuring himself and wife Glodean (of Love Unlimited). *11337 Burbank Boulevard, North Hollywood, CA 91601.* □ At **SUNSET SOUND** (Hollywood, California) **LEE RITENOUR** has finished mixing his upcoming Elektra LP in Studio 2. At the panel were **HUMBERTO GATICA** and **DON MURRAY** with **DAVID LEONARD** assisting. Ritenour's sessions utilized two Ampex 24-track MM-1200 machines locked up with an Audio-Kinetics Q-Lock SMPTE system. Also, Capitol Records artist **JUICE NEWTON** is in Studio 3 mixing her latest project with **RICHARD LANDIS** producing, and **WARREN DEWEY** engineering with **PEGGY MC CREARY** assisting, while **YVONNE ELLIMAN** is in Studio 1 doing vocals on a new album produced by **DAVID MALLOY** with **PETER GRANET** at the board. *6650 Sunset Boulevard, Hollywood, CA 90028. (213) 469-1186.* □ At **WESTLAKE AUDIO, QUINCY JONES** is finishing a new album for Qwest Records, with engineers **BRUCE SWEDIEN** and **ED CHERNEY. KENNY LOGGINS** is working with producer **BRUCE BOTNICK** and engineer **STEVE BOZE** on overdubs using 3M's Digital Tape System. Other sessions include a soundtrack for *Urgh!* for A&M Records, with **DEVO, PLASMATICS, WALL OF VOODOO, SURF PUNKS, DEAD BOYS, ALLEY CATS,** and **X,** engineered by **TIM SUMMERHAYES** and **ERIK ZOBLER.** Producers **MICHAEL COLINA** and **RAY BARDANY** are tracking for an upcoming album by **DAVID SANBORNE.** Engineer Bruce Swedien is mixing an upcoming **DIANA ROSS** television special, assisted by Ed Cherney. **GEORGE DUKE** and **STANLEY CLARKE** are also in producing their new album, with engineers **TOM VICARI,** Erik Zobler and **DAVE CONCORS.** Engineer **TOM VOEGLI** is handling recording duties on *Star Wars* for National Public Broadcast Radio. *6311 Wilshire Boulevard. Los Angeles. CA 90048. (213) 655-0303.*

Northern California:

■ **THE AUTOMATT** (San Francisco, California) announces the appointment of **MICHELLE MEISNER** to the position of studio manager. Prior to joining the staff at The Automatt, Meisner worked in national promotion for Fantasy Records. Other crew additions include engineers **SUSAN GOTTLIEB** and **MAUREEN DRONEY.** Gottlieb's background includes engineering work at Vance Frost & Associates, and teaching at San Francisco's Music Recording School. Droney had been chief audio technician at the San Francisco Lightworks. Activity at The Automatt includes **HERBIE HANCOCK** recording an LP for Columbia with **DAVID RUBINSON** producing and **FRED CATERO** and **LESLIE ANN JONES** engineering. **AMI STEWART** is also in working on her upcoming album for Hansa Productions, with **NARADA MICHAEL WALDEN** producing with engineer **KEN KESSIE** assisted by Droney. The same control-room team is recording **WANDA WALDEN'S** first LP for Electra Records. *827 Folsom Street, San Francisco, CA 94107. (415) 777-2930.*

■ **BODACIOUS AUDIO** (San Mateo, California) is now available to provide remote recording services to the Bay Area. These services include location recording, disk mastering, one-to-one tape duplication, and after-performance editing. A key technique employed by Bodacious on location is the use of Wahrenbrock Pressure Zone Microphones following the principle that with a few millimeters of a large surface, sound levels from a pair of equal signals add coherently. The method also provides for a controlled hemispherical response. *(See feature article by Steve Barker in this issue.)* The mobile recording van features a live-end-dead-end design with all mastering done on a phase-corrected Ampex ATR-100, allowing up to 90 dB of dynamic range. A Sunn Custom Magna 5000 24/4 console is employed, along with Dolby noise reduction, and dbx and Logical Systems compressor/limiters. *4114 George Avenue, Number 1, San Mateo, CA 94403. (415) 573-5297.*

STUDIO UPDATE

■ **RUSSIAN HILL RECORDING** (San Francisco, California) is a new 16- and 24-track studio designed by **JEFF COOPER.** Studio A features a Helios/GSM 32 x 24 console which feeds into an MCI 24-track JH-116 with Autolocator. Studio B operates a Neotek Series III 28 x 24 console and a 3M M56 16-track with Selectake. Both studios house UREI 813 Time-Align™ monitors, as well as JBL 4310s and Auratones. The list of outboard equipment includes Lexicon 224 digital delay, EMT 140 stereo plates, UREI 1176 limiters, Eventide Harmonizer, ADR Vocal Stresser, SCAMP rack system, UREI 964 digital metronome, and Lexicon Prime Time delay. Instruments include Steinway pianos, Hammond M-3 organ and Leslie 122, and a Synclavier II 32-voice Digital Synthesizer. A full complement of microphones is also available. *1520 Pacific Avenue, San Francisco, CA 94109. (415) 474-4520.*

— ACTIVITY —

HEAVENLY RECORDING STUDIOS (Sacramento, California) has **DEWAYNE BLACKWELL** in working on a new project for Snuff Garrett Productions with **LARRY LAUZON** engineering. **CAPPY LEWIS** is in producing his new album with **IKE PAGGETT** with Lauzon behind the console. Other activity includes **STAN RUTLEDGE** recording and mixing an album's worth of songs with engineer **RAYMON PYLE,** while **CLIFF MICKELSON** is producing **GUNSHY'S** new album for Cemtron Records. The studio has recently added a new musician's louge. *1020 35th Street. Sacramento, CA 95822. (916) 428-5888.* □ **PRAIRIE SUN RECORDING STUDIO** (Cotati, California) reports that **THE IMPOSTERS** are in the 24-track facility doing overdubs for their forthcoming album with **ALLEN SUDDUTH** engineering and producing. The LP of the Petaluma-based band is for 415 Records. Sudduth was formerly a member of the staff at the Filmways/Heider recording complex in San Francisco. *1304-A Scott Street. Petaluma, CA 94952. (707) 778-7175.* □ Recent sessions in Studio B at **RUSSIAN HILL RECORDING** (San Francisco) include **JOHN AMBROSE** working on a new album with **JOE TARANTINO** engineering; **JOHN BARSOTTI** and **JIM HENRY** cutting basic tracks for a new album by **MARK WEISBARTH'S** group **FLIGHT;** local producers **RON NAGLE** and **SCOTT MATHEWS** completing a new single by **ROY ROGERS,** with **JACK LEAHY** at the board; **JAY LYON** re-mixing with **RICHARD GREENE** engineering; artist/actor **NORTON BUFFALO** recording a new single, producing himself with **JACK LEAHY** engineering the project; and **DOOBIE BROTHER CORNELIUS BUMPUS** recording and mixing eight new tracks with Richard Greene at the board. *1520 Pacific Avenue. San Francisco. CA 94109. (415) p474-4520.*

Northwest:

■ **ROCKIN A RANCH STUDIO** (Greenleaf, Oregon) has ugraded to 16-track with the addition of a TEAC/Tascam 85-16 recorder with Auto-locator. The new machine is linked to a Tangent Series 16 console. Advanced DDL and AKG BX5 reverb are to be found in the outboard rack, while monitors are by JBL and mikes by AKG. The studio is located in the Oregon coastal mountains, and features private accommodation, home cooked meals, and a jacuzzi. **MICHALE AYLING** handles the bookings. *91770 Nelson Mountain Road, Greenleaf, OR 97445. (503) 964-5355.*

■ **WAVE RECORDING STUDIOS** (Vancouver, Washington) has been opened by **MICHAEL CHRISS** and **THOMAS ROBINSON,** former owner of Concert Audio Systems. The 16-track facility features an Ampex MM-1200 multitrack, and ATR-100 two-track mastering machine. Robinson has mixed sound for hundreds of national touring bands in the last two years, and has been involved with recording for almost ten years. *4009 East 18th Street, Vancouver, WA 98661. (206) 696-4553.*

STUDIO UPDATE

Canada:

■ **ITV LTD.** (Edmonton) has acquired a new Aphex Aural Exciter, which it is currently being used during sound mixdowns for projects on MCA/Phillips DiscoVision video disks. The unit is also being employed in producing *The Lawrence Welk Show* for syndication. *Edmonton, Canada.*

■ **MUSHROOM STUDIOS** (Vancouver, Canada) finds **NANCY NASH** in recording an album project with **ROLF HENNEMANN** in the control booth. Hennemann recently received the B.C.A.R.A.S. award for Best Engineer at the Society's "Tribute to West Coast Music" last January. Hennemann's credits as an engineer and a producer include work with **HEART, PRISM,** and **B.T.O.** *1234 West 6th Avenue, Vancouver, Canada V6H 1A5. (604) 734-1217.*

Great Britain:

■ **AIR STUDIOS** (London, England) has just ordered a new Neve 56-channel custom console to replace the 32-channel Neve desk currently in use in Studio 1 of the Oxford Street facility. This is the third identical board purchased by AIR — the first is currently in use at the AIR Montserrat studio in the Caribbean, and the second in the London studios. According to AIR's chairman, **GEORGE MARTIN,** "It was quite an act of faith to go for a completely different type of custom console, but the industry reaction has fully justified this decision. The response of artists to the very clean Neve sound has been nothing short of overwhelming." The new 56+6 channel, 24-group, 32-track console incorporates low-distortion amps with a bandwidth in excess of 60 kHz, and a new design of equalizer. *Oxford Street, London, England.*

■ The **BRITISH BROADCASTING CORPORATION** (London, England) recently inaugurated its new Manchester Music Studios with a broadcast of the Northern Symphony Orchestra. The new facility, which is equipped with a 32-input Solid State Logic Master Studio System, is reputed to be the most advanced music broadcasting studio in the world. Among its unique features, the Manchester studio was designed with the aid of a one-tenth scale model, which enabled acoustics testing and similar evaluations to be made prior to construction. The new facility also represents something of a departure for the BBC, in that the new SSL console is of an in-line design rather than the more traditional "split" format. Currently the BBC has four more SSL systems on order, for installation later this year at the Corporation's Maida Vale, London, studios, and for the regional centers in Cardiff, Wales, and Belfast, Northern Ireland. *Broadcasting House, London W1A 1AA, England.*

■ **EDDIE HARDIN RECORDING STUDIOS** (Berkshire, England) has taken delivery of a new Trident TSR 24-track tape machine, to be interfaced with a Trident Series 80 console. Hardin is formerly of **THE SPENCER DAVIS GROUP** and **HARDIN AND YORK.** *Berkshire, England.*

■ **PETE TOWNSHEND** of The Who has ordered a Solid State Logic Master Studio System for installation at his new audio/video complex in Twickenham, England. Delivery date is set for early May. Townshend's studio is said to be the first audio-for-video facility in the world to be equipped with the Solid State Logic TOTAL RECALL computerized automation system, which stores and recalls the settings of all input/output modules, including equalization, compression, gating, input selection, routing, panning, and so on. The new facility will also be receiving SSL's new LIVEMIX video-production software package, to enable simultaneous multitrack audio and broadcast-quality video recording. *Twickenham, England.*

South Africa:

■ **RPM GROUP** (Johannesburg) has just completed a new studio complex, Studio 1 being equipped with an MCI console linked to an MCI JH-114 24-track recorder and MCI and ReVox two-track machines. Ancillary gear consists of UREI, Audio & Design and SCAMP compressors and expander/gates. Eventide Harmonizer, DeltaLab DL-2 DDL and flanger. Delivery is expected soon of an MCI automation package. The studio itself can hold up to 54 musicians and has a separate large string booth. Studio 2 boasts a Neve 28/24 free-grouping console feeding a Studer 16-track and MCI and ReVox two-tracks, with outboards including compressors and expander/gates by Neve, Quad-Eight, Teltronic, and UREI, an Eventide Harmonizer and DeltaLab and Quad-Eight DDLs. The studio can accomodate 20 players, and has vocal/string booth. Studio 3 will soon be operational as a four-track room for demos, editing, and dubbing. Dolby noise reduction is used througout, with monitors utilizing JBL components in an Eddie Veal design. Veal also designed the control rooms of the large studios. Instruments available include Yamaha and Kawai grand pianos, Hammond organs and two full drum kits. **JOHN LINDEMANN** is the studio manager. *RPM House, 62 Goud Street, P.O. Box 2807, Johannesburg, South Africa. 29-2583.*

Sweden:

■ **SWEDISH LOKALRADIO AB** (Stockholm) has acquired a new Trident Series 80 console, the first version designed for broadcast applications. The broadcaster has options for 23 additional desks to be delivered over the next 18 months. *Stockholm Sweden.*

West Germany:

■ **CHAMELEON RECORDING STUDIO** (Hamburg) announces the opening of its new 24-track Studio 1 facility. According to owner/chief engineer **KLAU BOHLMANN,** the facility's acoustic design was done by **W. JENSEN,** with the studio design handled by **J. KLEVER.** New gear includes an MCI 636-LM console linked to a Lyrec TR532 24-track recorder with auto-locator and a pair of Studer A80-VU master recorders. All the machines are equipped with Dolby A, while the monitoring system consists of JBL 4350 bi-amped units, JBL 4311s, and Auratones. Outboards offered include EMT 250 and 240 reverb units, Lexicon Prime Time, an URSA Major Space Station for echo and reverb, MXR Pitch Transposer, Gain Brain limiters, Kepex II, UREI 1176s, and Orban Parametric EQ. Mikes by Sennheiser, Neumann, and E-V may be found in the room, as well as a Steinway grand piano. The operation also offers a recording truck featuring a 16-track Telefunken M15A recorder, a modified Tascam M45 console, UREI and dbx limiters, a number of equalizers and monitors by JBL and Panasonic. The mobile unit is operated by **ULRICH KINDLER,** while the company's video operations are managed by **UDO SCHINOWSKI.** *Alter Teichweg 61, 2000 Hamburg 70, West Germany. (040) 61 29 88 or 617 117.*

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THE A80VU MARK III... ANOTHER UNAPPROACHABLE STUDER!

No other multitrack recording system has ever neared the degree of perfection attained by STUDER, and the new A80VU Mark III represents one more milestone in the decade-long production of this classic machine. As always, STUDER sets and maintains the standard for the industry.

This newest A80 from STUDER has been outfitted with a completely redesigned, "close proximity" headblock for virtually undetectable drop-in/drop-out operations and totally reliable performance in the most demanding situations. Actually, the repositioning of the erase/record/playback heads is one of the few modifications made since the A80's inception, the original design being so advanced that a revision would be meaningless.

The new A80VU Mark III system includes a 20-address memory, microprocessor controlled, programmable autolocator with channel remote, which enables all tape deck functions to be operated within easy reach of the engineer at console position. The autolocator remote control is packaged as a fully-adjustable, freestanding unit.

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Shown with 20-address memory autolocator and channel remote

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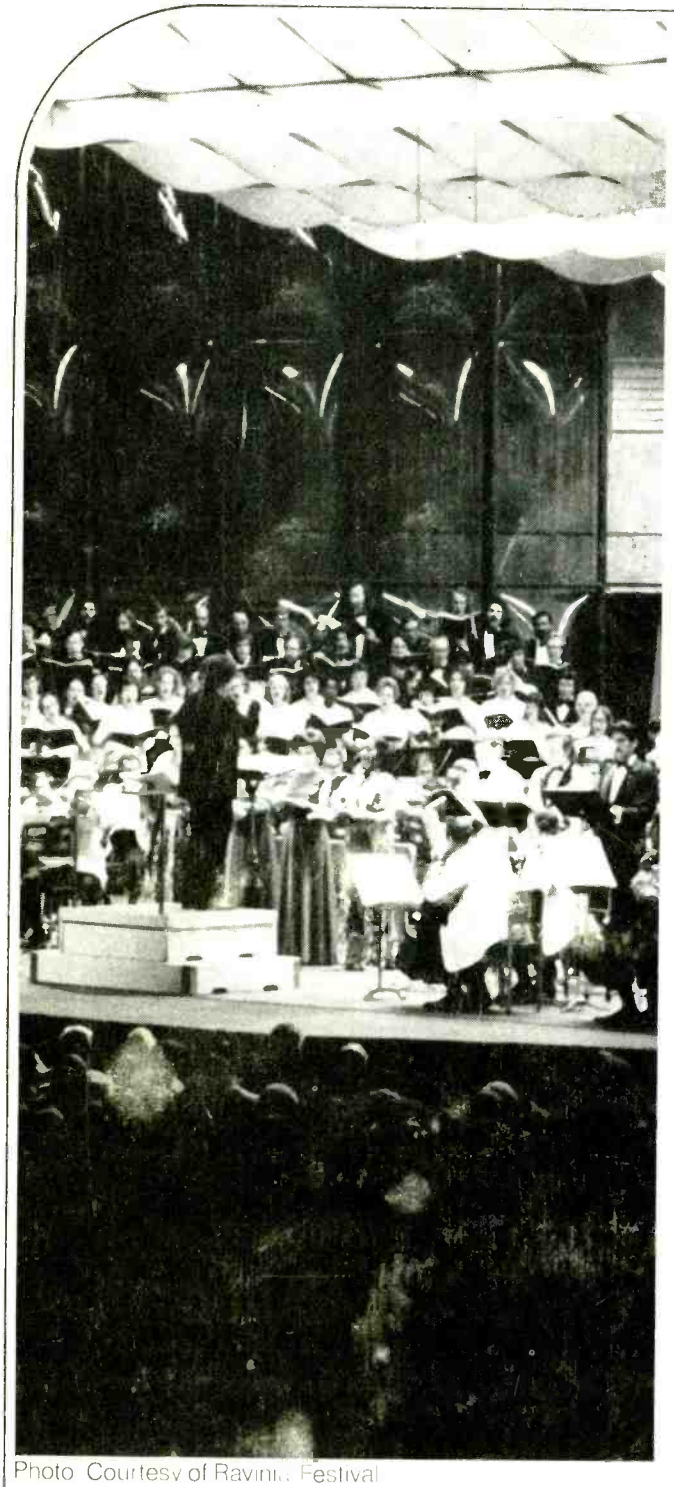
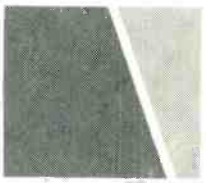


Photo: Courtesy of Ravinia Festival

Shure goes on location with the first superstation



fact:

WFMT, Chicago, uses the SM81 Condenser Microphone

WFMT, Chicago's fine arts station and the world's first network transcontinental-satellite classical music station, is continually dedicated to providing the very best broadcast quality—even when broadcasting live remotes.

After WFMT engineers did detailed examinations of all the problems and acoustical considerations inherent to remote broadcasting, they chose the Shure SM81 Condenser Microphone for a wide variety of program material and locations.

The SM81 is the only condenser microphone WFMT engineers found that is capable of withstanding the 100° heat and 100% humidity sometimes encountered over the stage in the open-air concert pavilion at Ravinia Park, near Chicago. Yet, the sound quality is so good that they also use the SM81 in the more intimate and totally enclosed Murray Theatre at Ravinia, where the Chicago Symphony Chamber Players perform.

Shure SM81's are also used by WFMT to record live performances in the highly acclaimed Myra Hess Concerts presented in the Chicago Public Library Cultural Center, as well as live programs from the Milwaukee Symphony, the Houston Grand Opera, and Chicago's Music Hall and Old Town School of Folk Music.

The SM81 has even been chosen over other condenser microphones for studio work, including the popular Studs Terkel Program, because of its superior sound over Studs' previous (and very expensive) microphone.

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