June 1987

Recording
ENGINEER/PRODUCER

The Technical Journal for Audio Professionals

AN INTERTEC PUBLICATION

Sound Reinforcement for the Grammy Awards
p. 72

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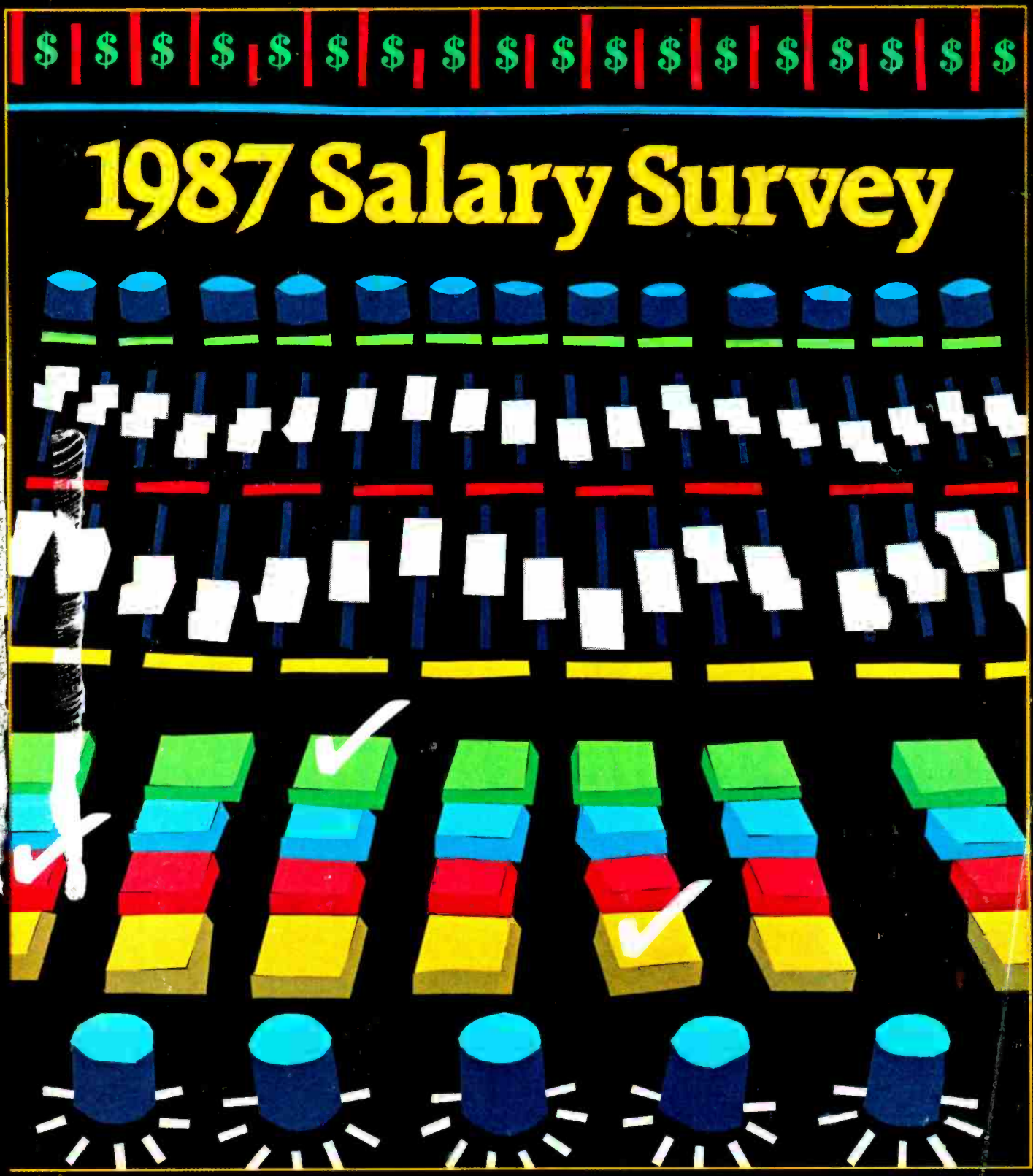

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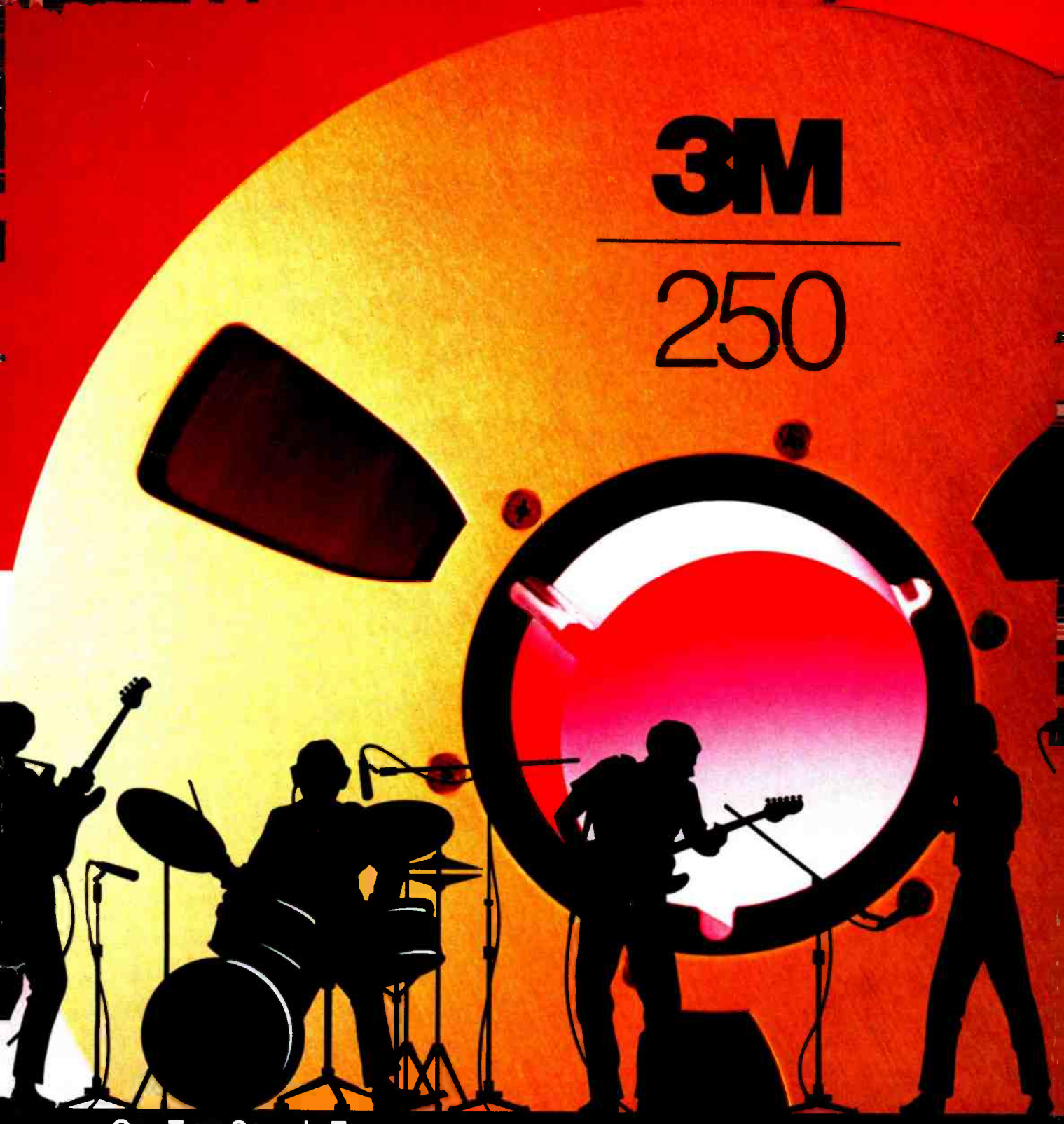

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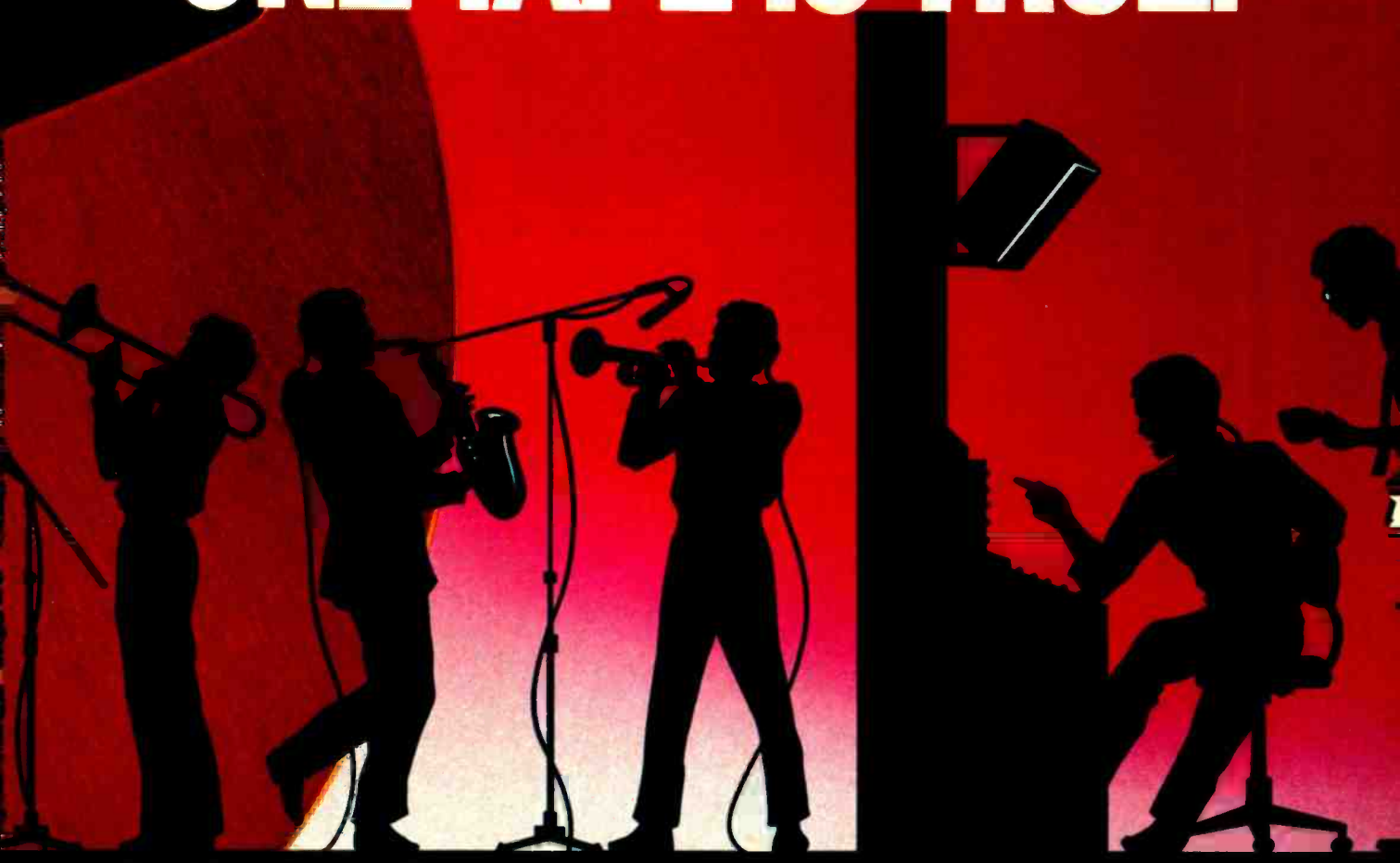

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On the Cover:

Cover design and concept by Noelle Kaplan, **RE/P's** graphic designer.

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Editorial

People & Software

By Mel Lambert, Editor

Back in the good ol' days of audio production, life for prospective facility operators was pretty simple. All you had to do to equip a commercial studio was to call up a bunch of friends that knew about things electronic and/or mechanical, and join the line for delivery of one of their new consoles, tape machines or signal processors.

Other, maybe less accessible, friends who specialized in acoustics—which was considered then, as now, pretty much as a talent bordering on black magic—would be called in to handle studio design and construction.

Having gathered all this hardware and cooperative talent in one place, you set about putting together the studio in much the same way that our forefathers might have approached a western barn raising. Few people were "experts" in their chosen fields, but we could all draw on each other's individual expertise to solve just about any problem.

That was then, this is now. Just how has the recording and production marketplace changed since those possibly halcyon days when it functioned more like a cottage industry? For one thing, the pro-audio market has matured a great deal, with the concomitant complexity and vertical integration that such maturity brings. Also, because of its size and diversification, the one-on-one contact that used to permeate the studio business is pretty much a thing of the past.

Or is such a degree of intimacy a thing of the past, I wonder? Over the past couple of years, and accelerating during the last six months or so, I detect a strong return to the individualistic approach of operating recording studios, and one that permeated the industry during its formative years.

Not just facility owners appear to be looking to secure a unique niche in the pro-audio marketplace; a growing number of equipment manufacturers also appear to be changing, to a large extent, the ways in which they operate.

Possibly in reaction to a growing tide of low-cost technology from the Orient, I am coming across an increasing number of individuals or small collectives that seem to be approaching the needs of our industry from a different direction. Maybe the changes I'm noticing are stemming from two complimentary influences.

Without a doubt, the future of our industry will be driven by developments in digital recording and production equipment—analog consoles and tape machines as we know them today will be things of the past by the mid-Nineties, not to mention software-based signal processing tasks being handled by devices exterior to the master console/recording system.

As has been pointed out several times in the pages of **RE/P,** the development and marketing of such integrated devices will be concentrated in the R&D departments of a small handful of companies that can effect some degree of economy of scale in terms of the high development costs necessary to bring one or more high-tech devices to market.

I predict, however, that when these newer systems begin to impact the pro-audio industry, subsequent development will come from the same guys and gals that are currently turning the computer industry upside down: those imaginative individuals capable of writing the type of software and operating systems that can take full advantage of the hardware architecture.

Which is not to say, of course, that the hardware manufacturers will be incapable of offering a catalog of software systems to suit most requirements. But, if we can learn anything from the way in which the Macintosh and IBM PC markets began to expand following the development of second-source software, manufacturers would do well to actively *encourage* the setting up of user-developed software libraries for assignable consoles, programmable reverb and effects processors, random-access editing systems and hard-disk recorders.

Just as applications (and acceptability) of sampling and FM-based keyboards skyrocketed when voice and patch editors appeared for low-cost PCs, the all-digital studio systems of the near future will need a wider pool of software talents than can be supplied by their respective manufacturers.

And even if such companies could attract the right calibre of people, I would still argue that the more appropriate environment in which to develop the interesting new algorithms necessary to drive programmable effects units and editing systems should be the place in which they are to be used: *the production studio.*

A session engineer may not have the time, nor inclination, to write code for these digital beasties. Without a doubt, however, it would behoove anyone out there with the capability of appreciating the amount of highly customized software that the future studio owners and engineers will need in the not too distant future, to look into—and keep an important jump ahead of the competition.

R-E/P

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News

Alpha Audio/GEXCO distribution

Alpha Audio Automation Systems has reached an agreement with GEXCO Technology International for international marketing representation of Alpha's BOSS automated audio-editing system.

"Our export consideration requires the best possible technical and marketing support," commented Nick Colleran, Alpha Audio president. "There's no question in my mind that GEXCO is the best possible representative for our product overseas. Their commitment to new technology is impressive, and their dealer network is second to none."

GRP Records uses Neve DTC-1 for CD project

The label made use of the fully automated, all-digital transfer console at Sterling Sound, New York. Dave Grusin's forthcoming CD release, *Cinemagic*, is said to represent the first session in the United States to be digitally mastered on the new system.

Ted Jensen, Sterling Sound's chief engineer, handled the CD mastering project, supervised by GRP Record's chief engineer and technical director, Josiah Gluck (who also mixed the album).

Cinemagic was recorded on a Mitsubishi PD-format X-850 32-track and mixed and edited using a Sony PCM-1630.

"This is the next practical step toward an all-digital release," Gluck says. "From the time the mixes are done, until the Compact Disc is played, there are no digital-to-analog conversions being performed. The benefits will be quite noticeable."

Apogee announces sales of digital anti-aliasing filters

Replacement 944 series filters have been delivered to several recording studios and artists for retrofit to Sony PCM-3324 DASH-format digital multitracks. Recent customers include Sixteenth Avenue Sound, Nashville, Bruce Springsteen, The Village Recorder, Los Angeles, and composer Denny Yeager, owner of two machines in San Francisco. The Village Recorder is currently awaiting a second order of filters to update its remaining 3324.

Theatrical Sound Designers Union names officers

Local 922 of the International Alliance of Theatrical Stage Employees has chosen John Shearing, president; Jan Nebozenko, vice president; Abe Jacob, executive secretary; Lou Shapiro, treasurer; and Jack Mann, Otts Munderloh and Marc Salzberg as the board of trustees.

"Sound designers have made many innovative and important artistic contributions to theater and the performing arts in the last three decades," president John Shearing says. "Our professional association with IATSE establishes our goal of continuing standards of excellence."

In addition to Broadway and professional houses, membership goals will emphasize sound designers working with LORT, college and regional theaters, ac-

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RECORDING ENGINEER/PRODUCER is edited to relate recording science to recording art to recording equipment, as these subjects, and their relationship to one another, may be of value and interest to those working in the field of commercially marketable recordings and live audio presentation. The editorial content includes: descriptions of sound recording techniques, uses of sound recording equipment, audio environment design, audio equipment maintenance, new products.

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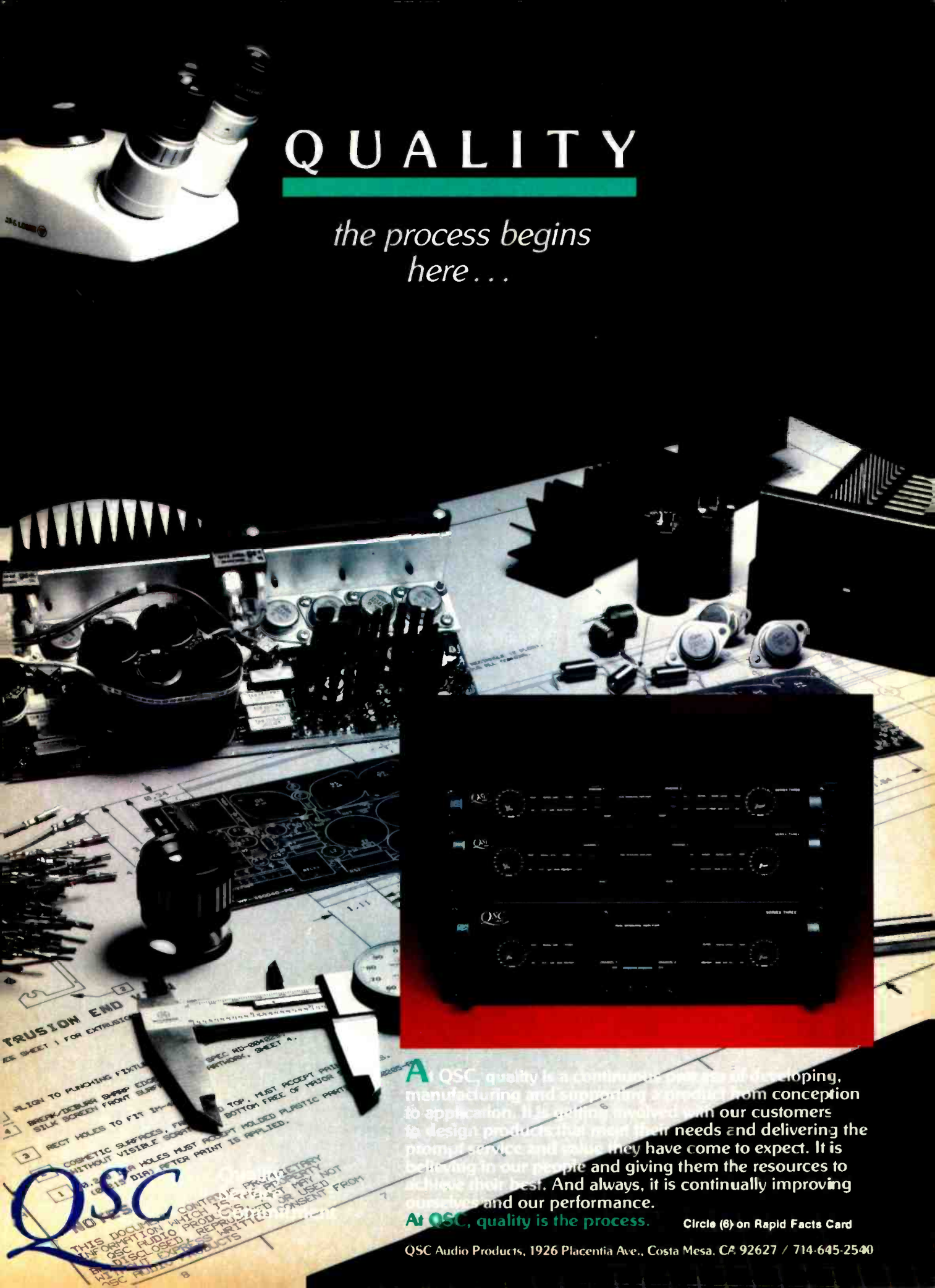
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News

cording to executive secretary Abe Jacob.

Audio Analysts sets up manufacturing company

Pierre Pare, a principal of Audio Analysts, has announced the formation of Creative Audio Design & Development (CADD), the primary purpose of which will be the development and manufacturing of pro-audio equipment.

Shane Morris, formerly of Soundcraft, will act as the company's chief design engineer, and will assume the responsibilities of overseeing the entire CADD engineering department.

CADD's first products are scheduled to be announced at the November AES Convention in New York.

Sonic Solutions offering noise-elimination service

The company's NoNOISE service is said to combine high speed computers and new digital signal-processing techniques to solve a problem that has long plagued the recording industry: how to eliminate noise on existing recordings without affecting the original sound. It is claimed that process can remove unwanted noise, such as tape hiss, background noise, clicks and pops, from a recording. Unlike other traditional noise clean-up techniques, however, NoNoise does not distort or alter the original sound, the company reports.

Initially targeted at the major record labels, NoNoise will allow producers to clean up analog recordings for CD release. The first NoNoise projects for commercial release include reducing tape hiss on a Paul Horn concert to be released by Rykodisc; eliminating clicks from a Jim Morrison vocal track from a Doors concert; and cleaning up some guitar recordings for George Winston's Dancing Cat Label.

Inside, one of Paul Horn's best known performances, was recorded under difficult acoustical conditions inside the Taj Mahal. "This recording is very fragile in that it embodies solo flute recorded on location in India nearly 20 years ago," said Don Rose, Rykodisc president. "We found the NoNoise process to be well-suited to the tasks of mopping up tape hiss and reducing ambient noise without diluting the 'ethereal' quality of the performance."

The Morrison vocal track, from the Doors' concert at the Hollywood Bowl in 1968, was unusable due to many loud clicks caused by a loose microphone cable. "With traditional clean-up techniques, it would have been impossible to remove the clicks without leaving some noticeable artifacts," said Bruce Botnick, president of Digital Magnetics, where the project is in post-production. "But, with NoNoise, the clicks were eliminated seamlessly, and the results are sensational."

In addition to music recording, Sonic Solutions has its sights on other markets. The service will be offered to the film and television industries to clean up production dialogue and sound effects during post-production, as well as sound-tracks of older films to be released on video.

The company's process facility is located in San Francisco. For further information, call 415-751-8666.

Clarity XLV interfaces for AMS RMX-16, Quantec QRS and Yamaha REV-1

New updates allow the XLV interface to provide MIDI and CV-based automation of the RMX-16, QRS and REV-1, in addition to automating via MIDI the Lexicon 224XL and 480L and voltage-controlled devices (such as digital delay lines and VCA systems).

All reverb and delay parameters changes can be memorized in any MIDI data-storage environment. "Effects automation is the obvious next step," says Clarity president Gregory Kramer. "When you've automated all of the faders, mutes and so on, automating reverb and delay effects is an obvious, even necessary, continuation of that trend."

3M tape to be packed with Mitsubishi X-86 2-track

The new packout program involves one reel of 3M 275 digital mastering tape included with each Mitsubishi X-86 PD-format digital 2-track sold in the United States and Canada.

3M 275 digital mastering tape is designed for use in all digital open-reel recorders, including Mitsubishi, 3M DMS and DASH-format transports. A proprietary laser scanning system is said to permit 100% inspection of the tape coating surface. As a result, coated-in errors are virtually eliminated, 3M claims, providing enhanced dropout performance.

Agfa-Gevaert expects R-DAT to boost duplication market

Digital audio tape (R-DAT) will constitute one-third of the world's audio duplicator business by the year 2000, according to Thomas Huebner, marketing manager of Audio Tape Duplication Products of Agfa-Gevaert AG, West Germany.

Speaking at a recent meeting of the International Tape/Disc Association, Huebner pointed out that R-DAT has the potential to increase the overall size of the international tape duplication business. He forecasts that total duplicated R-DAT cassettes could reach as many as 30 million units worldwide within four years from product launch, with nearly one-third of those units being duplicated in the United States.

"Agfa will be ready with a new R-DAT tape formula once the industry decides the time is right to launch the format internationally," Huebner explained, adding that, at least for the first few years, R-DAT manufacturing will remain a real-time duplication process only.

Lanesborough to buy Ampex

Allied-Signal and Lanesborough Corporation have signed an agreement for the sale of the former's Ampex Corporation unit to Lanesborough. Reported purchase price is $479 million, plus the assumption of certain liabilities.

According to Edward J. Bramson, Lanesborough president and CEO, "We intend to make sure that Ampex has the financial and other resources to continue investing in its future. Ampex is a strong company with outstanding capabilities. We think the company's prospects for growth are excellent."

"We are extremely pleased to be affiliated with Lanesborough," says Charles A. Steinberg, Ampex president and CEO. We're especially excited that Ampex will again be operated as a stand-alone corporation."

Headquartered in Redwood City, CA, Ampex had 1986 sales of more than $500 million.

Lanesborough, a privately owned company, manufactures a variety of specialty chemical products for sale in the United States and abroad.

People

Sony Professional Audio has named **Cary Fischer** as director of market development of digital audio products. He will be responsible for planning and implementing sales and marketing programs for DASH-format recording systems and other digital audio products. Fischer was formerly director of U.S. sales and marketing for the Mitsubishi Professional Audio Group.

R-E/P

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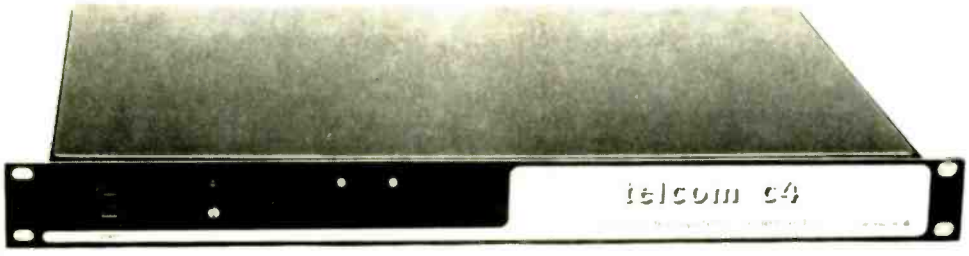

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Letters

Dialogue recording

From: Jim Wynn, engineer, KVUE-TV, Austin, TX

I have just read Larry Blake's February column "Film Sound Today" (I'm a little behind in my reading) and what he mentioned about dialogue recording set me to thinking. Would Larry or a colleague please write a tutorial on dialogue recording?

I regularly have to record dialogue on-location for various sorts of video productions—interviews, on-camera commercial announcers, "dramatized" commercials and industrials.

Getting good dialogue is almost always a battle, and I'm sure there are some tricks I'm missing. Being somewhat out in the hinterlands, I don't get too much of a chance to watch other mixers in action and learn from their methods. I'm sure there are many other folks in the same boat, and some help in broadening our horizons, would probably reach an appreciative audience.

In closing, I'd like to thank Larry Blake for his past fine writing on the art of film sound and look forward to much more.

[*Editors note*: We are currently preparing an editorial feature various aspects of dialogue recording, which should provide valuable information to Jim Wynn and others in our industry.]

Isolated piano micing

From: Richard Rupert, Green Valley Recording, Hughesville, PA.

In the March issue of **RE/P**, an article titled "Music Production for The Late Show," by Adrian Zarin, quotes Thom Wilson (mixer for the show): "If there's anyone out there who has an isolated piano micing setup, I'd like to know about it."

I guess Hughesville is "out there," so I'd like to suggest that Thom check out the C-Tape Transducer. The frequency response is wide and flat and the results are amazing—near total isolation.

The product is made in England by C-Tape, and its American representative can be reached at 1-800-CT-AUDIO [282-8346].

Thanks for a great magazine! R-E/P

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Managing MIDI

By Paul D. Lehrman

For those of us who use synthesizers and computers in the studio, Christmas comes in June. That's when the National Association of Music Merchants' major convention is held, usually in Chicago.

Walking onto the convention floor(s) is like waking up under the biggest Christmas tree you can imagine, with another marvelous toy at every turn. Each year as the tech gets higher, the gadgets at NAMM get to be more and more fun.

Although the treats at NAMM are always plentiful, one invariably ends up with the feeling that something's missing. It seems to be especially true of software—a new synthesizer either sounds good to you or it doesn't, whereas software *does* things. The things that *you* want it to do are never going to be the same as what the next guy wants.

Unfortunately, it's the next guy who's writing the program and therefore deciding what goes in it. Well, let's have no more of that. This year, I'm sending Santa a list. It's short:

- **Useful editing programs for MIDI-controlled mixers and processors.**

Now that hardware manufacturers are finally beginning to take MIDI seriously as a control scheme for mixers and processing equipment, it's about time we had some software manufacturers thinking the same way.

The software I want for an equalizer would let me see the curve, not just the positions of the sliders on an imaginary front panel. I should be able to grab any point of that curve and move it up or down, left or right, in real time, so that I can hear what it's really doing to the sound. I want to be able to specify frequency, bandwidth and type of equalization, and have the software not only execute the curve, but also tell me how close to those specs the hardware will let me get.

For reverbs and time-delay processors, I want a program that lets me draw a room, specify the materials on each and every surface (down to the tissue paper on the monitors) and let me place myself in the room, facing forward, backward or any angle I want. Conversely, I want to be able to design a room in terms of RT_{60} and pre-delays, and have the software show me graphically what I've created. I want to be able to generate and analyze impulse response curves from real spaces, so that I can then negate them, thereby *eliminating* room sound.

Let me draw echoes on a screen, using any linear or logarithmic time scale I want, with relative levels, feedback and frequency responses clearly displayed. Give me graphic icons for controlling such things as pitch change, resonant filters and chorusing.

- **Really good utility software for both stage and studio.**

There are some programs now available that let you do MIDI echoing, transposing or various types of mapping. They're neat, but one at a time, they're not very useful. The concept needs to be expanded drastically.

The things you want software to do are never going to be the same as what the next guy wants.

Here's a scenario I'd like to see: you have two keyboards on top of each other controlling 16 rackmount synthesizers. Notes in the top two octaves of the upper keyboard trigger patch changes—a different one in each synth. Press a patch change button and the keys reconfigure to a different set of patch changes. In the next two octaves down, the white notes play one synth, while the black notes play another, with appropriate transpositions so everyone's in the same key.

Each of the notes in the bottom octave trigger a different sequence. If you press a pedal and one of the notes, the new sequence will only start on a downbeat, in sync with the last sequence you started. A different pedal and the same note turns the sequence off. If a note is being played in one section of the keyboard, the mod wheel controls vibrato. If a note in a different section is being played, it handles volume, and vibrato control goes to the foot pedal. At the bottom of the keyboard are the panic buttons, which only act that way when the portamento pedal is pressed: Low "C#" sets all controllers to 0 (except volume) and "C" is all notes off.

The lower keyboard is split into four sections, each going to a different synth, but with intelligence built into the mapping, so that a legato line that crosses a boundary stays with the original synth. Patch buttons and pedals reconfigure the keyboard-split instantaneously or, if you like, after you've let go of the note you're holding. Everything you do is recorded and can be edited, reconfigured and played back from a computer, with each action taking the form of a "module" on the screen, where it can be addressed with a mouse.

- **Programs that let me really take advantage of system-exclusive data.**

There's a new synthesizer on the market that is creating quite a stir, for a number of reasons. One is that it allows the playing of microtones not, as other synthesizers do, through altered scales, but in real time using a system-exclusive data type called a fractional note. Unfortunately, even though patch librarians and editors for the device are being introduced almost daily, no one is doing anything with these fractional notes, because no sequencers can address them.

I want a sequencer, or some kind of performance package, that lets me specify that when I hit a particular key or controller combination in a certain way, it sends fractional note data to this box.

But, that's just one application. What I really want is to be able to define a huge number of "packets" of system-exclusive information, ranging in length from a half-dozen bytes to several thousand, and to send those packets down the MIDI line, either on a live command or in place of a sequenced event.

- **Composition software that goes beyond emulating a tape recorder.**

Actually, there's a little of this out already, but it's not that useful. The problem is, it's an either/or proposition—you get a tape recorder, or you get something else. Well, why can't we have both?

I love to play into a sequencer, and then have it mercilessly throw all my mistakes back in my face. Then, I love to edit the mistakes, and end up with a perfect track that I can pretend is how I played it in the first place. That's the tape recorder part that I can't do without.

However, I also want to take my ideas and play with them—invent variations on a theme, turn things around and upside down, change the mode, split up the voices among different channels, impose a different rhythm on the same notes, or take a note pattern and change it into a system-exclusive filter pattern.

I want to be able to play something in totally free time and, when I'm done, have the software insert bar lines and tempo changes where I tell it to. Then I want to be able to take all these pieces and reassemble them into a finished composition, which I can call up and play.

That's all. Am I asking too much? Maybe next month I'll present a hardware wish list for Santa. I've been good, really!

R-E/P

Paul D. Lehrman is a Boston-based free-lance writer, electronic musician, synthesist, producer and regular RE/P contributor.

TRUTH... OR CONSEQUENCES.

If you haven't heard JBL's new generation of Studio Monitors, you haven't heard the "truth" about your sound.

TRUTH: A lot of monitors "color" their sound. They don't deliver truly flat response. Their technology is full of compromises. Their components are from a variety of sources, and not designed to precisely integrate with each other.
CONSEQUENCES: Bad mixes. Re-mixes. Having to "trash" an entire session. Or worst of all, no mixes because clients simply don't come back.

TRUTH: JBL eliminates these consequences by achieving a new "truth" in sound: JBL's remarkable new 4400 Series. The design, size, and materials have been specifically tailored to each monitor's function. For example, the 2-way 4406 6" Monitor is ideally designed for console or close-in listening. While the 2-way 8" 4408 is ideal for broadcast applications. The 3-way 10" 4410 Monitor captures maximum spatial detail at greater listening distances. And the 3-way 12" 4412 Monitor is mounted with a tight-cluster arrangement for close-in monitoring.
CONSEQUENCES: "Universal" monitors, those not specifically designed for a precise application or environment, invariably compromise technology, with inferior sound the result.

TRUTH: JBL's 4400 Series Studio Monitors achieve a new "truth" in sound with an extended high frequency response that remains effortlessly smooth through the critical 3,000 to 20,000 Hz range. And even extends beyond audibility to 27 kHz, reducing phase shift within the audible band for a more open and natural sound. The 4400 Series' incomparable high end clarity is the result of JBL's use of pure titanium for its unique ribbed-dome tweeter and diamond surround, capable of withstanding forces surpassing a phenomenal 1000 G's.
CONSEQUENCES: When pushed hard, most tweeters simply fail. Transient detail blurs, and the material itself deforms and breaks down. Other materials can't take the stress, and crack under pressure.

TRUTH: The Frequency Dividing Network in each 4400 Series monitor allows optimum transitions between drivers in both amplitude and phase. The precisely calibrated reference controls let you adjust for personal preferences, room variations, and specific equalization.
CONSEQUENCES: When the interaction between drivers is not carefully orchestrated, the results can be edgy, indistinctive, or simply "false" sound.

TRUTH: All 4400 Studio Monitors feature JBL's exclusive Symmetrical Field Geometry magnetic structure, which dramatically reduces second harmonic distortion, and is key in producing the 4400's deep, powerful, clean bass.
CONSEQUENCES: Conventional magnetic structures utilize non-symmetrical magnetic fields, which add significantly to distortion due to a nonlinear pull on the voice coil.

TRUTH: 4400 Series monitors also feature special low diffraction grill frame designs, which reduce time delay distortion. Extra-large voice coils and ultra-rigid cast frames result in both mechanical and thermal stability under heavy professional use.
CONSEQUENCES: For reasons of economics, monitors will often use stamped rather than cast frames, resulting in both mechanical distortion and power compression.

TRUTH: The JBL 4400 Studio Monitor Series captures the full dynamic range, extended high frequency, and precise character of your sound as no other monitors in the business. Experience the 4400 Series Studio Monitors at your JBL dealer's today.
CONSEQUENCES: You'll never know the "truth" until you do.

JBL

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Circle (10) on Rapid Facts Card

Sound on the Road

By David Scheirman

As the concert sound industry matures, each passing year brings changes. Subtle differences and new patterns become apparent in the business, as well as with the equipment that is used and the technicians who own and operate it. Let's examine some developments in these areas as the summer touring season heats up.

• **Business.** This year, the typical concert sound reinforcement company (if, indeed, there is such a thing) is finding a wider, more diversified market for its services this year than ever before. Rock touring companies serving corporate events for IBM, Xerox and General Motors? Providing gear and staffing Broadway shows? Installing hanging clusters for permanent installations in churches and auditoriums? Yes, all of these and more.

The increased public awareness regarding "good sound," which is fueled handily by such cultural developments as stereo television and hi-fi contests at automobile shows, has helped to open the doors in many new areas of sound companies that specialized only in touring.

This is a positive development, apparently, because the touring business itself has been anything but predictable throughout the past decade. The massive capital investments now required to assemble a competitive arena-scale portable sound system require more financial security than is often found in the entertainment business.

As major companies move into diversification, and take advantage of increased production budgets for civic events, regional and state fairs, and multi-media shows, openings are then created for smaller, streamlined specialty sound companies that cater exclusively to the musical groups that helped to launch today's best-known sound reinforcement companies.

The touring music concert scene is certainly not dormant; it is perhaps better described as being in a state of metamorphosis. For example, the touring business is becoming stratified; that is, different segments of the industry have evolved into specialty markets, all with their own particular audio requirements.

The outdoor "rock festival" of 15 years ago has blossomed into "mega-events" such as *Live Aid, Farm Aid* and the *US Festival*. Very few sound reinforcement contractors are adequately prepared to even bid in this market. However, a plethora of other fair-weather concerts are apparent in every region of the country, providing work for the growing host of regional PA companies. Civic-sponsored galas such as the *Los Angeles Street Scene* (attracting a million people in one weekend annually) and Chicago's *Tast of Chicago* (combining live musical entertainment with hundreds of food-sampling booths) require modern sound systems.

Other growth areas include the video support market segment, in which portable sound systems are required to provide audio to accompany large-screen projection at sporting events and the like. Promotional tours for new bands on the concert club circuit also have their own specialized needs.

Trends that began a decade or more ago are now shaping up to be established patterns in the touring-sound field.

In addition, record company dollars have once again started to flow in the direction of production support for new artists; portable stage monitor systems and house mixing station packages are in demand here.

• **People.** As the options available for touring soundmixers and technicians continue to grow, different skills are developed to incorporate new technologies. Many recording engineers are venturing forth to tackle "The Road," attempting to translate tape-recorded efforts into the large-scale acoustical domain; other individuals focus on a certain live-sound "style," similar to the technique used by a record producer, expanding a client list by achieving consistent, repeatable results and making use of effects racks that travel with the soundmixer, even if the actual sound system is different from night to night.

Other people perhaps travel with a personal stock of high-quality microphones—fragile studio condensers on the road for use with new acoustic music artists, for example, or a brace of clip-on mini-mics to pick up casino showroom horn sections.

Along with increasing skill levels has come increased compensation; major artists have no qualms about paying top dollar for expert soundmixing talent. A touring soundman currently based in Los Angeles is paid $500 per show to work with a well-known jazz guitarist; when at home he drives a Ferrari.

A broad, expanding base of technicians, however, with major-venue road experience makes the job market increasingly competitive. Many veterans who are choosing to stay close to home find opportunities on the production staffs of theme parks, civic buildings and with installation contracting companies.

• **Equipment.** A glance at a major-venue touring sound system will show that the hardware packages being put on the road are also undergoing changes. The double-console phenomenon, whereby a sound company sends out separate, auxiliary mixing consoles to service the show's opening act, is now quite common. Many companies actually express interest in having console technology stay at this level, rather than look forward to the next generation of boards that will have to recall capabilities and onboard microprocessors to handle quick set changes.

More performers are actually mixing portions of the program material onstage themselves. MIDI-patching and onstage submixers help take the burden away from the front-of-house position which, in some instances with the biggest shows, is actually reaching past the 100-input mark.

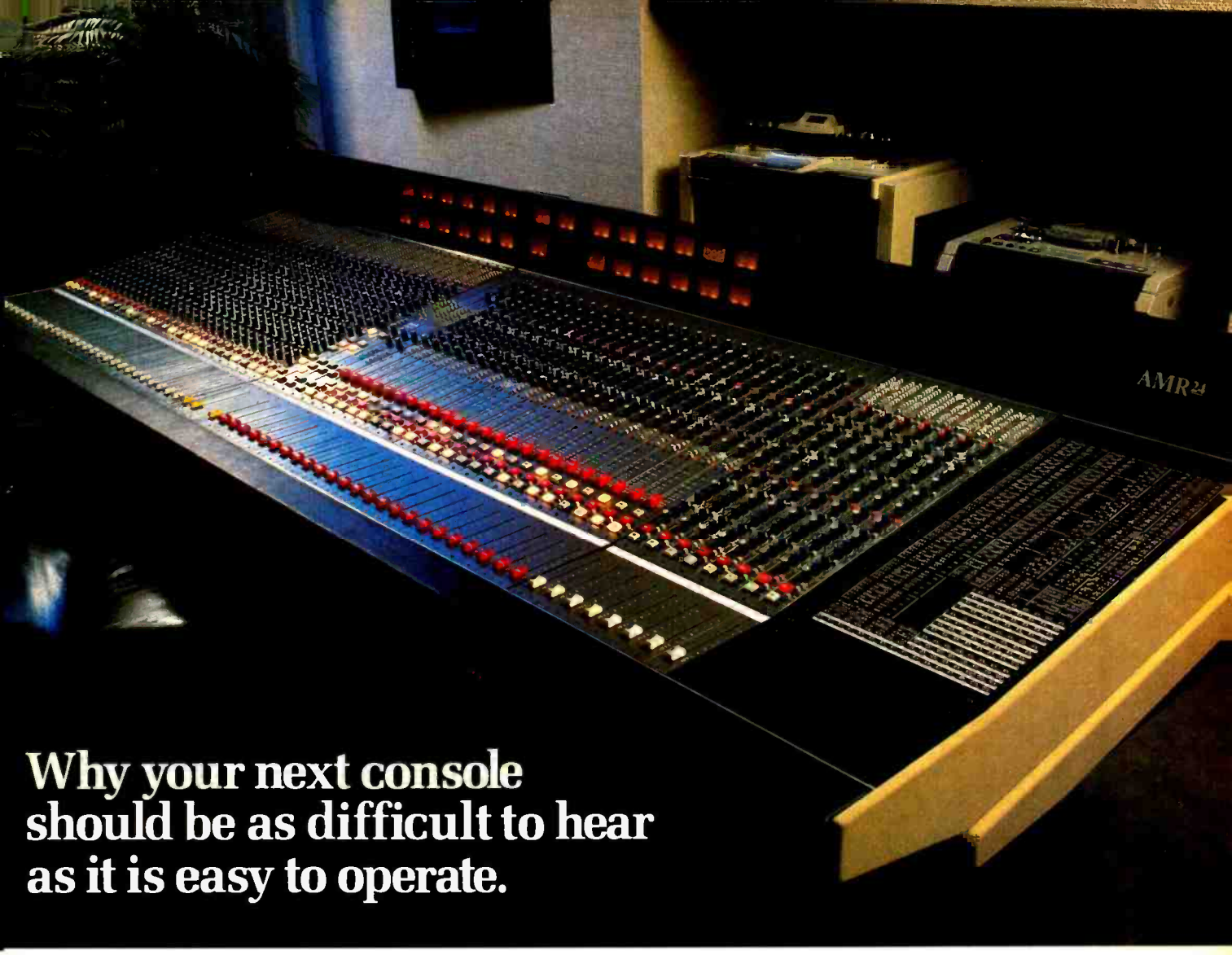
Wireless technology continues to improve, and this ultimately affects the touring business dramatically. Not only are the artists relying more strongly on wireless vocal microphones and guitar, bass and saxophone RF units, but this technology is being used to feed far-flung delay cluster systems at major events.

Event documentation is becoming increasingly valuable. The success of Bruce Springsteen's live record album set, released during last year's Christmas season, proved the wisdom of tape recording various performances. The record gift set would not have existed if farsighted production personnel had not taped shows a decade ago. Both audio and video recording of live events requires a significant change in the way that sound equipment is set up for an event; sophisticated splitting systems, isolation transformers and multiple-output mixing consoles find a ready market.

Trends that began a decade or more ago are now shaping up to be established patterns in the touring-sound field. Business strategies, personnel and equipment are in a state of flux; rather than being rigidly defined, they are all constantly changing. This is typically a sign of health and growth.

R-E/P

David Scheirman is president of Concert Sound Consultants, Julian, CA, and RE/P's live-performance consulting editor.



Why your next console should be as difficult to hear as it is easy to operate.

The studio is more complex and less forgiving.

Electronic production techniques using MIDI and SMPTE sync require more control than a "wire with gain" can provide. But as functions and components accumulate, the console's signal path has grown more complex, and its audio performance has suffered. On analog recordings, higher levels of crosstalk, noise and intermodulation were an acceptable price for additional control. On digital multitrack, however, these flaws become glaringly obvious.

Crosstalk blurs the stereo image.

Now that digital recorders have virtually eliminated crosstalk, this is an especially annoying problem. *The AMR 24 matches the channel separation performance of digital multitracks* because it employs balanced buses that eliminate crosstalk the same way mic inputs do. This radical design approach takes full advantage of digital's more coherent stereo imaging.

Balanced buses also eliminate the intermodulation that plagues the sound of conventional "virtual ground" mix amps. *The AMR 24's noise floor is constant whether you route one input to a group, or thirty six.* So you can concentrate on the music without distractions from the mixer, even on digital multitrack.

Features shouldn't degrade audio performance.

Automation widens creative possibilities — and narrows the margin for console error. For example, FET mute switches that are "silent" individually can produce audible glitches when grouped. The AMR 24's carefully controlled switching time constants eliminate this problem.

Every circuit in the AMR 24 has been calculated with equally close attention. Each stage has at least 22 dB of headroom; total dynamic range is over 100 dB. Even so, *unused stages are bypassed to produce the shortest effective signal path in every operating mode.*

Perhaps the AMR 24 is a product of extremist engineering. But as we see it, optimum audio performance, not simply a revised layout, is what makes a console automation- and digital-ready.

The feel is familiar, the functions are unprecedented.

The AMR 24 facilitates innovative production techniques within a classically split configuration. Master Input Status switches select mic inputs or line returns on all input channels simultaneously. In its mixdown configuration, the AMR 24 will handle up to 60 tracks, because the 24 Track Select switch changes the monitor returns to line returns normalled to your second 24 track (or to synchronised "virtual tracks" from synthesisers and samplers). The monitor returns have aux buses, solo and mute, plus four bands of EQ and long throw faders, so this flexibility is achieved with no loss of audio quality. For additional effects returns, the Fader Reverse function creates an additional 24 patch points through the cue send faders.

Imaginative design and uncompromising construction give the AMR 24 flexibility and sonic transparency that represent clear achievements: especially clear on digital recordings. For all the facts on this innovative console, send your business card or letterhead to:

DDA AMR 24 SPARS

Klark-Teknik Electronics Inc., 30B Banfi Plaza North
Farmingdale, NY 11735 (516) 249-3660

Unit #1, Inwood Business Pk., Whitton Rd.
Hounslow, Middlesex, UK TW3 2EB

Film Sound Today

By Larry Blake

The practice of recording stereo sound effects for films has become commonplace in the past 10 years, primarily because younger sound editors wanted to bring high-quality, fresh sound effects to the mix. On a practical level, too, almost all of the top sound editors are "independents" and are not directly connected with a studio. Such individuals don't have a large sound library to fall back on and, instead, have had to record what they need when they need it.

The upside of this dilemma is that the large studio libraries contain, for the most part, decades-old, tired recordings. A friend once described them as "*nth* generation copies of copies. No one knows where they came from; they have no master." To this day, the libraries of a shocking number of sound editorial companies are comprised of these very same *nth* generation library effects, stored on 35mm mag.

In any event, a growing number of sound editorial companies are amassing large, fresh libraries recorded either on EIAJ-format PCM digital or ¼-inch analog tape. (A high-quality Dolby-C cassette recording on metal tape is good enough for most effects, save gunshots and thunder, and certainly beats an ancient library recording.)

Only half the battle is won by going out and securing high-quality effects; the other part comes in with the editing and organization of a library. A well-thought-out system suited to the needs of the users has to be established from the outset, and then must be followed rigidly.

Probably the best arrangement has the tapes organized by subject matter, with all of the, say, auto effects, on the same rolls. Separate tapes within the auto section might be devoted to maneuvers (skids, chirps, peel outs), antiques, sports car, hot rods and miscellaneous (doors, switches, pedal and shifter movement). New recordings are added to the end of a given roll, allowing an editor to review all cues in a given subject by searching through a minimum number of tapes.

With standard ¼-inch tape, this method can be achieved either by editing the original field tapes, or by editing a copy and vaulting the original. The trade-off is either permanently losing the outtakes (no real problem) or going down a tape generation, although use of noise reduction helps reduce the quality loss. In addition, copying provides the added peace of mind that the masters are not subject to wear; also, storing them in another facility guards against fire and theft.

With VCR-based digital recordings, of course, editing is equivalent to copying. Glitch-free editing with consumer digital processors is currently not possible with standard equipment; this only becomes an issue if you edit between cues and not within them. Insert editing is yet another reason to keep one's fingers crossed for R-DAT technology.

Again, the point to be made here is that no matter what the recording or storage medium, organizing according to subject matter is a big help. Such a system will pay off when a company goes to a digital editing system; access will be made more efficient by minimal spreading out of like effects. The value of this would be most evident in the mastering of hard disks, optical discs or R-DAT cassettes. If the latter two use a "jukebox" changer, and don't dedicate one player for each disc/cassette, then keeping similar effects together will speed up the auditioning process.

A growing number of sound editorial companies are amassing large, fresh sound effects libraries.

In the Dark Times, prior to the era of personal computers, libraries were organized either by 3x5 cards or 3-ring binders, and logs inside the tape boxes were hand-written or typed. While a paper-bound system is quite sufficient (albeit slow) for finding specific cues, this is just the tip of the iceberg.

A supervising sound editor must then assign the sound to a reel or a scene and write out a transfer order. The transfer person will then scribble out a label to be placed at the head of each effect during the 35mm transfer, to assist the assistant editor in "breaking down" the effects. The key words here, of course, are "manual" and "redundant." Nevertheless, this is the way that most of the industry works, blissfully ignoring the obvious advantages of letting a computer manage data.

Good sound-library techniques begin with the recordist in the field. Complete vocal slates are essential, and the more information at the head of the take the better. Also, the recordist should indicate on the boxes the date of recording and general contents, in addition to the sequence (tape 1 of 3). Recording tail tone is helpful to the transfer personnel; if the last take is needed, then they won't have to wind to the head (assuming tails-out storage) to get to the tone. Paper leader for ¼-inch tape aids the transfer person in finding cues without having to look at the machine.

The logging sequence is simple: the edited tape is assigned roll and cue numbers, grouped according to subject matter, and each take is described and cross-referenced. If the edited tape is a copy, a sensible system would entail storing the originals either according to film title or recordist name.

One issue of paramount importance is consistency: whatever method a system uses to cross-reference the cues, all similar actions must be cross-referenced in the same manner. If the effect has a direct relationship to a specific scene, the librarian should note this information in the logs. Librarians must also remember to frequently solicit opinions from others regarding descriptions, and shouldn't hesitate to use their imagination.

Consistency is facilitated by a system that sorts on the main description, and doesn't require a separate field for cross-referencing information. A separate field means that the key information must be repeated, placing a burden on the data-entry personnel to be on their toes.

You might notice that there has been no mention of the purchase of off-the-shelf sound libraries, either on ¼-inch tape, vinyl LP or CD. I'd rate the ones that I've heard no better than good and, no, I haven't auditioned any of the recently released digitally recorded libraries on CD.

Whatever the quality, there's an unavoidable dilemma here: if the library is available to the public, and is worth buying, you can bet that a lot of other people have it. Owning the same effect as dozens of other companies does not, shall we say, give one an edge over the competition. This applies to any store-bought library, analog or digital recording, or the release medium. These libraries are perhaps best purchased as a "it's-3 a.m.-and-I-need-a_____" safety net. In this context, the price (about $50 per CD) amounts to cheap insurance, not to mention that you can obtain a whole library for the price of a few days of an effects recordist's time.

In next month's column I will take a look at the process of recording sound effects, with special attention paid to microphone selection. R-E/P

Larry Blake is RE/P's film sound consulting editor.

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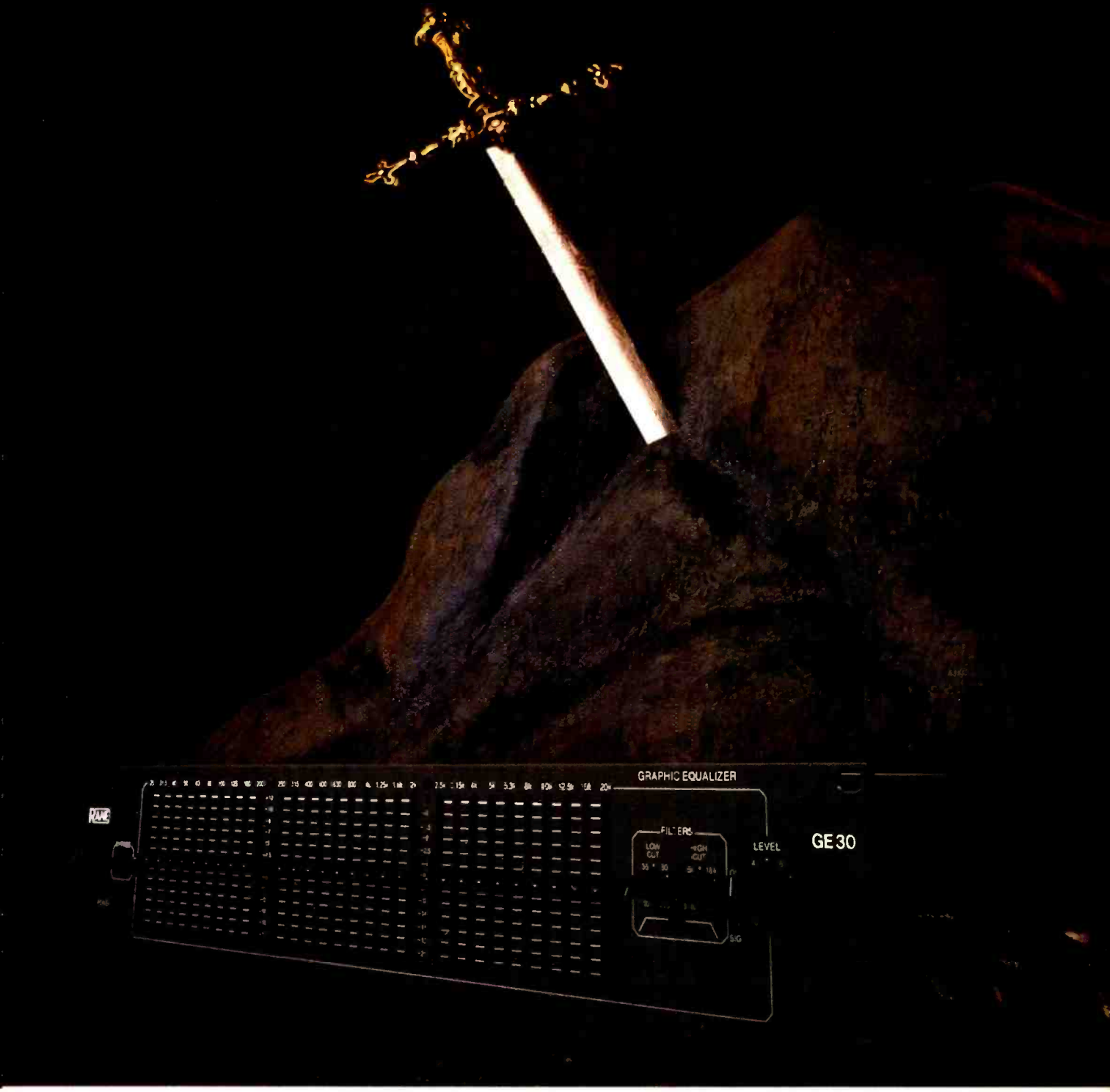

The Rane GE 30. First to feature Constant-Q performance with interpolating capability (between ISO centers), switchable boost/cut or cut-only operating modes, switchable transformer or direct-coupled balance output, plus 50mm high-resolution faders. And more.

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RANE

Circle (12) on Rapid Facts Card

You're looking at the

In developing our newest console, we invited the engineers, consultants and contractors you see here to be a vital part of the mix. We asked them what works and what doesn't. What they like and don't like. What they want. And what they don't want.

We took this input and combined it with our own experience that includes nothing less than the development of the well-known PM1000 and PM2000. The result is an extraordinarily responsive, reliable, versatile mixing console, the PM3000. A console able to meet the demands of concert tours, fixed installations and broadcast applications by combining new technologies and ideas with proven Yamaha reliability.

MIX Magazine 1986 TEC Award for technical achievement.

In designing the PM3000, we considered not only where it will be used but also how it will be used. That's why the overall size and weight of the PM3000 are less than its predecessor's. Why the meter bridge height has been lowered. And why the 40-channel model has a center master configuration.

Greater control over equalization was another important consideration. Each input channel has a four-band parametric equalizer with a variable frequency high pass filter. The 12dB/octave high pass filter has its own in/out switch and its -3dB cutoff frequency is sweepable from 20Hz to 400Hz. This range makes it useful in minimizing the effects of low frequency stage rumble, vocal pops or wind noise. This high pass filter is also useful when micing high-hats or cymbals, to reduce the unwanted pick-up of nearby drums. Each of

Pictured (rear, l. to r.) Jay Kingery, Recording Consultants, Inc.; Herb Swartz, Harrah's-Tahoe; John Windt, Windt Audio; Rick Southern, Southern Star Engineering; Gary Davis, Wales, Sonics Assoc.; Al Siniscal and Bobby Ross, A-1 Audio; Craig Olsen, Product Mgr./Yamaha. Not pictured: Chris "Smoother" Smyth and Steve Venezia, Delicate Audio;

PM3000's input channels.

the four stereo AUX returns also has its own two-band sweep-type EQ.

The PM3000's transparent sound quality is achieved by utilizing matched components in its electronic differential input stages. Yet it still retains a high degree of stability and common mode rejection. For those situations where the extra common mode rejection of a transformer is needed or where total grounding isolation is necessary, the optional IT3000 input transformers can be installed on a channel-by-channel basis.

To help accommodate the increased number of effects used in the real world today, the PM3000 provides eight AUX sends, each with level control and pre/off/post switch.

There are also eight VCA groups. We designed and built our own VCAs to insure that they would be stable enough to withstand the effects of constantly changing environmental conditions.

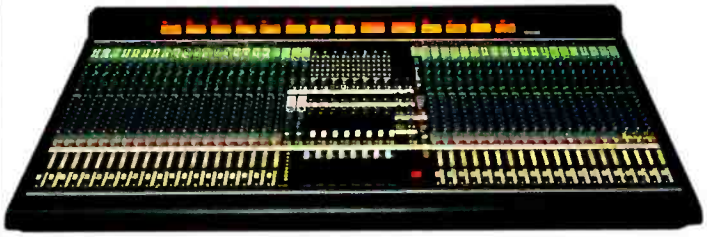
We also incorporated extensive and flexible muting capabilities into the PM3000. Each input channel has eight mute assign switches that permit the channel's on/off function to be controlled by the eight master mute switches. That means multiple channels can be muted or turned on at once, making scene changes or punch-ins quick and convenient. The mute-safe switch on each channel guards against inadvertent channel muting, if desired.

While the VCAs allow tremendous level control flexibility, conventional group busses and faders are provided for routing and signal processing purposes. These master faders are assignable to our unique mix matrix feature, the stereo buss and to the rear panel XLR connectors.

You'll appreciate the convenience of the PM3000's extensive cue and solo capability. Especially during sound checks. The ability to solo one channel while muting all inputs except the one being monitored makes sound checks a lot easier.

As previously stated, it was input from professionals like the ones you see here that enabled us to design a console as impressive and versatile as the PM3000. The result of all this can be heard at your Yamaha Professional Audio Dealer. More complete technical information is available from Yamaha Music Corporation, Professional Audio Division, P.O. Box 6600, Buena Park, CA 90622. In Canada, Yamaha Canada Music Ltd., 135 Milner Avenue, Scarborough, Ontario M1S 3R1.

Gary Davis & Assoc. (from L to r) Bill Schuermann, Antech Labs; Lynn McCrosky and Alvis Michael Wickow and John Henderson, Little River Band; Ken Fause, Smith, Fause & Assoc.



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Circle (13) on Rapid Facts Card

Living with Technology

By Stephen St. Croix

I work out four times a week on free weights and in fact, have increased my bicep diameter by over 40% in the last year alone. Combine this amazing feat with the fact that I went to Carnegie, and that one of my majors was fine art, and you would think that I would be the perfect person to handle a light pen. I once thought so too, but the bottom line is that I simply am not strong enough. Maybe it is that Man is not strong enough.

It is not very natural to spend half a day holding your arm out in front of you while drawing pictures (or pointing to icons) on a 60kV piece of vertical electronic paper. If the screen in question were horizontally mounted, the situation would improve greatly.

I have tried it; I built a special desk that held the monitor at just the right angle for me in exactly the right place for my right hand, and I was pretty happy for a while. But it remains a problem to figure out how this idea should be applied so that different people of different sizes can all feel comfortable with it.

What has all this got to do with your life, you ask? Well, Nancy, as you get more of what you ask for—in this case power in the studio—you are faced with the problem of how to get to this power.

Equipment already exists today with front panels that are not able to do much more than power up, and then allow you to view a vast world of information and power through a tiny frustrating window of little LEDs or a pitiful few LCD characters. I don't care any more about all the cool ways people have found to scroll, compress and shift what data there is to read; the bottom line is that we are looking at a world through a keyhole. It is a big world, and a very little keyhole.

Anyway, after you have memorized all those secret codes so that you know what it means when LEDs 1, 2, and 4 are on (and LED 3 is blinking), or you have learned what *DLYMODFR65* means, you then need to figure out how to tell the machine that you want less delay, more high-frequency rolloff, a little more modulation and that you want it all autopanned a little faster to the left when the snare comes along. Have fun. No rush; it's only studio time.

Both getting in and out are becoming critical problems. Remember how nice it was when you got your first scientific calculator, and it had a shift key? Each button could actually do two things—twice the power. Then shift became rollover, and each button could do three or more things. That was even nicer, and we understood what was going on because the buttons had the alternate functions printed on all available surfaces.

But now, this concept has evolved beyond all rationality. Perhaps you have one of these very devices that incorporate one of man's truly great encryption schemes: "pages." With pages, you have the added thrill of any given button or knob doing a totally different thing at any time, depending on what you told it to do earlier. Just to keep it fun (and because you cannot predict what a given control is going to do at any given time) many controls now have *no* labels at all, or cute labels such as "Knob" or "Controller." Really: I have equipment with those words printed on them.

As you get more of what you ask for, you are faced with the problem of how to get it.

Soon, equipment will appear with front panels that will not be able to do much more than boot. Some sort of interactive surface will be needed to coherently and efficiently display data, respond to your requests and changes, and display the results. It was once thought that the light pen was the answer. Although they are great fun for drawing pictures of your cat (as long as you can draw fast), hundreds of people out there with huge right arms are realizing that this approach may not be right for 10-hour sessions.

Then came the mouse. Though not as good for drawing a cat, a mouse seems to be slightly better for pointing to icons. A problem with the mouse appears when you bring one in to the studio: where do you let it roll? It is very hard to find a suitable, perfectly horizontal surface within reach that does not interfere with other devices in today's control rooms. This leads us to the track ball, or inverted mouse. They work, but people don't seem to like to work them, at least not outside of video arcades.

Let's see....touch screens, maybe. The technology is still being sorted out: capacitive, infrared X/Y scanned and others. The current state of affairs allows you to point to nice bold boxes, but cannot support detailed input such as drawing. Further, the technology for dealing with greasy, smudgy screens left behind after a session with service from Taco Bell has yet to be addressed.

The same problem that plagues light pens applies to the new touch screens if they are used as primary controllers: the big burn of arm fatigue.

What does this leave us? It looks as if there is no hope, no answer. It's true; there is no hope. No, wait, I'm kidding.

Let's examine what goes on when we look at the screen. We usually know what we want, and we are doing one of two things: shopping for it or, having found it, preparing to push a button or draw something. We are constantly moving our eyes and heads around as we do this, and the key for the technology of the future may well lie in that simple fact.

I have worked with prototypes of ultrasonic and infrared systems that let you simply look at a place on the screen and push a simple button to enter what you see. While still not good enough for drawing, I have seen systems that do a good job of pointing and selecting.

I have also worked with a prototype of a system that is simply a cursor control mounted on the arms of a chair, where your hands would naturally fall. This design seemed to work quite well for situations where you do not need to enter typed data often, and today more and more of this type of thing exists.

Whatever the system that may emerge as functional, it has to be *one*. Only one *type* of system and only one *of* them in each facility. If (here we go again) we could standardize on one system, then you could buy 10 devices, hook up all 10 devices to the "master interface" and see all and control all through one optimized interface.

Switching software that lets you instantly slide from one device to another might be a good approach to getting at everything in the studio where there is no room for 10 screens or keyboards. You could sit in one chair, right in the middle of the stereo image, and stay there. No more leaning to the effects racks to change something and, with a simple audio matrix switcher, no more noisy patch cords.

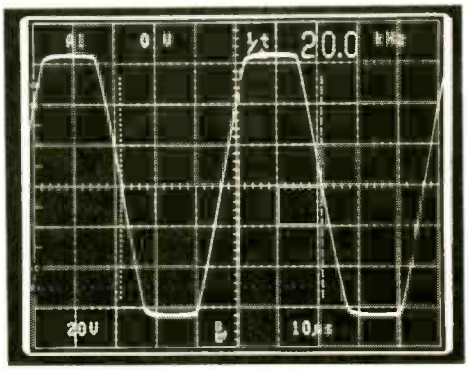
With standardization like this, you need not commit to one monster virtual console/effects unit to mix like a king. (Of course, this kind of integrated power would be available in a monster system, but you lose all options such as being able to update to the newest toy concept, or even to shop around to customize and build up your facility to your needs.)

A dream? Well, yes. But if we don't dream it today we aren't going to see it tomorrow. R-E/P

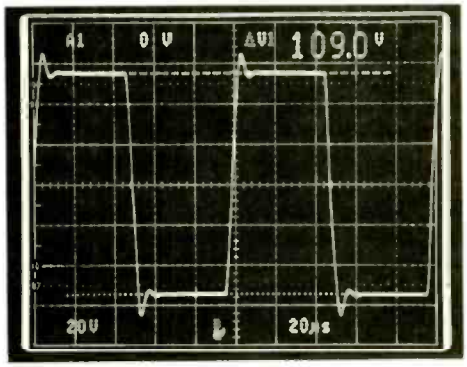
Stephen St. Croix, RE/P's technology developments consulting editor, is president of Lighting Studios and Marshall Electronic, Baltimore.

Knowledge is Power.

The more you know about RAMSA power amps, the better they look. Designed for stability and reliability,* they reflect our knowledge of the most demanding applications. And their graceful overload characteristics dramatically improve apparent headroom. To learn more, see your RAMSA dealer, or write to 6550 Katella Avenue, Cypress, CA 90630.



The WP-9920 exhibits gentle overload characteristics even when overdriven 3dB into 4Ω Load at 20 kHz (643 Watts).



The WP-9220 exhibits minimum ringing even with extremely reactive loads. (8Ω, 1µF; 10 kHz square wave input.)

*Ramsa amplifiers carry a 5-year limited warranty.

Circle (14) on Rapid Facts Card

RAMSA
Panasonic
Industrial Company

SPARS On-Line

By Gary Helmers

This month I'd like to take a look at the life of today's recording and production engineer, and offer some suggestions for achieving a good income. Obviously, an engineer must be talented, technically educated and energetic, but how these qualities are applied will determine the pay scale. The mixer who has a "point" on a platinum album will have a better hourly return than a PA mixer working in a small jazz club.

Let's create a hypothetical future engineer called John (or Jane) Mixer. John made a decision to enter the audio business—not just the music business. Music sessions account for less than 20% of the business of audio production. Many engineers create a narrow future by concentrating only on music sessions and as a result, the field is overloaded.

First, let's explore some of the options open to a mixer entering the field. Next, I'll discuss ways to improve income once the job has been landed. Bear in mind that we're documenting a fictional character's rise to fame; all aspirants in the modern world of audio production must find their own particular paths.

John Mixer had always liked music, but earning a good living was his prime concern. After an 8-week education in 24-track recording he was ready to take on the world. He had a good personality, was clever and never argued with anyone. He realized that he might not be the most talented mixing engineer around, and decided on the strong, silent approach—to wisely avoid putting his foot in his mouth.

John decided to move to a town with high pay scales. From the U.S. Chamber of Commerce he discovered which cities had the most business in his chosen field, and what the relative pay scales were in each market. He moved to the city that offered the most potential and, because living costs were high, took a modest apartment.

Deciding to do some market research on his own, John called all the studios in town and told them he was writing a term paper on the growth of the recording business. He asked what the studios were looking for in new employees and what problems the employers had encountered.

Next came the job interviews. His market research came in handy. He was given tours of the studios and made a point of remembering everyone's name. As he toured each facility, he was friendly with everyone and gave the impression that he was already fitting in. He was courteous, and never arrogant. He didn't try to show off his knowledge, because he didn't really know much at all.

Now it was time to close a deal with a prospective employer. Before the interviewer had a chance to say there were no openings, John mentioned that he had some other offers, but that he preferred this studio above all others. The other studios offered minimum wages, he explained, but included the chance to volunteer on night sessions and learn with hands-on experience. John's honesty about his relative lack of experience and his willingness to work were impressive. The interviewer didn't want an engineer with such potential to go to the competition. He got the job.

All aspirants in the modern world of audio production must find their own particular career paths.

John started working days, and spent his nights reading technical manuals and helping out wherever he could. Much to his surprise, he discovered that some of the highest paid engineers were not working exclusively on music sessions; they were media mixers, film mixers, mastering engineers, location recordists, video sweeteners, and PA and stage monitor mixers. The top people in each field were doing quite well.

Some of these high paying professions required union membership. John was lucky to be working at a studio that had union affiliation for some divisions of its business. He informed management that he was interested in the union jobs and they were delighted. It is often difficult to find young engineers willing to take gofer jobs in union divisions. To make a long story short, John received an apprentice union card and within three years became a journeyman.

At night, John had continued his self-education. He became proficient with several consoles. He made friends with a number of local bands and assisted in their growing careers. His union experience in film made him an attractive engineer for those music clients involved in film work. When he had a slow month in music mixing, he would take on jobs in other fields.

One day, a big producer needed a music mixer with film experience. While working on this new project, John met a rock and roll "legend." The combination of luck, perseverence and talent boosted John into the big league. His percentage royalties on popular albums were invested wisely, and John also expanded his horizons by becoming a producer.

When interviewed on *60 Minutes*, John was asked his secret to success. "To know your capabilities and use them to the fullest," he answered. "Continue studying and expanding your knowledge. Associate with people who are on the move, and be identified as a winner. Hang out with losers and you will be identified as a loser."

Although John is a hypothetical engineer, he is actually a composite character created from a number of successful engineers. All of the real people from which this character was drawn had a passion for working hard on whatever project they were involved. They realized that their name was associated with each project, and they made an effort toward consistent quality. They realized the importance of interfacing effectively with colleagues and clients. They were honest about their shortcomings, asked for advice, learned quickly and always gave credit where credit was due.

Perhaps most important of all, good engineers know when to sublimate their egos. The range of personalities that engineers encounter is vast, from the humble beginner to the arrogant superstar. In the studio there is only room for one ego at any given time.

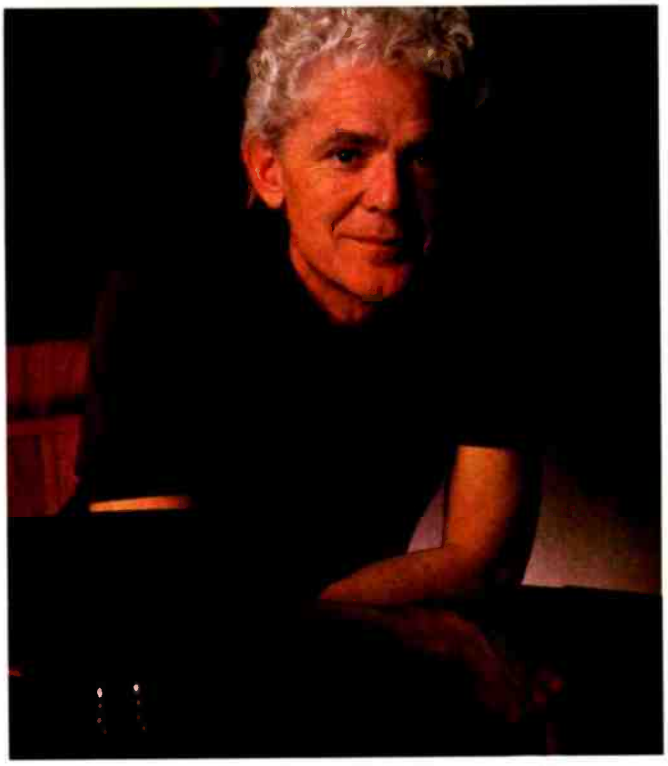
By following these suggestions and developing your own personal workstyle, you stand a good chance at succeeding in this business. There are lots of success stories—engineers who have made a fine living, enjoying their work and continuing to do so into their golden years. So, to get ahead, work hard and honestly, be smart and be recognized as a winner.

I'd like to thank Murray Allen, president of Universal Recording, Chicago, for his help in preparing this column. In his long and successful career, Murray has been associated with the top names in recording, and a number of them owe their success to his support and advice.

R-E/P

Gary Helmers is the executive director of the Society of Professional Audio Recording Studios

Before you choose speaker components, listen to Tom Hidley.



It's a good bet that of all the people reading this ad, 10 out of 10 know the name Tom Hidley.

One engineer we spoke with called him "the best engineer in the world." Another described him, a bit more colorfully, as "pretty damn hot."

But most of you know him as perhaps the foremost studio designer in the world today.

The reason we bring this up is that the speaker components Tom prefers for his clients are the ones we make.

TAD.

"I WILL USE ONLY TAD, UNLESS A CLIENT DEMANDS OTHERWISE."

In fact, he does more than prefer them. Insists Tom, "I will use only TAD, unless a client demands otherwise."

We, of course, are delighted that Tom feels so strongly. But it should also be of more than passing interest to you, since you want the speaker components you use to be the best.

And on the subject of "best," Tom has some very definite opinions about TAD. "They are the most state-of-the-art, consistent quality products today. Nothing touches their performance, honesty, stability and transient response."

"NOTHING TOUCHES THEIR PERFORMANCE, HONESTY, STABILITY AND TRANSIENT RESPONSE."

There are some sound technological reasons for such enthusiasm. For example, we use only pure beryllium diaphragms in our compression drivers for high speed sound propagation and exceptional efficiency. We also assemble every component by hand, with tolerances as close as a millionth of an inch. And we use exhaustive and esoteric evaluation techniques—such as the Doppler laser and anechoic chamber—every step of the way, from original design right through to manufacturing.

"TAD MAKES THE BEST SOUNDING COMPONENTS I'VE EVER HEARD."

But for Tom, that's all frosting on the cake. "At the end of the day," he says, "it's what comes out of that speaker that determines success or failure. No matter what it measures, it all comes down to what it sounds like. TAD makes the best sounding components I've ever heard."

If you're in the market for professional speaker components, for yourself or a client, we hope you'll seriously consider what Tom Hidley has to say about TAD.

And thanks for listening.

TAD Technical Audio Devices

Professional Products Division of Pioneer Electronics (USA) Inc.
5000 Airport Plaza Dr., Long Beach, CA 90815. (213) 420-5700.

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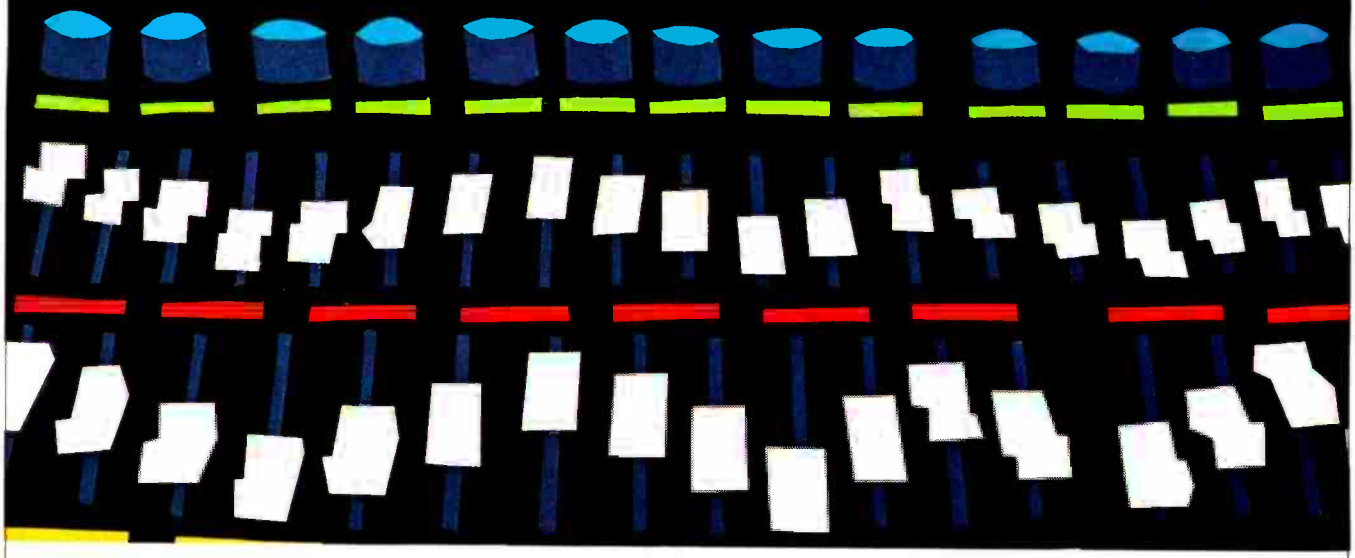
Circle (15) on Rapid Facts Card

1987 Salary Survey



By Mel Lambert, Editor

For the first time, RE/P presents a detailed breakdown of salaries and benefits for management, technical and production staff working in the professional audio industry.

No matter what industry we are employed in, all of us exhibit a healthy interest in salary levels—not just our own, but those of fellow workers and others employed in related industries. It is therefore somewhat surprising, perhaps, that such information has never before been available to the professional audio industry.

Welcome to the first **RE/P Salary Survey**, the results of which are presented in tabular and graphic form on the following pages.

To make it a little easier to digest the large amounts of interesting data that we have gathered, the results from our questionnaires have been broken out into replies from three main staff categories:

- Company management (president, owner, partner, general manager, studio manager, etc.)
- Technical and engineering staff (chief engineer, maintenance engineer, engineering manager, etc.)
- Operations and production staff (producer, live-sound engineer, post-production engineer, sound editor, staff/independent engineer, mastering engineer, etc.)

Respondents within each of these major staff categories have been further broken down into sub-categories that describe the *types* of audio-production facility or business at which they are employed:

- Recording/production studio (both fixed and mobile facilities, CD and disk mastering, etc.)
- Live-performance environments (concert sound engineers using temporary systems, sound contractors working with fixed installations, etc.)
- Radio broadcast production studios (station-based and independent audio production for radio broadcast facilities,
- Video and TV broadcast production studios (independent audio-for-video production and post-production facilities, station-based and independent TV audio production facilities, etc.)
- Corporate, educational and government audio production studios.
- Film re-recording facilities (in-house and independent film sound production and post-production companies and facilities, etc.)
- Independent engineers and producers.
- Dealers, distributors and rental houses for audio recording and production equipment and systems.

The results of our Salary Survey for the three job title categories, broken down amongst the eight business classifications, are tabulated in Tables 1, 2 and 3. Note that we asked for answers to the following questions:

- Salary level received.
- Level of salary increase during the last year.
- Fringe benefits received in the job (insurance, sick leave, pension plan, etc.)
- Years in present job.
- Years in the audio production industry.
- Education level attained.
- Age of respondent.
- Union memberships.
- Membership of industry societies and trade organizations.
- Attendence of U.S. and overseas trade shows.

The median salaries for each of the three job title categories are summarized in Table 4. As can be seen from these data, the average salary for management staff is $34,250; for technical staff it is $31,400; and for production staff is is $27,500. Table 5 lists the median salary increases that respondents received during the past year; as can be seen, the increase level of between 8%-9% is slightly above the inflation level for the same period.

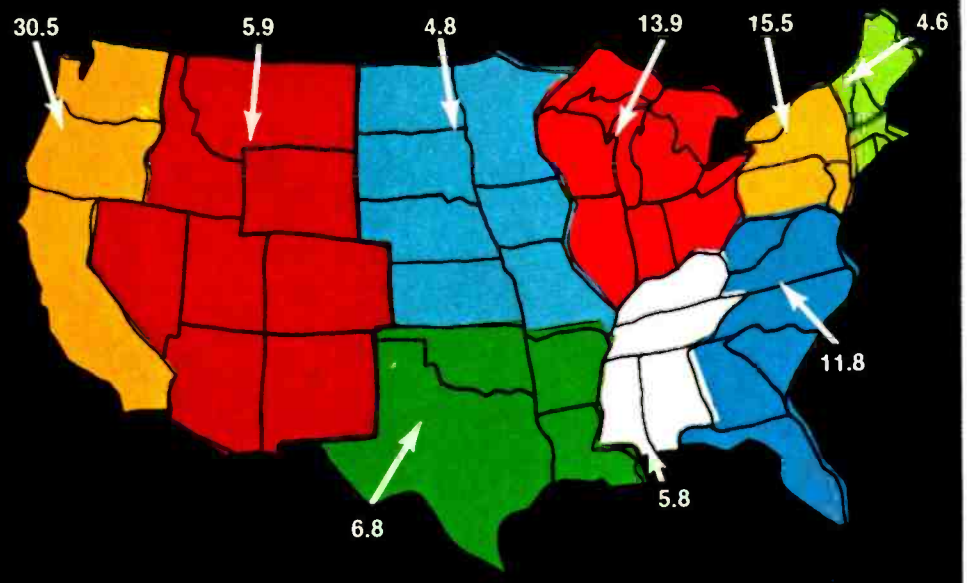
Within all three job categories, the highest salaries seem to be paid to people employed at unionized facilities (video/

BREAKDOWN OF RESPONSES BY GEOGRAPHIC LOCATION

Salary Survey RE/P-1987

Geographical Location:	Survey %
New England	4.6
Middle Atlantic	15.5
East North Central	13.9
West North Central	4.8
South Atlantic	11.8
East South Central	5.8
West South Central	6.8
Mountain	5.9
Pacific	30.5
Not given	.4

Questionnaires mailed: 2,307
Questionnaires returned: 848
Response rate: 36.8%



Readers Comments

"It is nice to know that equipment costs are coming down, while the quality and variety of equipment is up. The little guy now stands a chance of sounding good!"

"Audio formats make purchasing new equipment a big gamble. Is 1-inch 16-track viable for the next 10 to 15 years as a quality alternative for TV audio post, or is it just a trend? Show me the equipment that will help me sell my services for the long haul."

"Career opportunities are limited due to the political nature of our business. The best bet is be an independent, learn by doing and use your imagination."

"The technology changes, but the people stay the same. There is still much great music being recorded by people who care about what they do."

*"It is now a very exciting time in audio: technology is changing the field rapidly. New opportunities are arising frequently; established companies, it seems, must devote considerable time and energy to these changes to stay competitive. I owe **RE/P** a great deal of thanks for helping me stay on top of the latest developments."*

"Studio rates are too low compared to the amount of money needed to equip a typical studio."

"There is too much corporate control and board room politics determining where the big-ticket projects are produced. And not enough emphasis is placed on quality and recognition to the people who do produce quality."

"Advice to entering engineers: Get all the training you can in computers, MIDI and digital components."

"The major opportunities are in the areas of audio-for-video and film. The major problems are copyright and other laws keeping pace with technology. Also standardization of recording formats."

continued on page 39

TV audio production and film re-recording, for example). It should be noted, however, that a large number of independent producers and engineers—60% of whom enjoy incomes greater than $35,000—have included themselves within the management job category, which suggests they might also serve as president and/or CEOs of their own independent production companies.

To provide a graphical representation of the key data from these three staff designations, we have provided Figures 1 thru 6. These pie charts detail the range of salary levels within each category, and also provide a breakdown of the number of years respondents have been employed in the audio production industry. Interestingly, the median number of years that managers, technical and operational/creative staff have been working in the pro-audio industry is 16.8, 14.0 and 11.9 years, respectively, which indicates a pretty stable workforce.

Of the fringe benefits listed by our respondents, it would appear that the majority of management, technical and production staff are receiving paid medical, dental and, in some cases, life insurance, plus sick leave and paid holidays.

Obviously, we will need to wait 12 months for these data to provide any analytical trends in salary levels throughout the pro-audio industry. In the meanwhile, however, the results do at least demonstrate that most of us are enjoying a well-paying position with adequate fringe and other benefits.

Methodology

On Feb. 18, 1987, the marketing research department of Intertec Publishing Corporation, directed by Kate Smith, conducted a scientific study on salary information of audio professionals. Questionnaires were mailed to 2,307 **Recording Engineer/Producer** readers on an nth basis from our circulation list.

By March 23, 1987, 848 questionnaires had been returned, for a response rate of 36.8% of those mailed to **RE/P** readers. The data presented in this report are based on those responses.

The purpose of this Salary Survey is to provide audio professionals with valuable compensation and career information that will help you better evaluate your own position and that of your subordinates.

TABLE 1.– MANAGEMENT STAFF PROFILE

	Total %	Recording Studio %	Live Sound %	Radio Broadcast Production %	TV and Video Audio Production %	Corp./ Ed./ Gov't. %	Film Re-Recording %	Indep. Eng./ Prod. %	Dealer/ Distributor/ Rental %
Salary Level									
Less than $15,000	5.4	11.7	3.5	9.6	2.9	–	–	5.3	2.2
$15,000 to $24,999	19.4	18.1	27.6	13.5	34.3	17.4	4.4	15.8	17.8
$25,000 to $34,999	25.4	16.9	22.3	36.4	17.1	47.8	8.7	15.8	26.7
$35,000 to $49,999	22.3	26.0	19.0	15.4	17.1	26.1	30.4	26.3	22.2
$50,000 or more	25.5	26.0	27.6	21.2	25.7	6.5	47.8	36.8	31.1
No answer	2.0	1.3	–	3.9	2.9	2.2	8.7	–	–
Median =	$34,250	$36,450	$33,000	$30,000	$30,000	$30,300	$51,500	$51,700	$36,000
Received Salary Increase During Past Year	53.3	44.2	58.7	42.4	51.4	74.0	47.8	52.7	57.8
Percent of Increase									
Less than 5%	6.8	5.2	3.5	7.7	8.6	19.6	–	–	4.4
5% to 9%	19.7	10.4	19.0	17.3	17.1	41.3	21.7	21.1	17.8
10% to 14%	9.9	13.0	12.1	5.8	11.4	6.5	13.0	5.3	8.9
15% or more	14.4	15.6	24.1	7.7	14.3	2.2	4.4	26.3	20.0
No answer	2.5	–	–	3.9	–	4.4	8.7	–	6.7
Median =	9.7	12.5	12.9	8.4	10.0	6.9	9.5	15.0	11.9
Fringe Benefits Received									
Medical Insurance (paid)	64.2	53.3	60.3	69.2	65.7	82.6	60.9	36.8	75.6
Dental insurance (paid)	34.5	26.0	34.5	30.8	25.7	50.0	56.5	31.6	42.2
Life insurance (paid)	39.4	33.8	34.5	38.5	40.0	50.0	52.2	26.3	44.4
Sick leave (paid)	47.0	27.3	41.4	59.6	45.7	76.1	69.6	26.3	42.2
Vacation (paid)	52.1	46.8	50.0	73.1	54.3	73.9	78.3	21.1	15.6
Holidays (paid)	56.1	35.1	50.0	65.4	54.3	73.9	78.3	26.3	73.3
Stock purchase plan	10.7	11.7	6.9	11.5	8.6	10.9	17.4	5.3	13.3
Savings plan	10.7	7.8	5.2	7.7	14.3	10.9	21.7	15.8	15.6
Pension plan	28.5	19.5	29.3	23.1	28.6	54.4	34.8	26.3	20.0
Compensation deferment plan	5.9	–	8.6	5.8	5.7	10.9	13.0	5.3	4.4
Bonus	22.5	22.1	20.7	34.6	25.7	10.9	26.1	10.5	24.4
Trade show/convention/ seminar expenses (paid)	35.2	9.1	32.8	36.5	37.1	43.5	52.2	15.8	71.1
Tuition refund plan	18.6	24.7	13.8	21.2	11.4	30.4	17.4	5.3	11.1
Automobile furnished	23.9	20.8	24.1	36.5	28.6	8.7	21.7	15.8	31.1
None	20.0	32.5	27.6	13.5	17.1	4.4	17.4	47.4	4.4
Years in Present Job									
1 or 2	16.9	13.0	13.8	17.3	17.1	13.0	30.4	5.3	28.9
3 or 4	16.9	14.3	10.3	17.3	20.0	17.4	8.7	21.1	28.9
5 to 9	26.7	32.4	27.6	32.7	31.4	19.6	17.4	31.4	15.6
10 to 14	16.9	10.4	27.6	13.5	22.9	21.7	8.7	21.1	11.1
15 or more	22.0	28.6	20.7	19.2	8.6	28.3	34.8	21.1	13.3
No answer	.6	1.3	–	–	–	–	–	–	2.2
Median =	8.0	8.4	9.7	7.4	7.1	10.0	8.2	8.8	4.4
Years in Professional Audio Industry									
Less than 5	5.9	9.1	1.7	3.9	5.7	2.2	4.4	10.5	11.1
5 to 9	13.5	13.0	13.8	21.2	20.0	10.9	–	5.3	13.3
10 to 14	24.5	16.9	20.7	28.8	20.0	28.1	26.1	26.3	35.6
15 to 24	32.4	39.0	39.7	17.3	42.8	17.4	43.4	52.6	22.2
25 or more	22.0	20.7	22.4	28.8	8.6	37.0	26.1	5.3	15.6
No answer	1.7	1.3	1.7	–	2.9	4.4	–	–	2.2
Median =	16.6	17.7	18.3	14.4	15.7	18.8	19.5	16.5	13.5
Education									
High school	14.4	15.6	13.8	26.9	11.4	2.2	8.7	15.8.	15.6
Two years of college	27.0	39.0	25.9	25.0	20.0	17.4	43.5	15.8	22.2
Four years of college	31.0	27.3	31.0	30.8	37.1	21.7	13.0	36.9	48.9
Post-graduate college	22.5	15.6	20.7	15.4	22.9	58.7	30.4	10.5	11.1
Music school	9.6	15.6	10.3	7.7	–	19.6	–	15.8	–
Voc/tech school	13.2	13.0	22.4	21.2	14.3	2.2	4.4	5.3	11.1
Armed service school	6.5	9.1	6.9	5.8	2.9	8.7	13.0	5.3	–
No answer	2.5	1.3	1.7	–	8.6	–	4.4	15.8	–
Company is Unionized	13.5	10.4	13.8	36.4	20.0	26.1	21.7	10.5	4.4
Reader is a member Union	8.7	6.5	12.1	27.3	11.5	13.0	13.0	10.5	2.2
IATSE	5.9	3.9	8.6	–	5.7	13.0	8.6	10.5	2.2
IBEW	.9	–	1.7	–	2.9	–	–	–	2.2
NABET	.6	1.3	1.7	–	–	–	–	–	–
Other	3.9	5.2	1.7	27.3	2.9	10.9	–	–	2.2
No answer	1.4	2.6	1.7	–	–	2.2	4.4	–	–

*Management staff: president, owner, partner, vice president, general manager.

ave goodbye to one-color sound

The full-color sound of the ESQ-1 Digital Wave Synthesizer makes other synths sound . . . well . . . black and white by comparison.

After all, a broad pallette of sound is your first criterion for a synthesizer. And the major international music magazines who've reviewed the ESQ-1 seem to agree.

The tone colors possible with 3 digital wave oscillators, 4 envelopes, 4 DCA's, 3 LFO's and 15 routable modulation sources for each ESQ-1 voice impressed KEYBOARD magazine's Jim Aikin. "The ESQ's voice offers far more than what you'll find on a typical synthesizer — even on some instruments costing twice as much".

In somewhat colorful comparative terms, Peter Mengaziol of GUITAR WORLD wrote, "The ESQ-1's sound combines the flexibility and analog warmth of the Oberheim Matrix-6, the crisp ringing tones of a DX-7, the realism of a sampler, the lushness of a Korg DW-8000 and polytimbral capacity of the Casio CZ-1".

There are hundreds of ESQ tone colors available on cartridge, cassette and disk. And now, each ESQ-1 includes an Ensoniq Voice-80 Program Cartridge. Added to the 40 internal programs, that's 120 great keyboard, acoustic, electronic, percussive and special effect sounds right out of the box.

MUSIC TECHNOLOGY's Paul Wiffen had a great time mixing colors with the ESQ-1's 32 on-board waveforms and 3 oscillators per voice. "After a few minutes of twiddling, you can discover that, for example, an analog waveform can make the piano waveform sound more authentic, or that a sampled bass waveform can be the basis for a great synth sound. Fascinating stuff!"

Even though its flexibility is unmatched in its class, creating sounds on the ESQ-1 is simple and intuitive. Mix a little blue bass with some bright red vocal and pink noise and get a nice deep purple tone color.

But there's one color you won't need a lot of to get your hands on an ESQ-1 — long green. The ESQ-1 retails for just $1395US.

There are sound librarian programs for the ESQ and most personal computers, so you can save and sort your creations quickly and easily. If you'd rather just plug it in and play, there are hundreds of ESQ sounds on ROM cartridges, cassettes and disks available from Ensoniq and a host of others.

The easiest way to see the possibilities for yourself is to follow the wave to your authorized Ensoniq dealer for a complete full-color demonstration.

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TABLE 1.—MANAGEMENT STAFF PROFILE ...continued

	Total %	Recording Studio %	Live Sound %	Radio Broadcast Production %	TV and Video Audio Production %	Corp./ Ed./ Gov't. %	Film Re-Recording %	Indep. Eng./ Prod. %	Dealer/ Distributor/ Rental %
Trade Shows Attended									
AES—United States	45.6	54.6	51.7	13.5	34.3	47.8	43.5	26.3	75.6
NAB	34.7	16.9	27.6	46.2	45.7	26.1	34.8	31.6	62.2
SMPTE	21.7	16.9	17.2	5.8	28.6	23.9	43.5	15.8	37.8
NAMM—Summer	14.4	10.4	19.0	3.9	11.4	10.9	4.4	15.8	37.8
NAMM—Winter	12.7	9.1	19.0	—	8.6	2.2	—	21.1	42.2
NSCA	4.8	—	10.3	—	2.9	2.2	—	—	20.0
AES—Europe	3.1	—	6.9	—	2.9	2.2	4.4	—	8.9
APRS	1.1	2.6	—	—	—	2.2	—	—	2.2
Other	10.1	2.6	5.2	13.5	17.1	10.9	13.0	10.5	17.8
None	27.0	33.8	29.3	38.5	17.1	28.3	30.4	21.1	6.7
Geographical Location									
New England	3.7	3.9	3.5	1.9	—	10.9	—	5.3	2.2
Middle Atlantic	13.2	22.0	3.5	9.6	17.1	15.2	13.0	15.8	8.9
East North Central	15.1	11.7	12.1	13.5	11.4	19.5	17.4	26.3	20.0
West North Central	5.1	2.6	6.9	9.6	5.7	6.5	—	5.3	2.2
South Atlantic	12.1	14.3	10.3	13.5	14.3	15.2	13.0	10.5	4.4
East South Central	5.4	7.8	1.7	11.5	2.9	4.4	—	—	6.7
West South Central	8.7	5.2	6.9	17.3	8.6	15.2	—	5.3	6.7
Mountain	5.1	6.5	8.6	9.6	2.9	2.2	—	—	2.2
Pacific	31.0	26.0	44.8	13.5	37.1	10.9	52.2	31.5	46.7
No answer	.6	—	1.7	—	—	—	4.4	—	—
Society/Organization Membership									
AES	31.6	37.7	41.4	5.8	20.0	43.5	34.8	10.5	42.2
SMPTE	15.5	11.7	17.2	5.8	22.9	17.4	26.1	10.5	20.0
NAB	14.7	5.2	10.3	46.2	8.6	6.5	13.0	5.3	17.8
NAMM	5.9	6.5	12.1	1.9	—	2.2	—	5.3	13.3
SPARS	5.6	9.1	5.2	—	2.9	8.7	8.7	5.3	4.4
NSCA	2.8	—	12.1	—	—	—	—	—	6.7
APRS	1.1	1.3	—	1.9	—	—	4.4	5.3	—
IMA	1.1	—	1.7	—	—	2.2	4.4	5.3	—
MMA	.3	—	—	—	—	2.2	—	—	—
Other	20.6	14.3	22.4	26.9	14.3	26.1	26.1	15.8	20.0
None	38.6	41.6	34.5	38.5	48.6	37.0	26.1	42.1	37.8
Age									
Under 25	3.4	6.5	3.5	3.9	2.9	—	—	—	4.4
25 to 34	33.5	31.1	39.6	42.2	28.6	23.9	21.7	21.1	44.5
35 to 44	32.4	28.6	31.0	23.1	48.5	37.0	30.5	42.0	31.1
45 to 54	16.9	19.5	13.8	13.5	14.3	23.9	8.7	21.1	17.8
55 or more	11.3	11.7	10.4	17.3	—	15.2	34.7	—	2.2
No answer	2.5	2.6	1.7	—	5.7	—	4.4	15.8	—
Median =	38.7	38.9	36.9	36.7	38.2	42.1	43.6	37.5	35.4

Figure 1. Years in professional audio industry for management staff.

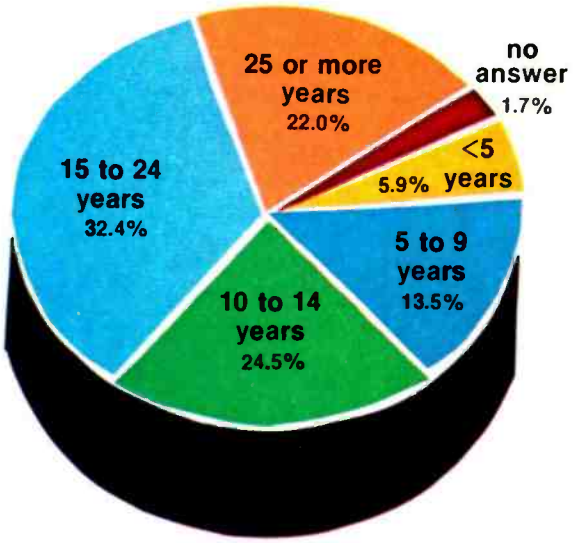
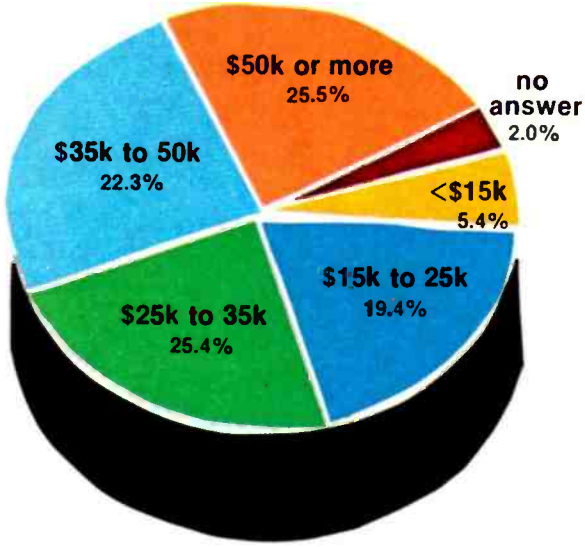
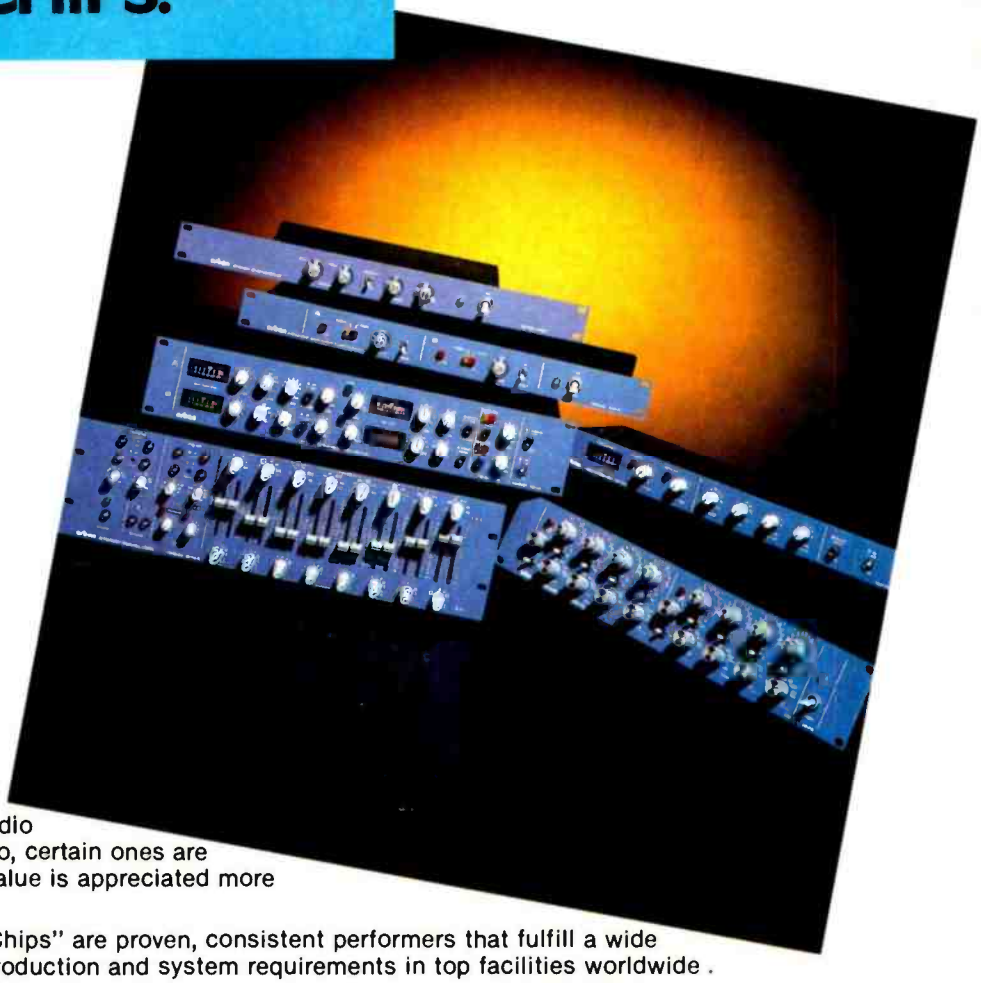


Figure 2. Salary level for management staff.



THE BLUE CHIPS.



While trendy audio products come and go, certain ones are timeless. Their true value is appreciated more year after year.

Orban's "Blue Chips" are proven, consistent performers that fulfill a wide variety of essential production and system requirements in top facilities worldwide .

622B Parametric Equalizer: The standard by which all others are judged. Sonically and musically pleasing. Can be used as combination 4-band EQ and notch filter. A real job saver.

672A/674A Graphic Parametric Equalizers "The Paracrossalizer": Combines eight bands of parametric EQ with tunable high and lowpass filters. A uniquely versatile production tool. Also quickly becoming the smart choice for room and system tuning because it eliminates ringing and phase shift problems. Can be used as full electronic crossover plus EQ in one cost-effective package.

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412A/414A Compressor/Limiter: Transparent level control delivers the punch without the bruise. Very cost-effective. Ideal for installations and reinforcement work.

245F Stereo Synthesizer: Magical stereo effects from mono synths, drum machines, or any mono source. Perfect for extending capability of smaller format multi-track systems—the 5th, 9th, 17th, or 25th track. Inexpensive.

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Our new machine is built for speed. The kind of speed that makes posting a lot more productive.

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Which means no more retakes.

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You can accelerate your overdubbing, thanks to the lead we've taken in head design.

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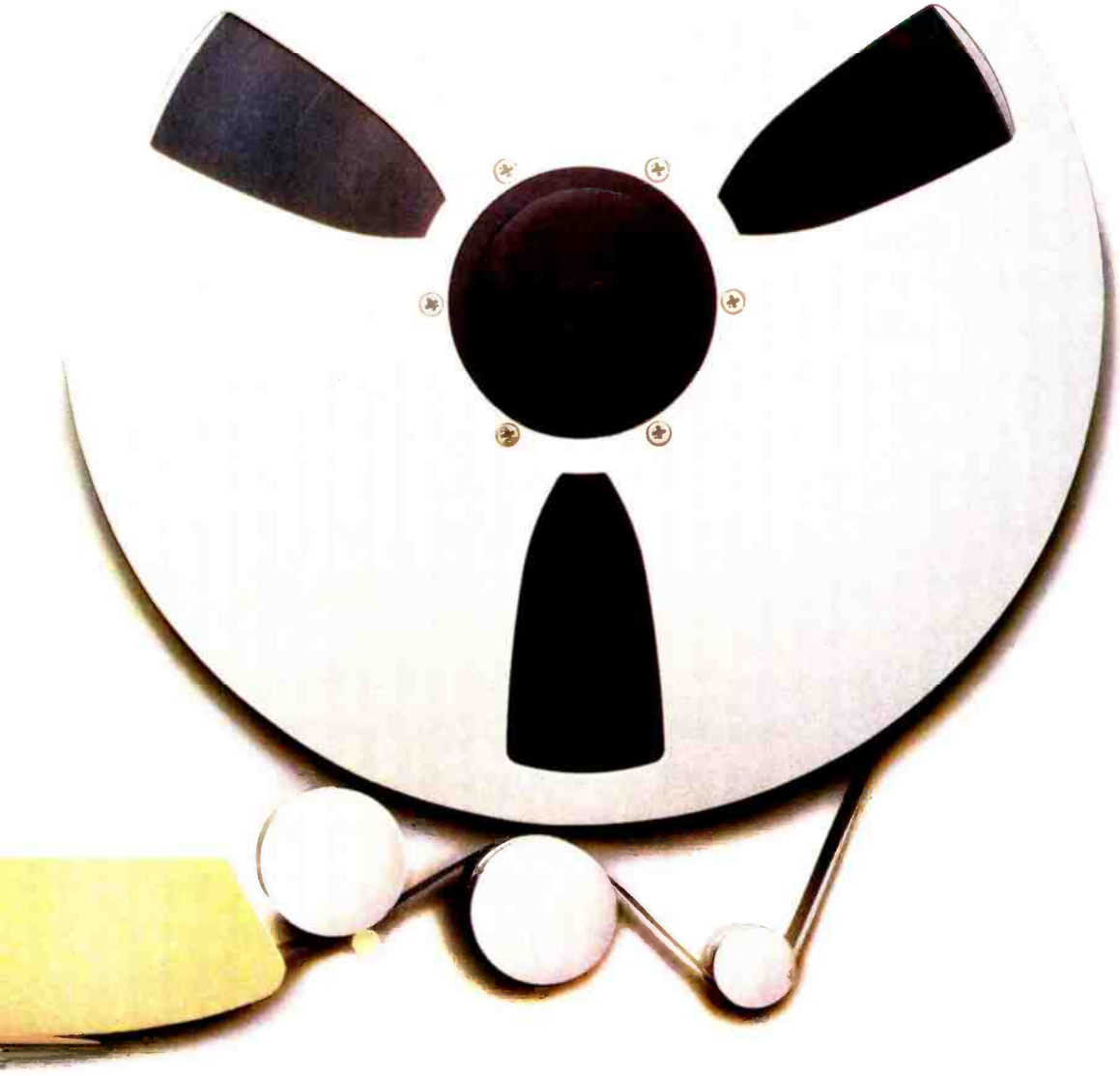
Our heads also give you crosstalk rejection that beats most others. So you can use the track next to time code for music, instead of wasting it as a guard band.

A 32-track version of the ATR-80 will be available soon. Dolby SR is a trademark of Dolby Laboratories Licensing Corp.

And now there's a faster way to finish.

TASCAM



Quicker editing and overdubbing would ordinarily be enough to distinguish a new machine. But the ATR-80 doesn't stop there.

For instance, it interfaces instantly with any existing noise reduction system (including Dolby SR). And it accepts 14" reels, so you can work non-stop with an hour's worth of tape.

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We even built speed into the ATR-80's maintenance systems: you can replace its modular power supply in just minutes if anything goes wrong.

Of course, that's very unlikely. Because like every Tascam component, the ATR-80's power supply has been built to the industry's most rigorous standards. And designed with the benefits of 30 years' experience and field-testing.

We're so confident of our quality, in fact, that we'll come to your studio and give the ATR-80 a complete check-up. While it's still under warranty.

So call us for the Tascam ATR-80 dealer nearest you. Then look one over and start it up.

You'll finish in the money.

TASCAM

TABLE 2. – TECHNICAL STAFF PROFILE

	Total %	Recording Studio %	Live Sound %	Radio Broadcast Production %	TV and Video Audio Production %	Corp./ Ed./ Gov't. %	Film Re-Recording %	Indep. Eng./ Prod. %	Dealer/ Distributor/ Rental %
Salary Level									
Less than $15,000	3.7	15.8	–	10.2	–	–	–	NA	–
$15,000 to $24,999	24.3	31.6	70.0	34.7	11.1	42.9	4.4	NA	2.6
$25,000 to $34,999	32.7	36.8	10.0	38.8	33.3	40.0	21.7	NA	30.8
$35,000 to $49,999	22.0	–	–	14.3	27.8	11.4	30.4	NA	43.5
$50,000 or more	17.3	15.8	20.0	2.0	27.8	5.7	43.5	NA	23.1
No answer	–	–	–	–	–	–	–	–	–
Median =	$31,400	$24,500	$21,650	$26,550	$37,500	$26,800	$46,300	NA	$38,600
Received Salary Increase During Past Year	67.3	57.9	60.0	55.1	77.9	68.7	52.3	NA	87.3
Percent of Increase									
Less than 5%	17.3	5.3	10.0	14.3	27.8	22.9	4.4	NA	23.1
5% to 9%	29.4	26.3	30.0	28.6	30.6	34.3	8.7	NA	38.5
10% to 14%	10.8	15.8	–	10.2	5.6	8.6	26.1	NA	7.7
15% or more	8.9	10.5	20.0	2.0	11.1	2.9	8.7	NA	18.0
No answer	.9	–	–	–	2.8	–	4.4	NA	–
Median =	7.7	9.5	8.4	7.3	6.6	6.7	12.1	NA	7.7
Fringe Benefits Received									
Medical insurance (paid)	79.9	79.0	70.0	71.4	91.7	80.0	73.9	NA	87.2
Dental insurance (paid)	50.5	31.6	40.0	34.7	63.9	62.9	43.5	NA	61.5
Life insurance (paid)	56.1	47.4	30.0	55.1	72.2	57.1	43.5	NA	59.0
Sick leave (paid)	75.2	57.9	60.0	75.5	80.6	82.9	56.5	NA	87.2
Vacation (paid)	88.8	79.0	70.0	87.8	100.0	88.6	82.6	NA	94.9
Holidays (paid)	83.2	63.2	60.0	81.6	97.2	85.7	78.3	NA	89.7
Stock purchase plan	15.0	10.5	20.0	6.1	27.8	5.7	4.4	NA	28.2
Savings plan	18.2	15.8	10.0	10.2	38.9	11.4	–	NA	25.6
Pension plan	46.3	21.1	20.0	42.9	55.6	62.9	43.5	NA	48.7
Compensation deferment plan	6.1	–	10.0	6.1	5.6	8.6	–	NA	7.7
Bonus	18.7	15.8	20.0	24.5	8.3	8.6	26.1	NA	28.2
Trade show/convention/ seminar expenses (paid)	44.4	31.6	30.0	36.7	47.2	40.0	39.1	NA	66.7
Tuition refund plan	31.8	15.8	30.0	22.5	36.1	45.7	13.0	NA	46.2
Automobile furnished	9.4	5.3	–	12.2	16.7	5.7	–	NA	12.8
None	2.8	5.3	10.0	2.0	–	2.9	–	NA	2.6
Years in Present Job									
1 or 2	24.8	31.6	50.0	20.4	16.7	20.0	17.4	NA	35.9
3 or 4	18.2	10.5	10.0	20.4	16.7	25.6	13.0	NA	20.5
5 to 9	29.9	26.3	–	30.7	38.8	22.9	39.2	NA	33.3
10 to 14	11.2	15.8	20.0	16.3	8.3	5.7	17.4	NA	–
15 or more	15.0	10.5	20.0	12.2	19.5	22.9	13.0	NA	10.3
No answer	.9	5.3	–	–	–	2.9	–	NA	–
Median =	6.1	6.0	3.0	6.5	7.2	5.7	7.5	NA	4.4
Years in Professional Audio Industry									
Less than 5	9.4	21.1	10.0	2.0	2.8	14.3	–	NA	20.5
5 to 9	16.8	10.5	30.0	22.5	8.3	20.0	17.4	NA	15.4
10 to 14	28.4	42.1	30.0	34.6	30.6	31.4	34.8	NA	7.7
15 to 24	24.8	26.3	20.0	22.5	30.6	5.7	21.7	NA	38.5
25 or more	18.7	–	10.0	18.4	27.7	22.9	26.1	NA	12.8
No answer	1.9	–	–	–	–	5.7	–	NA	5.1
Median =	14.0	12.2	11.7	13.7	17.7	12.1	14.7	NA	16.0
Education									
High school	14.5	21.1	60.0	12.2	22.2	5.7	8.7	NA	5.1
Two years of college	35.1	36.8	10.0	34.7	44.4	31.4	47.8	NA	25.6
Four years of college	31.8	42.1	30.0	36.7	27.8	37.1	8.7	NA	35.9
Post-graduate college	10.3	–	–	4.1	2.8	11.4	13.0	NA	30.8
Music school	6.1	10.5	20.0	–	2.8	5.7	4.4	NA	10.2
Voc/tech school	24.3	31.6	30.0	28.6	27.8	20.0	26.1	NA	12.8
Armed service school	7.9	10.5	10.0	14.3	8.3	5.7	4.4	NA	2.6
No answer	3.3	–	–	4.1	–	2.9	13.0	NA	2.6
Company is Unionized	21.5	10.6	10.0	18.4	33.3	28.6	43.5	NA	5.1
Reader is a member	13.6	5.3	–	12.2	25.0	11.4	39.1	NA	2.6
Union									
IATSE	6.5	5.3	–	–	11.1	–	39.1	NA	–
IBEW	2.3	–	–	6.1	5.6	–	–	NA	–
NABET	1.9	–	–	4.1	5.6	–	–	NA	–
Other	3.2	–	–	4.1	–	11.4	–	NA	2.6
No answer	.5	–	–	–	2.8	–	–	NA	–

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TABLE 2.—TECHNICAL STAFF PROFILE ...continued

	Total %	Recording Studio %	Live Sound %	Radio Broadcast Production %	TV and Video Audio Production %	Corp./ Ed./ Gov't. %	Film Re-Recording %	Indep. Eng./ Prod. %	Dealer/ Distributor/ Rental %
Trade Shows Attended									
AES—United States	41.1	68.4	30.0	14.3	33.3	28.6	78.3	NA	61.5
NAB	41.1	31.6	10.0	57.1	69.4	28.6	39.1	NA	20.5
SMPTE	23.8	36.8	—	4.1	41.7	14.3	52.2	NA	23.1
NAMM—Summer	8.9	5.3	10.0	—	2.8	5.7	—	NA	35.9
NAMM—Winter	5.6	5.3	—	—	—	—	8.7	NA	23.1
AES—Europe	1.9	—	—	—	—	—	4.4	NA	5.1
NSCA	.9	—	—	—	—	—	—	NA	5.1
Other	5.6	5.3	10.0	12.2	—	11.4	—	NA	—
None	21.5	10.5	50.0	26.5	16.7	37.1	4.4	NA	10.3
Geographical Location									
New England	3.7	5.3	—	6.1	2.8	2.9	—	NA	5.1
Middle Atlantic	17.3	36.6	20.0	14.3	19.5	14.3	26.1	NA	7.7
East North Central	15.9	21.1	20.0	26.5	11.1	11.4	—	NA	18.0
West North Central	7.5	5.3	—	10.2	8.3	8.6	—	NA	7.7
South Atlantic	8.9	5.3	10.0	6.1	8.3	22.9	8.7	NA	2.6
East South Central	4.7	5.3	10.0	4.1	8.3	—	—	NA	5.1
West South Central	6.1	5.3	10.0	8.2	5.6	11.4	—	NA	2.6
Mountain	5.6	—	—	10.2	11.1	5.7	—	NA	2.6
Pacific	30.3	15.8	30.0	14.3	25.0	22.8	65.2	NA	48.6
Society/Organization Membership									
AES	30.8	47.4	20.0	14.3	16.7	25.7	47.8	NA	56.4
NAB	14.5	5.3	10.0	32.7	25.0	2.9	—	NA	7.7
SMPTE	12.2	15.8	—	2.0	27.8	11.4	34.8	NA	—
NAMM	1.9	—	—	—	—	—	—	NA	10.3
SPARS	1.4	5.3	—	—	—	—	4.4	NA	2.6
IMA	.9	—	—	—	—	—	—	NA	5.1
MMA	.9	—	—	—	—	—	—	NA	5.1
Other	31.3	31.6	10.0	42.9	38.9	22.9	13.0	NA	35.9
None	33.6	21.1	60.0	34.7	25.0	48.6	26.1	NA	25.6
Age									
Under 25	3.3	15.8	20.0	2.0	—	2.9	—	NA	—
25 to 34	39.7	57.8	40.0	40.8	36.1	40.0	13.0	NA	51.3
35 to 44	32.7	21.1	30.0	34.7	38.9	25.6	47.9	NA	25.6
45 to 54	14.5	5.3	—	14.3	16.7	22.9	8.7	NA	15.4
55 or more	6.5	—	10.0	4.1	8.3	5.7	17.4	NA	5.1
No answer	3.3	—	—	4.1	—	2.9	13.0	NA	2.6
Median =	36.6	30.9	32.5	36.5	38.6	37.2	41.4	NA	34.5

Figure 3. Years in professional audio industry for technical staff.

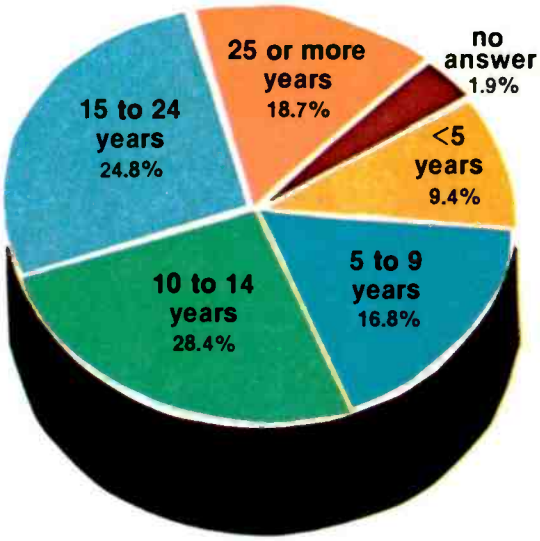
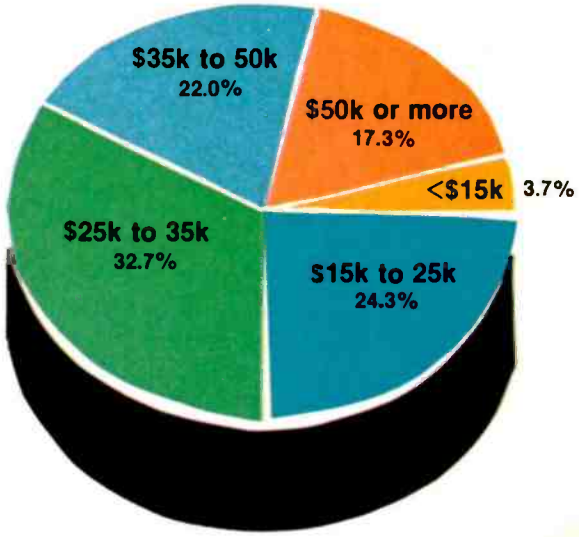


Figure 4. Salary level for technical staff.



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Month after month on demanding tours like Bruce Springsteen's and Michael Jackson's, night after night in sweltering bars and clubs, the Carver PM-1.5 has proven itself. Now there are two more Carver Professional Amplifiers which deliver equally high performance and sound quality — plus some remarkable new features that can make your life even easier.

SERIOUS OUTPUT. The new PM-175 delivers 250 watts RMS per channel into 4 ohms. As much as 500 watts RMS into 8 ohms bridged mode. The larger PM-350 is rated at 450 watts per channel into 4 ohms. Up to a whopping 900 watts in 8 ohm bridged mode. Both with less than 0.5% THD full bandwidth at any level right up to clipping. Plus 2 ohm capability as well.

SERIOUS PROTECTION. Like the PM-1.5, both new amplifiers have no less than five special protection circuits including sophisticated fault interruption against dead shorts, non-musical high frequency, and DC offset protection, as well as low level internal power supply fault and thermal overload safeguards. The result is an amplifier which is kind to your expensive drivers — as well as to itself.

OUTBOARD GOES INBOARD. Each PM-175 and PM-350 has an internal circuit card bay which accepts Carver's new plug-in signal processing modules. Soon to be available is an electronic, programmable 2-way stereo crossover, with 24 dB per octave Linkwitz-Reilly phase -aligned circuitry, a built-in adjustable high-end limiter and balanced outputs. And more modules will be available in the near future to further help you streamline your system.

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TABLE 3.—PRODUCTION STAFF PROFILE

	Total %	Recording Studio %	Live Sound %	Radio Broadcast Production %	TV and Video Audio Production %	Corp./ Ed./ Gov't. %	Film Re-Recording %	Indep. Eng./ Prod. %	Dealer/ Distributor/ Rental %
Salary Level									
Less than $15,000	9.7	13.8	11.9	21.4	6.9	–	7.1	9.1	–
$15,000 to $24,999	31.8	27.6	42.9	42.8	30.0	32.3	14.3	45.4	22.3
$25,000 to $34,999	25.8	24.1	26.2	28.6	21.9	51.6	16.7	–	33.3
$35,000 to $49,999	15.4	10.3	11.9	4.8	20.6	16.1	16.7	27.3	33.3
$50,000 or more	16.9	20.7	7.1	2.4	20.6	–	45.2	18.2	11.1
No answer	.4	3.5	–	–	–	–	–	–	–
Median =	$27,500	$26,450	$23,750	$21,650	$28,950	$27,750	$46,000	$22,500	$34,150
Received Salary Increase During Past Year	75.7	58.6	64.4	66.7	86.3	84.0	81.0	72.8	88.8
Percent of Increase									
Less than 5%	14.7	–	16.7	14.3	21.9	22.6	7.1	–	22.2
5% to 9%	33.0	10.3	28.6	31.0	41.1	48.4	38.1	9.1	22.2
10% to 14%	10.4	20.7	4.8	9.5	11.0	6.5	4.8	18.2	33.3
15% or more	15.4	20.7	14.3	7.1	12.3	6.5	26.2	45.5	11.1
No answer	2.2	6.9	–	4.8	–	–	4.8	–	–
Median =	8.4	13.8	7.7	7.7	7.6	7.0	9.1	18.3	10.0
Fringe Benefits Received									
Medical insurance (paid)	71.3	20.7	64.3	78.6	80.8	87.1	88.1	9.1	100.0
Dental insurance (paid)	49.5	13.8	42.9	38.1	52.1	67.7	76.2	9.1	88.9
Life insurance (paid)	47.3	6.9	38.1	45.2	60.3	80.7	45.2	–	77.9
Sick leave (paid)	62.0	20.7	47.6	78.6	76.7	93.6	50.0	–	88.9
Vacation (paid)	76.0	31.0	57.1	90.5	86.3	96.8	90.5	9.1	100.0
Holidays (paid)	67.0	24.1	54.8	61.9	84.9	90.3	73.8	9.1	100.0
Stock purchase plan	13.6	3.5	14.3	4.8	24.7	12.9	9.5	–	33.3
Savings plan	17.9	3.5	7.1	4.8	32.9	32.3	11.9	–	55.6
Pension plan	44.1	3.5	33.3	33.3	48.0	83.9	59.5	18.2	66.7
Compensation deferment plan	4.3	–	2.4	–	9.6	6.5	4.8	–	–
Bonus	17.2	13.8	16.7	21.4	21.9	9.7	16.7	–	22.2
Trade show/convention/ seminar expenses (paid)	29.0	10.3	38.1	23.8	28.8	48.4	21.4	9.1	66.7
Tuition refund plan	20.1	–	28.6	9.5	26.0	38.7	11.9	–	44.4
Automobile furnished	2.2	–	2.4	2.4	2.7	3.2	–	–	11.1
None	15.4	55.2	26.2	2.4	5.5	3.2	7.1	63.6	–
Years in Present Job									
1 or 2	30.1	31.0	33.3	35.7	26.0	22.6	31.0	27.3	44.5
3 or 4	21.2	44.9	11.9	11.9	24.7	16.1	19.1	27.3	22.2
5 to 9	27.2	17.2	33.3	28.6	31.5	25.8	21.3	27.3	22.2
10 to 14	10.0	6.9	14.4	14.3	9.6	9.7	4.8	18.1	–
15 or more	11.1	–	7.1	9.5	6.8	25.8	23.8	–	11.1
No answer	.4	–	–	–	1.4	–	–	–	–
Median =	4.9	3.8	5.7	5.4	4.9	7.2	5.0	4.7	3.5
Years in Professional Audio Industry									
Less than 5	15.4	34.6	9.5	11.9	9.6	16.1	21.4	–	33.3
5 to 9	22.9	17.2	28.6	23.8	20.5	19.4	21.4	36.4	33.3
10 to 14	28.0	24.1	35.7	21.4	37.0	22.6	14.3	45.4	22.3
15 to 24	20.4	17.2	19.1	35.7	16.4	16.1	26.2	9.1	–
25 or more	10.8	–	7.1	4.8	11.0	25.8	16.7	9.1	11.1
No answer	2.5	6.9	–	2.4	5.5	–	–	–	–
Median =	11.9	8.5	11.7	13.1	12.3	13.2	12.5	11.5	7.5
Education									
High school	12.9	13.8	9.5	11.9	9.6	6.5	31.0	9.1	–
Two years of college	26.5	27.6	38.1	26.2	24.7	22.6	23.8	18.2	22.2
Four years of college	43.4	37.9	42.9	47.6	46.6	45.2	31.0	45.5	66.7
Post-graduate college	14.3	13.8	7.1	11.9	15.1	25.8	14.3	18.2	11.1
Music school	7.2	13.8	9.5	9.5	1.4	3.2	7.1	18.2	11.1
Voc/tech school	18.6	20.7	19.1	7.1	20.6	19.4	26.2	27.3	–
Armed service school	2.5	–	7.1	–	4.1	–	–	9.1	–
No answer	1.1	6.9	–	–	1.4	–	–	–	–
Company is Unionized	25.8	–	11.9	9.5	32.9	29.0	54.8	36.4	33.3
Reader is a member	20.8	–	9.5	9.5	27.4	16.1	47.6	36.4	11.1
Union									
IATSE	9.0	–	7.1	–	4.1	–	42.9	9.1	–
IBEW	3.6	–	2.4	–	9.6	3.2	2.4	–	–
NABET	2.9	–	–	2.4	5.5	–	2.4	18.2	–
Other	4.7	–	–	7.1	4.1	12.9	2.4	9.1	11.1
No answer	1.1	–	–	–	4.1	–	–	–	–

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TABLE 3.—PRODUCTION STAFF PROFILE ...continued

	Total %	Recording Studio %	Live Sound %	Radio Broadcast Production %	TV and Video Audio Production %	Corp./ Ed./ Gov't. %	Film Re-Recording %	Indep. Eng./ Prod. %	Dealer/ Distributor/ Rental %
Trade Shows Attended									
AES—United States	39.1	58.6	42.9	9.5	37.0	25.8	59.5	72.7	22.2
SMPTE	20.8	13.8	14.3	—	34.3	12.9	33.3	36.4	11.1
NAB	19.4	6.9	7.1	23.8	31.5	16.1	19.1	9.1	22.2
NAMM—Summer	3.6	13.8	4.8	—	1.4	—	2.4	—	22.2
NAMM—Winter	3.6	24.1	—	—	—	3.2	—	9.1	11.1
AES—Europe	1.4	10.3	—	2.4	—	—	—	—	—
NSCA	.4	—	2.4	—	—	—	—	—	—
Other	6.1	6.9	—	11.9	2.7	16.1	2.4	18.2	—
None	40.9	20.7	52.4	61.9	38.4	45.2	28.6	9.1	55.6
Geographical Location									
New England	6.5	6.9	9.5	4.8	6.9	6.5	—	18.2	11.1
Middle Atlantic	16.7	13.8	11.9	14.3	16.4	22.5	19.1	36.3	11.1
East North Central	10.8	6.9	4.8	11.9	9.6	29.0	7.1	9.1	11.1
West North Central	2.5	6.9	—	7.1	1.4	—	—	—	11.1
South Atlantic	13.6	10.3	28.5	14.3	13.7	16.1	2.4	—	11.1
East South Central	7.2	3.5	9.5	9.5	4.1	9.7	4.8	18.2	11.1
West South Central	5.0	3.5	4.8	14.3	4.1	3.2	2.4	—	—
Mountain	7.2	3.5	16.7	9.5	8.2	6.5	—	—	—
Pacific	30.1	41.2	14.3	14.3	35.6	6.5	64.2	18.2	33.4
No answer	.4	3.5	—	—	—	—	—	—	—
Society/Organization Membership									
AES	26.5	27.6	45.2	4.8	24.7	22.6	35.7	27.3	22.2
SMPTE	12.9	6.9	11.9	—	19.2	12.9	26.2	—	—
NAB	8.2	3.5	4.8	28.6	6.9	3.2	4.8	—	—
IMA	1.1	3.5	—	—	1.4	—	—	9.1	—
NAMM	.7	3.5	—	—	—	—	—	—	11.1
NSCA	.4	—	2.4	—	—	—	—	—	—
SPARS	.4	—	—	—	—	—	2.4	—	—
Other	21.2	20.7	14.3	16.7	13.7	32.3	31.0	54.6	11.1
None	49.1	48.3	50.0	61.9	53.4	45.2	31.0	36.4	66.7
Age									
Under 25	9.0	10.3	4.8	14.3	12.3	—	11.9	—	—
25 to 34	49.0	62.1	59.4	45.2	42.4	45.1	40.3	72.7	55.6
35 to 44	29.0	17.2	26.2	38.1	34.3	25.8	28.6	18.2	22.2
45 to 54	6.5	3.5	4.8	2.4	5.5	16.1	9.8	—	11.1
55 or more	5.4	—	4.8	—	4.1	13.0	9.6	9.1	11.1
No answer	1.1	6.9	—	—	1.4	—	—	—	—
Median =	33.2	30.8	32.6	32.9	33.7	36.9	34.4	31.9	34.0

Figure 5. *Years in professional audio industry for production staff.*

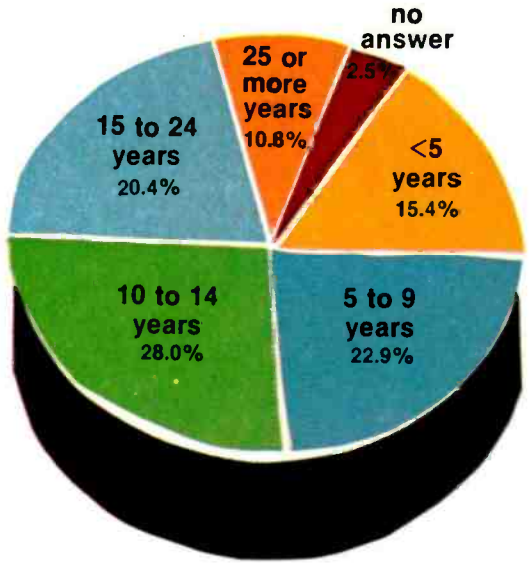

Figure 6. *Salary level for production staff.*

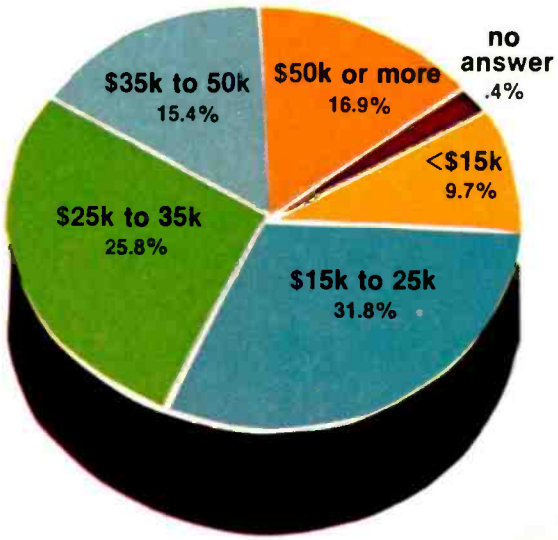

TABLE 4. – MEDIAN SALARY SUMMARY FOR 1987

	Total	Recording Studio	Live Sound	Radio Broadcast Production	TV/Video Audio Production	Corp./ Ed./ Gov't.	Film Re-Recording	Indep. Eng./ Producer	Dealer/ Distributor/ Rental
Management	34,250	36,450	33,000	30,000	30,000	30,300	51,500	51,700	36,000
Technical	31,400	24,500	21,650	26,550	37,500	26,800	46,300	NA	38,600
Production	27,500	26,450	23,750	21,650	28,950	27,750	46,000	22,500	34,150

TABLE 5. – MEDIAN SALARY INCREASES FOR THE PROFESSIONAL AUDIO INDUSTRY

	Total %	Recording Studio %	Live Sound %	Radio Broadcast Production %	TV and Video Audio Production %	Corp./ Ed./ Gov't. %	Film Re-Recording %	Indep. Eng./ Prod. %	Dealer/ Distributor/ Rental %
Management	53.3	44.2	58.7	42.4	51.4	74.0	47.8	52.7	57.8
Technical	67.3	57.9	60.0	55.1	77.9	68.7	52.3	NA	87.3
Production	75.7	58.6	64.4	66.7	86.3	84.0	81.0	72.8	88.8

continued from page 24

"There are many more people in this business than there are jobs! And too many trade schools for too few positions."

"Creativity and talent are still the bottom line. This is evidenced by the impact that small producers using narrow-gauge multitrack equipment have had in recent years."

"We are looking forward to the arrival of a professional R-DAT format, which would be especially useful for location recording with camera sync."

R-E/P

Session Profile: Recording Patrick Williams' "10th Avenue" Album

By Tony Thomas

A technical look behind the scenes during the live digital tracking and remix sessions for a big-band album project at Clinton Recording, New York.

Composer/arranger Patrick Williams with session producer Phil Ramone.

In many ways, *10th Avenue* represents the consumate New York City jazz album. Phil Ramone, former A&R recording director of engineering, combined his talents with two of his most successful proteges—Don Hahn (who now heads his own production company) and Angel Balestier (the project's director, and president and co-founder of Group IV Recording, Hollywood)—along with the skills of a first-call New York session band.

In addition, a representative sample of New York's music business elite was on hand as audience for the digital sessions at Clinton Recording to help perserve the album's live feel.

Even the songs were chosen on the basis of their association with New York (as in the case of Billy Joel's "New York State of Mind") or for their big-city feel (as in the case of Paul Simon's "Still Crazy After All These Years").

"We wanted the album to have a *definite* New York flavor," explains composer, arranger and band leader Pat Williams. "All of the composers represented [who, in addition to those mentioned, include Quincy Jones, Nat Adderley, Paul McCartney, Victor Feldman and Williams himself] have a real New York feel.

"New York is where I started. I worked there eight or nine years before I came out to California. When I go back it's like I'm going home.

"Plus," Williams says, "there was a special quality about the relationships born there. Phil, Donny and I all go back a long way and we all started out in New York."

The *10th Avenue* project was more than an album for all those involved—it was a reunion; it was "old home week."

Production team

As far as musical talent goes, you cannot get any better than the players used on *10th Avenue*. The band included drummer Steve Gadd, bassist Nathan East, Richard Tee on piano, Chuck Loeb on guitar, Kenny Asher and Rob Mounsey on synthesizers, Ralph MacDonald on percussion, and soloists Bill Watrous and the Brecker Brothers. The band included four trmpets, four trombones, four french horns, a tube, two mallet percussionists and a percussionist, along with a rhythm section of bass, drums, piano, guitar and two synthesizers.

Arranging for such a large ensemble was no easy task, as Williams recalls. "It was a real challenge. I took a long time writing the charts for this album because I wanted to tailor them to the players I knew were going to be on this album.

"There were no rehearsals beforehand, so I wanted to make sure that the band would be totally comfortable playing the music; it had to be something that they could fall into immediately, stylistically.

"I also wanted to avoid endless conversations in the studio on how we were going to play this music—the charts had to be written so that they would *know* how

Tony Thomas is a free-lance musician, composer, producer and session engineer, and president of Target Communications International, a Los Angeles-based audio production company.

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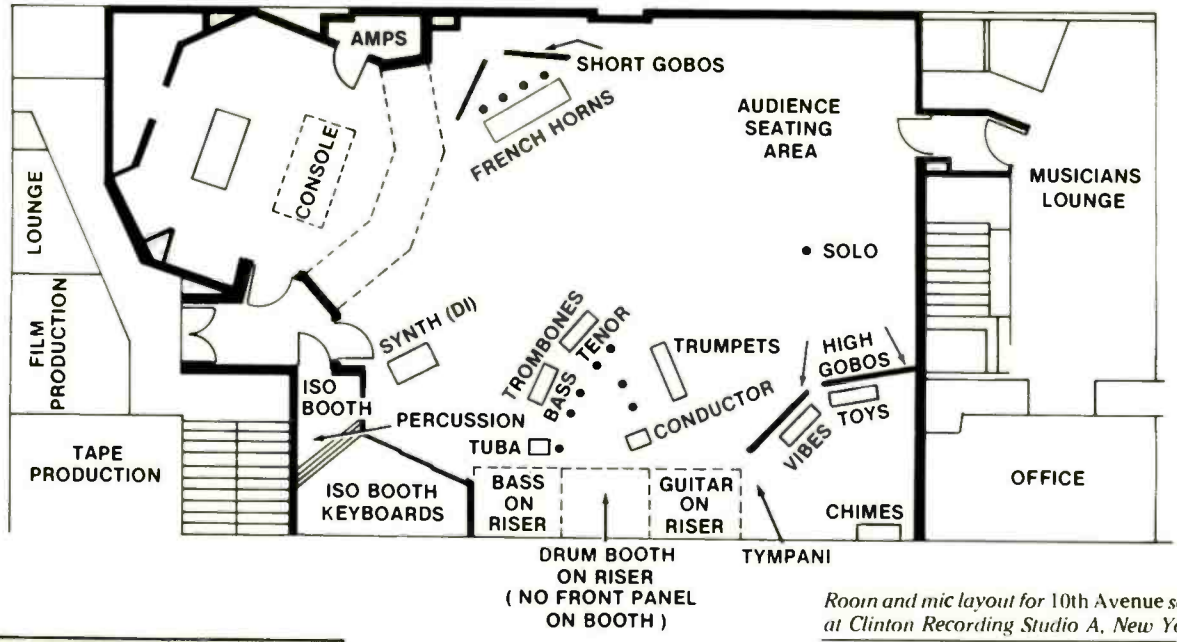


Room and mic layout for 10th Avenue *sessions at Clinton Recording Studio A, New York.*

A Profile of Session Engineer Don Hahn

Don Hahn's career spans nearly three decades, and compasses the range from studio engineer to producer, to record company vice president and back to studio engineer again.

"I started my career in 1959 at A&R Recording," he recalls, "which during the Sixties and Seventies was the hottest studio in the country. My reason for moving out to Los Angeles [from New York] was to accept a position at A&M Records in February 1977.

"I became studio director in 1980 and vice president/general manager in 1985. I left A&M to form my own production company and to pursue my recording career in January 1986, because the fun is in the recording, not in the administration; I decided to leave A&M because my career was turning into a job," Hahn says.

Hahn, who at last count has engineered more than 2,000 records, along with countless movies, TV scores and commercials, has worked with some of the biggest names in the business; practically everyone from Basie to the Brothers Johnson. His engineering credits include Music from Big Pink, *by the Band; Barbra Streisand's* Yentl *and Grammy-winning* Broadway Album. *He has engineered sessions for Quincy Jones, David Sanborn, Herb Alpert, Ronnie Laws, Doc Severnsen, Chico Hamilton, Shirley Bassey, Horace Silver, Antonio Carlos Jobim and Kiki Dee.*

One of the greatest moments of his career, Hahn says, was sitting on the floor wearing headphones during the recording of We Are the World, *a session he helped coordinate as A&M's vice president of engineering.*

After nearly 30 years in the studio, Hahn easily sums up his career. "You have to be crazy to keep your sanity in the record business."

to play this music," Williams says.

"Also, it was very important for me to get as much of my 'personality' as possible into the arranging style. I've done quite a few big-band albums over the years—although not too many recently—and I have always felt that they should have my signature on the arrangements. That's why I wanted to get as much of *me* as I could on this record.

"As a result, I really tried to have the session as streamlined as possible: to have as many of the details as I could worked out before we got into the studio; to have the arrangements as clean as a whistle; and to try to make each arrangement something that could stand on its own with *no* turkeys. Definitely not kitchen sink stuff. That's why it took me three months to write the arrangements."

As far as improvisation goes, he wanted the players to improvise around strong tunes. Williams says that's the reason he selected the material that he did.

"I also included French horns, tuba and synths into the big-band lineup, because I felt that would give the album my personal touch. I had some experience doing albums with that kind of instrumentation, minus the electronics, and I always enjoyed the sound of it. For me to go into the studio with five saxophones and eight brass would be, at this point, somewhat self-defeating. I mean, there are so many other wonderful bands that use that lineup. The synthesizers were used for quasi-woodwind sounds."

Williams says he loves the sonority and power of all that brass. "I was a trumpet player myself, so I had a great deal of empathy for what they were up against. There was a great deal of sound leakage going on at those sessions, because the album has a lot of dynamics. You can hear the pain. Sometimes the brass players had to play soft, and still fill up the horn; sometimes they played quasi-classically. Then at times they had to hit the really hot stuff and do it with real authority. The hard part was they had to do all of that *live*."

It was really a challenge for all the musicians, Williams admits, and they wished that there were more sessions like this going on.

"The only thing I'm going to do next time is to have a rehearsal before we go in. I think I slightly underestimated how demanding it was going to be in there, even with the top professionals we had playing, because everybody wanted it to be really something. It was *no* place for amateurs, especially in the control room. Phil and Donny both did a great job."

Digital recording

Early in the planning process, it was determined that *10th Avenue* would be recorded and mixed entirely in the digital domain. This is in keeping with the stated objectives of Williams' own label, Soundwings.

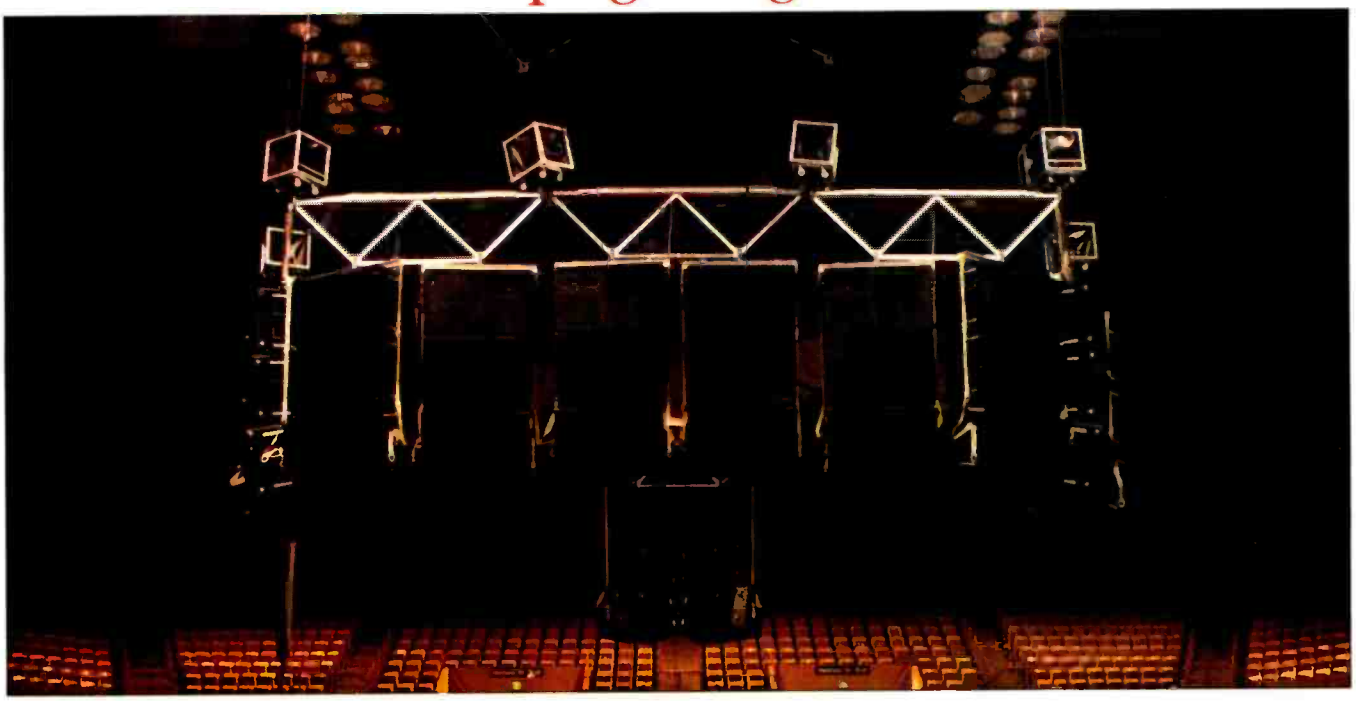
"We plan to be on the leading edge of state-of-the-art sound," he says. "We are not just releasing records in the Compact Disc format; we are recording specifically *for* it.

"Everything is digitally recorded, mastered and designed for this medium. We are giving great consideration to the studio, console, microphones and engineer; all the technical aspects involved in digital recording. Our goal is to create exciting musical adventures in digital sound."

10th Avenue engineer Don Hahn (who's most recent credits include engineering Barbra Streisand's Grammy-winning *The Broadway Album*) is no

EAW KF550C

It keeps getting better



The Engineering Advantage

When you consider the fact that EAW builds the KF550 it should come as no surprise that it is the qualitative standard of the industry. After all, EAW's director of engineering, Kenton Forsythe, has spent the last twenty years advancing the "state of the art" in concert sound loudspeaker systems. His contributions to the industry include:

1972 Forsythe B215, the world's first 2 x 15 inch bass horn to incorporate a phase coupler and true exponential flare (not to mention that it fit through most doors).

1976 Forsythe SR109, the world's first cone mid range horn utilizing a phasing plug and lead reinforced fiberglass construction.

1977 Forsythe B212CT, using polyurethane filled subassemblies to create the world's most mathematically correct bass horn.

1978 EAW MR102, the first mid bass horn to use a center displacement plug for flat power response.

1978 EAW/Carlo CS3, the world's first "One Box" horn loaded flying system.

1979 EAW BH800, the first bent horn using polyurethane reinforced wood construction.

1981 EAW JF500, the world's first all horn loaded compact full range system.

1983 EAW KF550, the world standard "One Box" flying system with flying strip hardware enabling easy construction of complex arrays with only two fly points per cabinet.

Since then we have continually refined the KF550 to stay well ahead of our imitators. The new KF550C version adds the H9040 constant coverage high frequency horn, full frontal coverage vinyl coated perforated steel grills and rear panel cable/connector chamber as standard. This is in addition to the standard features and performance that has made the KF550 the first choice of sound companies in the past.

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Track	Instrument	Mic	Routed Via
1	Bass guitar	Direct inject	Custom pre-amp
2	Kick drum	MD-421	Custom pre-amp and 622B EQ
3	Snare	SM-57	Custom pre-amp and 622B EQ
4	High-hat	KM-84	–
5	Toms left	C414 and SM-57	Combo of four mics via 8078
6	Toms right	C414 and SM-57	Combo of four mics via 8078
7	Overhead left	251	Custom pre-amp
8	Overhead right	251	Custom pre-amp
9	Piano low	C414EB	Pultec EQ
10	Piano high	C414EB	Pultec EQ
11	Guitar left	C452	–
12	Guitar right	C452	–
13	Synthesizer left	Direct inject	–
14	Synthesizer right	Direct inject	–
15	Synth #2 left	Direct inject	–
16	Synth #2 right	Direct inject	–
17	French horn left	U87/U89	Custom pre-amp
18	French horn right	U87/U89	Custom pre-amp
19	Trumpets left	U47 FET	Custom pre-amp
20	Trumpets right	U47 FET	Custom pre-amp
21	Tenor trombone	U87	–
22	Bass trombone	U87	–
23	Tuba	U87	–
24	OPEN	–	–
25	Various – see footnote	–	–
26	Various – see footnote	–	–
27	Various – see footnote	–	–
28	Various – see footnote	–	–
29	**REMIX LEFT**	–	–
30	**REMIX RIGHT**	–	–
31	Various – see below	–	–
32	Various – see below	–	–

The assignments for tracks 25 thru 28, plus 31 and 32, varied according to the instrumentation being used on a particular song. For example, tracks 25 and 26 received a stereo mix of saxophones on a couple of tunes, while on others the tracks might be used for stereo percussion mixes balanced on the Neve model 8078 console at Clinton Recording, or taken direct.

The final stereo mix on tracks 29 and 30 (or, on occasion, other track combinations) were bounced onto a U-matic VCR and Sony PCM-1610 digital processor for Compact Disc mastering.

Producer on these sessions was Phil Ramone, with engineering by Don Hahn, assisted by Joe Martin and Fred Bova.

Table 1. *Track assignments to Mitsubishi X-850 PD-format digital 32-track during the tracking sessions for Pat Williams' 10th Avenue album project.*

stranger to working in the digital domain. In fact, he was responsible for engineering what many people consider to be of the first all-digital albums, Herb Alpert's *Rise*, recorded in 1979.

Hahn's goal on the *10th Avenue* sessions was to keep the sound from exhibiting the pristine "sterility" for which digital productions are so often criticized, without sacrificing the punch and ambience of a live performance.

"The first thing to remember when doing a live album," Hahn says, "is to go into the studio and *listen* before you start processing. Don't gobo everything and build houses in the studio—learn how to play the ambience, or the 'air' as I like to call it, in the room. I'm for capturing what is actually taking place in the room."

Hahn's formula for capturing and not creating a performance also extends to the mixing stage of a production: "The rule I've always gone by is not to mix forever. When you mix the same thing for a long period of time, you get a technically sterile and medicinal record that lacks feeling.

"I approach mixing like a jazz artist approaches a solo; you don't get him to play the whole solo when you're setting up—you just have him play a few bars. Because, if you don't catch the solo while the tape is rolling, you're in deep trouble.

"I always try to keep in mind that it's impossible to mix a 'perfect' record; you just can't do it. You end up with sterility, not perfection."

Because of the huge costs and logistical problems involved, a live-to-digital album would be a nightmare for a lot of other engineers. But, it was a real dream for Hahn.

"I love doing live dates," he explains. "They are a real challenge for me. Your palms sweat, you get nervous, you pace the floor, you lay awake the night before the session—especially if it's a heavy date.

"There shouldn't be that kind of pressure for me on an album like this. I know how Pat writes. He's just picked up another Grammy [for Bill Watrous' *Suite Memories*].

"I know how Phil Ramone produces," Hahn says. "I also know that he was an incredible engineer in his own right when I was his assistant; when I became a full-fledged engineer, we traded dates and split album projects.

"I know all the guys in the band—guys like Steve Gadd, Nathan East and Richard Tee. I know I have a dynamite studio, a dynamite crew, a dynamite producer, a dynamite arranger, dynamite musicians.

"So where's the pressure? The pressure is in knowing that if it *doesn't* come out right, my ass is on the line—that's where the pressure is!"

Tracking session

The actual recording of *10th Avenue* took place in late December 1986, during a 2-day period in Clinton Recording's Studio A. It was mixed in Studio B over a 3½-day period. According to Hahn, Clinton's 40-input Neve 8078 console with NECAM II fader automation proved invaluable during the project.

"I like Neve consoles," he says. "I like vintage APIs the best, and they're my first choice, but the Neves are great."

Even though the 8078 is known for its high-quality sections, Hahn elected to use a direct route for most of the instru-

Continued on page 48

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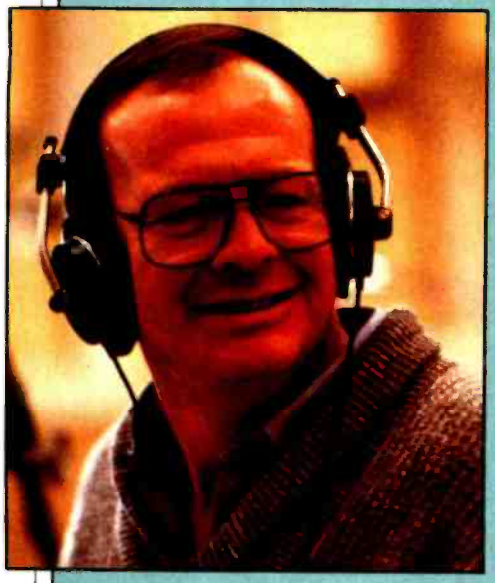
Digital Technology to Showcase High-Quality Sound

A Conversation with composer/producer Pat Williams



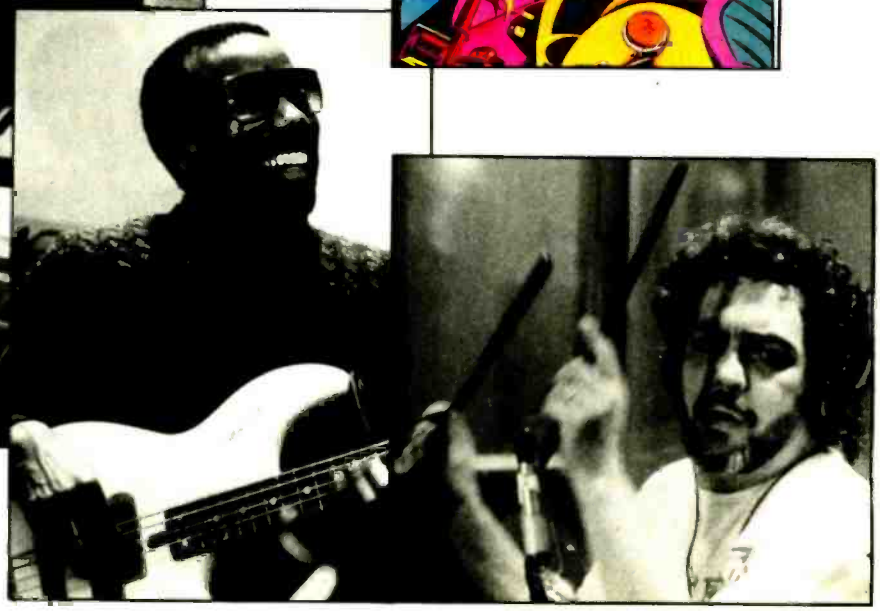
From arranging for album dates, to composing for film and television, to conducting a symphony orchestra, to heading his own record label, Pat Williams has covered almost every base in the music business. He is the recipient of two Grammy Awards (one of which came this year for arranging Bill Watrous' Suite Memories *album on his own Soundwings label); two Emmy Awards; a Pulitzer Prize nomination; an Oscar nomination; two Emmy nominations and nine Grammy nominations.*

His past work includes composing the music for dozens of films, including Breaking Away, The Toy, Swing Shift, The Best Little Whorehouse in Texas, The Buddy System, The One and Only *and most recently,* Just Between Friends *and* Violets Are Blue.

He has also composed music and themes for such television programs as The Mary Tyler Moore Show, The Bob Newhart Show, The Tony Randall Show, Streets of San Francisco, The Days and Nights of Molly Dodd, After-Mash *and* The Devlin Connection. *In addition, Williams has handled arrangements for Billy Joel, Barbra Streisand, Chicago, Paul Simon and Dionne Warwick.*

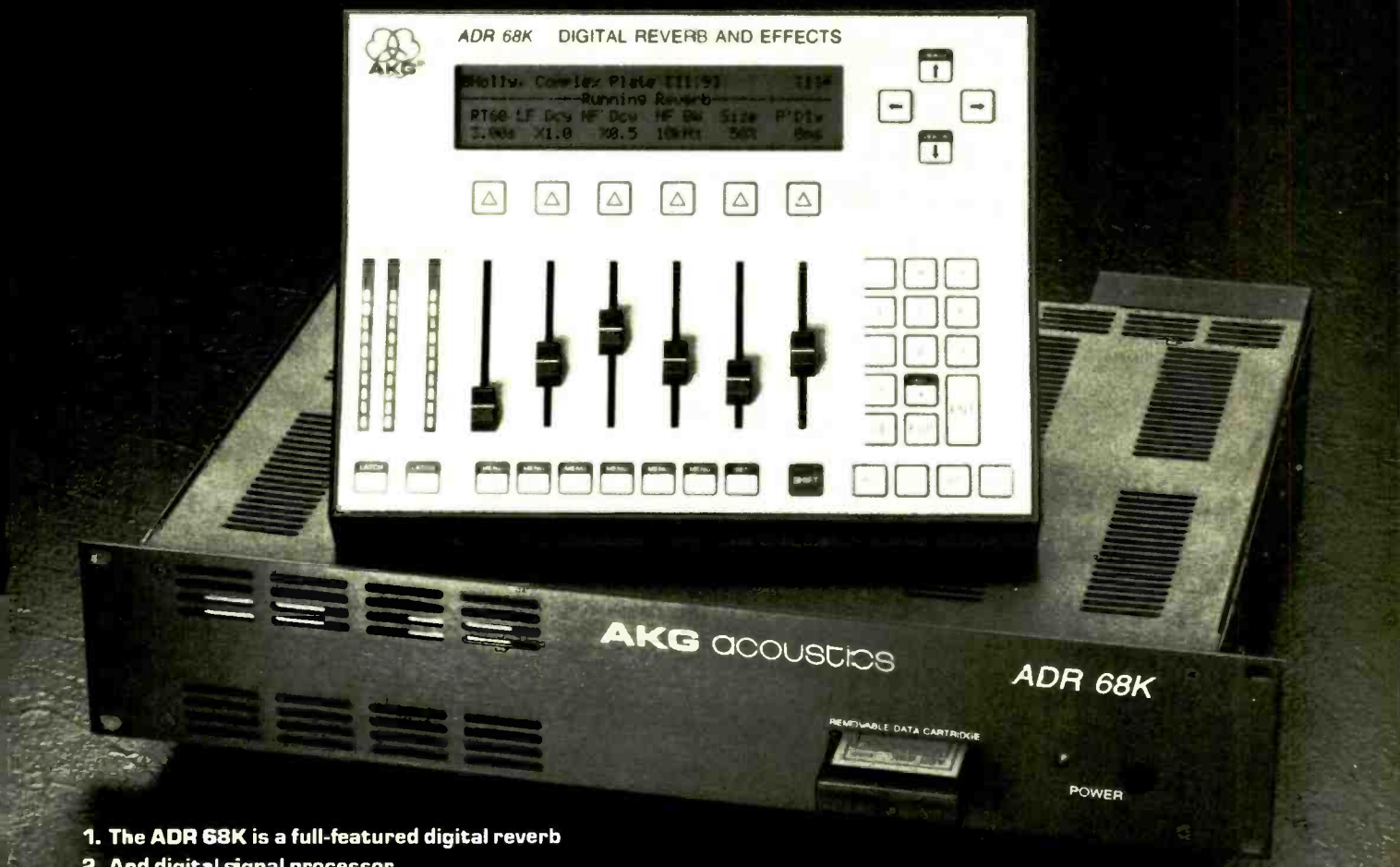
10th Avenue *is Williams' first solo album in more than 12 years, and is the first for his Soundwings label. What made such a successful composer and arranger want to move into the record business?*

"I personally had no fantasy about starting a record company," he confesses. "But when the Compact Disc came along, I felt that here was an exciting musical opportunity that could be viable from a musical point of view. There is a window of opportunity for recordings designed to showcase not only exciting music, but high-quality sound."



Session musicians involved during the 10th Avenue *digital sessions include (from top left): keyboard player and synthesist Rob Mounsey, bassist Nathan West and drummer Steve Gadd.*

16 BITS



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AKG acoustics

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continued from p. 44

ment mics. The outputs were patched directly into the inputs of the Mitsubishi PD-format X-850. Bass drum, kick, drum overheads, bass guitar, trumpets, French horns and solo instruments were routed to the multitrack through Hahn's custom pre-amps (whose design or builder Hahn would not disclose). Kick and snare were also processed through an Orban model 622B parametric equalizer, while the piano mics went through Pultecs.

Instrument micing also was pretty straightforward, with bass guitar, synths and electric piano going direct; kick through a Sennheiser MD-421, snare through a Shure SM-57, a Neumann KM-84 on the sock and Telefunken 251s as drum overheads.

AKG C414s were used on the toms and vibes; a pair of C414EBs on the piano (high and low); AKG C452s on electric guitar amp (left and right), congas and other percussion; Neumann U47 FETs on the trumpets (set omni pattern); U87s on the trombones and tympani; KM84s on chimes; U89s and 87s on the French horns; and a U87 on the soloist.

During the tracking dates, signal processing was kept to a minimum, with virtually no compression or gating. Levels were monitored and adjusted the "old-fashioned way"—by hand. "That's why a mixer is not a bartender," Hahn says with a chuckle.

For the mix, EMT 250 echo and a 140 plate (with a Marshall Tape Eliminator used to provide pre-delay) were used primarily for additional ambience, with a Yamaha REV-7, Lexicon 224XL, AMS RMX-16 and a Lexicon PCM-70 digital reverbs added for some of the cuts.

Regarding the choice of a Mitsubishi X-850 on the session, a machine that he had never used before, Hahn says, "I knew I didn't want to use other digital multitracks on a brass album. They sound a little bit too edgy, grainy and pinched for that kind of project.

"On the other hand, I had heard nothing but good things about the new X-850 from very reliable engineers that I trusted in the business, so I decided to go with that transport."

The album was remixed to two open tracks on X-850, and to a U-matic VCR via a Sony PCM-1630 processor for CD mastering.

A problem surfaced while *10th Avenue* was being prepared for CB release, involving the digital-to-digital transfer.

"When Phil and I heard the D-to-D transfer from the editor, we noticed a considerable loss of bottom-end punch and echo, along with a grainy top-end," Hahn recalls. "I didn't appreciate the degradation caused by the editor."

Because of this, the resultant tapes were premastered for CD release by Bernie Grundman, of Bernie Grundman Mastering, Hollywood, who took special care to maintain the integrity of the source material.

All in all, the project turned out to be a rewarding one for everyone involved.

"It's not a perfect album, but it's an honest album," Williams says. "Out here, I do a lot of film work that is recorded live but, in that kind of work, the movie is the star. When you do an album like this, however, the *music* is the star. And when the music is the star, there's more on the line.

"It's too bad that the record business has got to the point where the labels are more interested in the perfection of the parts than the product as a *whole*. I'm not on a crusade about this or anything, because I do some of that kind of work too. But, in the end," Williams says, "I'd much rather have a record that has a few problems, but captures the spirit."

All photography by Timothy White/ONYX. R-E/P

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Circle (67) on Rapid Facts Card

Understanding Circuit Principles

System Gain and Noise

By Terry Pennington

In the second part of this series written for recording and production engineers, we look at the various sources of electrical noise in circuits and how best to optimize system noise performance by paying close attention to gain structures.

"Why don't I have enough level here, and why is what level I do have so noisy?"

If you aren't asking yourself this question daily, or even hourly, you are a very atypical engineer. When a solution is found for the level problem, the noise goes even higher. What then? The higher the fader, trims and EQ settings, the higher the noise.

Sound familiar? It should. Every input on every console, processor, tape machine or amplifier produces noise. Virtually all of these devices then apply some gain to the noise on the input, making the problem greater with each step. Although the problem cannot be eliminated, a reasonable understanding of its origins can go a long way toward making it a problem that can be lived with.

Source of noise

Electrical noise begins with the movement of sub-atomic particles in the conductors used in transducers, wires, passive attenuators, amplifiers and so forth. In order for electrical signals of any sort to pass through conductive matter, noise will be generated. It's a bit like any movement; only in a totally frictionless environment can you move anything without generating some level of noise.

In electronic circuits, noise is being generated in all conductive elements regardless of whether or not a purposeful signal is applied to the system. Consider the hiss one hears on an input channel when the gain is raised to a normal operating level. This noise is an amplified version of the random electron activity (thermal noise) taking place in the components at the very input of the channel, and all successive gain stages.

These components include anything in the dc portion of the circuit such as resistors, transistors, wire, vacuum tubes or whatever else has been included in the paths of inputs. Usually, ac components (capacitors) do not include themselves in the noise equation, unless they are operating as something other than a pure capacitance, which sometimes happens with capacitors that are improperly applied. (This latter criteria shouldn't be a problem in equipment from reliable designers and manufacturers.)

Once the thermal noise at the input stages of the amplifiers is established, it is then amplified (multiplied) by the gain of all succeeding amplification stages. In a normal microphone to line-level situation there can be as much as 80dB of gain present. As a result, the noise that lives at the input will be increased by as much as 10,000 times.

In practice, the input noise of a good amplifier may be as low as 3nV to 4nV (10^{-9}V) times the square root of the bandwidth (usually 20kHz), which yields a noise level of about 0.5μV (10^{-6}V) over the audio range. Multiplying this number by 10,000 (the gain of the pre-amp) yields a noise level of 5mV (10^{-3}V). This, by any standards, represents a lot of noise. It is *unavoidable.*

Passive noise

The random electron activity that produces thermal noise is dictated by the exact nature of the components in which the noises are generated. In resistors, for instance, the noise produced is a direct function of the resistance and temperature of the part, as well as its composition. The higher the resistance, the higher the noise; if temperature rises, so does the noise. (This is at least one of the reasons why one doesn't find very many, if any, high-impedance microphones in the recording studio.)

As far as the chemistry of the noise source is concerned, there is a difference between wire and various types of resistors. The equation used to calculate the exact noise of a component is very specific, and yet not always practical. Most different types of resistors, for example, will not measure exactly as the formula predicts.

The difference between the theoretical noise level of a resistor and its measured value will differ slightly—the difference is referred to as "excess noise." The differences are slight and not worth a great deal of concern in almost all cases.

Resistors of the carbon-composition variety tend to have the highest excess noise; carbon-film types are a bit better; metal-film resistors are better yet; and wire-wound resistors tend to be the best. If you look inside a piece of equipment that is noisy and discover nothing but carbon-composition resistors inside, changing them to metal-film or wire-wound types will rarely make a measurable or audible change in its performance. The noise almost *always* lies in the active components, or even the device's basic design philosophy.

Active noise

The input stages of amplifiers exhibit much the same thermal-noise characteristics as do passive elements such as wire and resistors. The most common gain block used in modern processing equipment, the operational amplifier, has an "equivalent input noise" specification that supplies the required information to tell us how much noise will be applied at its input.

Terry Pennington is director of technical marketing and product development at Rane Corporation, Mountlake Terrace, WA.

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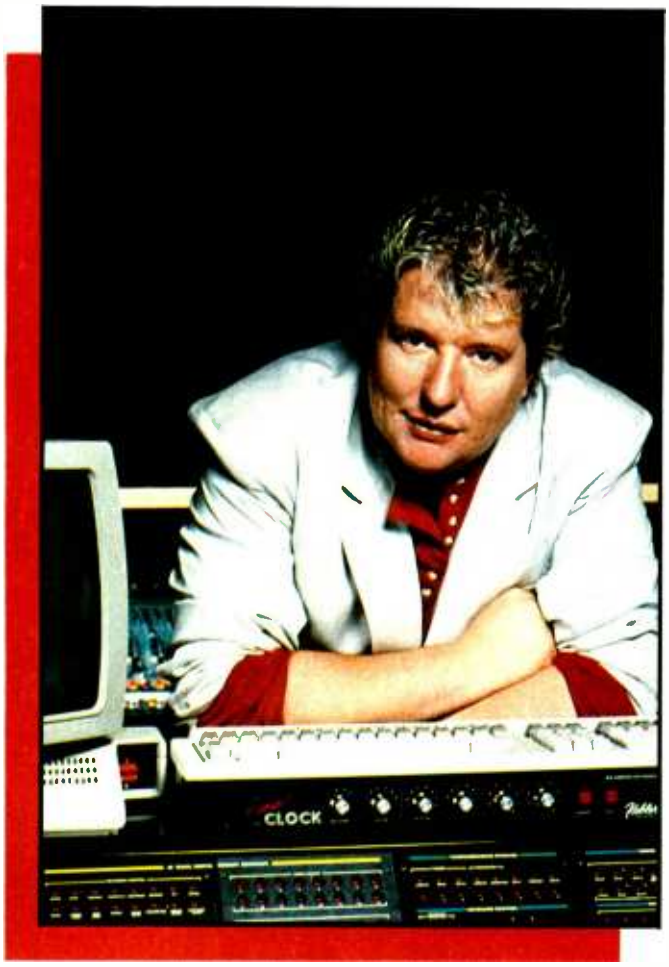

Roy Thomas Baker's magic has touched such artists as: Queen, The Cars, Journey, Foreigner, Alice Cooper, Cheap Trick, Devo, Slade, Nazareth, and more recently T'PAU. His hit albums have generated over 80 million in sales, and that figure is still climbing.

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The amount of noise present is a function of the conductive density of the input stage, just as it is with the density of a passive component. In resistors, the higher the conductive density the lower the noise that follows with a lower resistance. High densities create less noise than do low densities. An operational amplifier may be designed such that the physical area of the transistors is large and operated at relatively high current to reduce the amount of noise generated.

The same sort of trick has been used in discrete amplifiers many times for special applications, such as instrumentation pre-amps and moving-coil phonograph cartridge amplifiers. In these later cases, many small-geometry transistors are connected in parallel to effectively increase the area and, therefore, the density of the active elements, which has the same effect as one large transistor.

Noise in practice

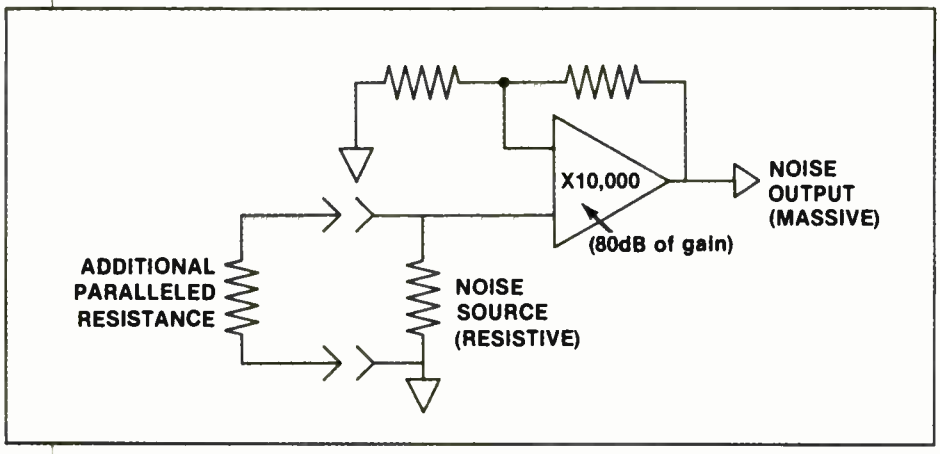
The net impedance (resistance) at the input of the microphone pre-amplifier has a great deal to do with the ultimate noise performance of the amplification process. The impedance of the microphone ends up paralleling the input impedance of the pre-amplifier, thereby reducing the overall impedance to a low enough level to guarantee satisfactory noise performance.

A typical example might be a case where the open, unloaded input of a microphone pre-amp has an input impedance of 10kΩ. With nothing connected to this input, and the gain raised to its maximum, there would most likely be a great deal of noise present, for two reasons. The first is the inherent noise of the elements in the input stage rubbing their electrons together and thereby making noise. The second noise source would be the ability of hum fields, radio signals and the random activity of the cosmos to enter the system through this unterminated high impedance, and then be amplified to an audible level at the output. High impedances make great antennas for all manner of undesirable background noises that live in our atmosphere.

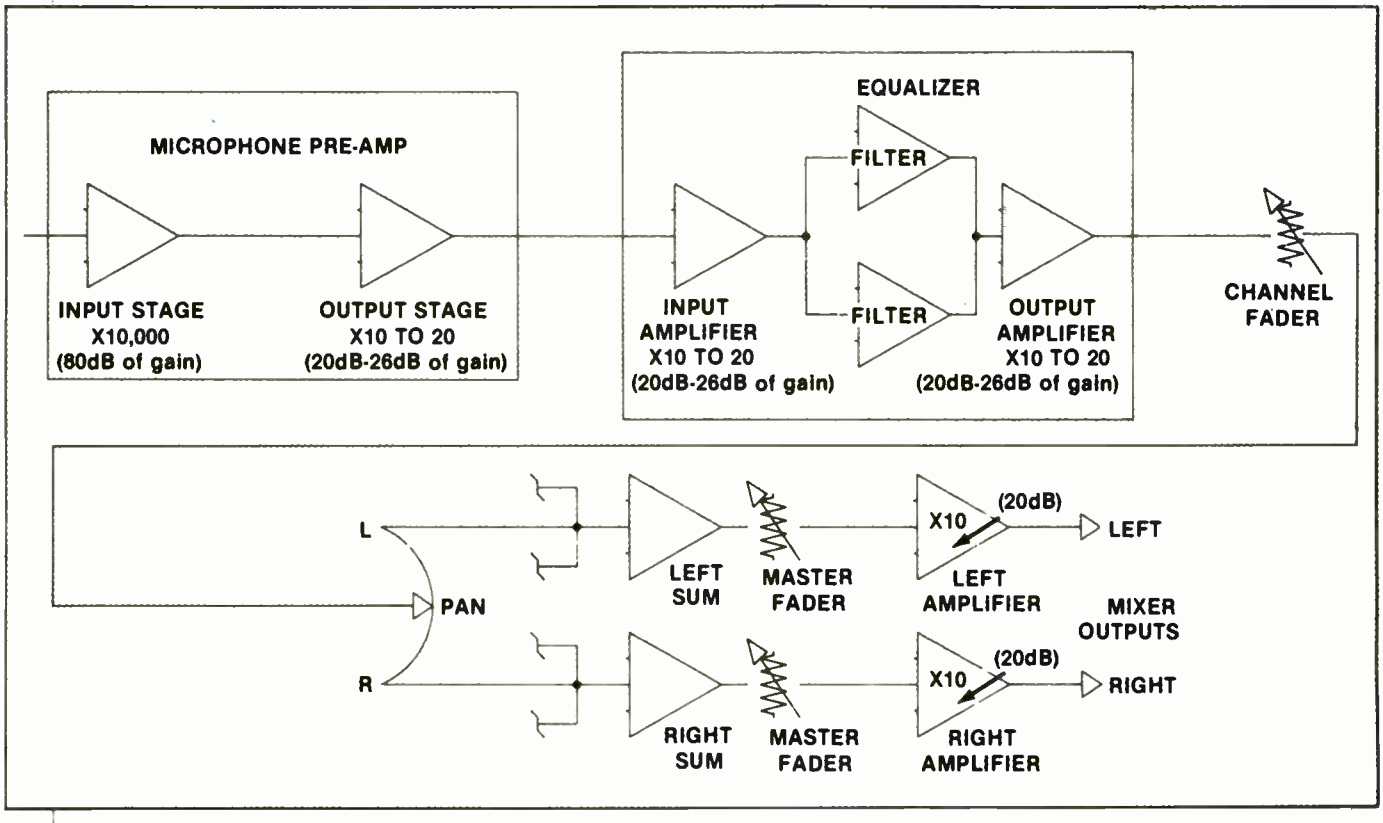
For these two reasons, high impedances should be avoided at all costs. It is safe, however, to allow high impedances to exist if they will be reduced by external means when the circuit is in actual use.

Once a low-impedance microphone is connected to the high-impedance input, the impedance of the mic is paralleled with the open impedance of the amplifier's. When two resistances or impe-

The point at which noise is generated in audio circuitry.



Block diagram of a simplified audio mixer, showing points in the signal flow path at which noise is amplified.



dances are connected in parallel, the net result will be somewhat lower than the lowest value. In the case of your average microphone, the impedance may range anywhere between 100Ω and 600Ω. At this level, the majority of the thermal noise of the resistance will be reduced to an acceptable level, and the input's ability to receive unwanted electromagnetic phenomena from the ether will be tamed to a nominally usable level.

Most amplifier inputs are fairly high impedance when open, and for a very good reason. It is assumed that a low impedance source will be connected to the input, which will lower the net result for optimum noise performance. If the input impedance were low to begin with, the input would load the source and reduce the level at that point. This is not a good idea, because the loss incurred must then be compensated for with extra gain which, in turn, raises the noise.

An example of this would be a case where a 600Ω source is driving a 600Ω input. When this occurs, exactly one-half of the signal voltage will appear across the source and the other half across the input. Because the signal across the input is all that the amplifier can see, half of the signal is effectively lost. If the input were at 10kΩ, the vast majority of the signal would appear across the 10kΩ, with only 5% of the original signal remaining across the 600Ω source. This equates to a loss of only −0.5dB, as opposed to −6dB with the input impedance set at 600Ω, which represents a far better situation for good noise performance. Yes, the 10kΩ input would be noisier with nothing plugged in to it. (As Henny Youngman would say: "Doctor it hurts when I do this....to which the doctor replies: 'Then don't do that!' ")

All of the concepts that can be applied to microphone inputs can be expanded to include line-level inputs and gain structures. The most general rule should be to provide all outputs with as low an impedance as possible and, conversely, to ensure that all inputs are at as high of an impedance as possible. Doing so will ensure a minimum of signal loss (requiring less make-up gain and therefore less noise) and will likewise ensure that the net impedance at the input of each gain stage will be as low as possible to minimize thermal noise and induced pickup of extraneous signals.

Gains and losses

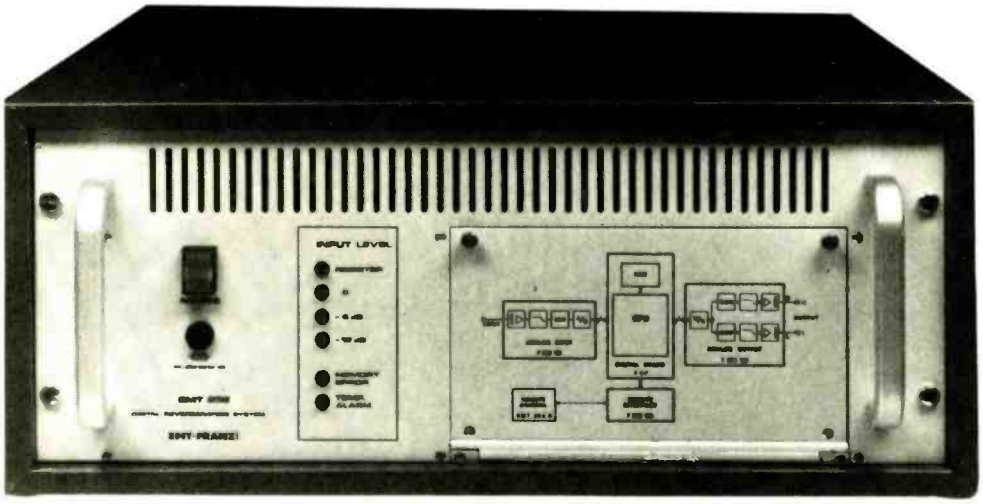
Having said that, the next thing to watch out for is gain structure. Where gain is applied in the chain of events in any audio system is extremely critical to the end result, in terms of both noise and distortion. It is normal and sound operational procedure to take as much gain as possible at the source: the microphone input. Once you have done that, no further gain should be required outside of some minor trimming and equalization. Obviously, unless a fader is at maximum, some loss will be incurred. This loss, however, will be relative to other channels in the system.

Ideally, you should be able to hit full scale on the tape machine being used, so that the mic stage is doing the majority of the work when the channel fader is at maximum. If you attenuate and re-amplify the signals passing through an audio system, each time gain is taken to make up for losses, additional noise is created that is not present in the source. This occurs because of the nature of thermal noise in each gain stage.

There are no totally silent means of creating analog gain and therefore the noise of each stage will add to the net amount. Taking as much gain as possible in the very beginning eliminates the need to add superfluous noise to the project.

R-E/P

EMT model 252



Digital Reverb System

By Bob Hodas

For years, EMT has been a recognized giant in the field of artificial reverberation. The EMT 140 plate became standard equipment in a large number of studios, and the company has continually innovated and upgraded its product line to provide us with high-quality production tools.

The latest addition to its line is the model 252, which represents the third generation in the evolution of the model 250 and the 251 digital reverb units. The 252 is a mono-input, stereo-output device that provides seven effects and reverberation programs with variable parameters. There are 64 variations of the programs stored in protected memory, and an equal number of locations available for user-program storage.

Physical layout

Physically, the model 252 is a logical departure from the large "spaceship-control" appearance of its predecessors. It is a much smaller 2-piece unit, with a control head attached by cable to the mainframe processor unit.

The mainframe occupies 4U (7 inches) of 19-inch rack space and weighs 62 lbs. The rear panel contains standard 3-pin XLR-type connectors for the single input and two outputs. A special 6-pin XLR-type connector is used for the remote control. The mainframe can normally be operated up to 60 feet from the control head, and up to 300 feet with an external power supply. Remote operation is desirable because the mainframe contains two fans that generate a fair amount of noise.

I was surprised to see no other connectors, such as an RS-232 or IEEE interface, on the back panel. This indicates a limited control expansion capability that, in an age of MIDI and expanding computer control, seems to be a severe oversight.

The front panel contains a power switch, fuse and several LED indicators. The latter display input level and overload, as well as a temperature alarm and memory error. There is also a hinged plate secured with two thumb screws for easy access to important circuit boards.

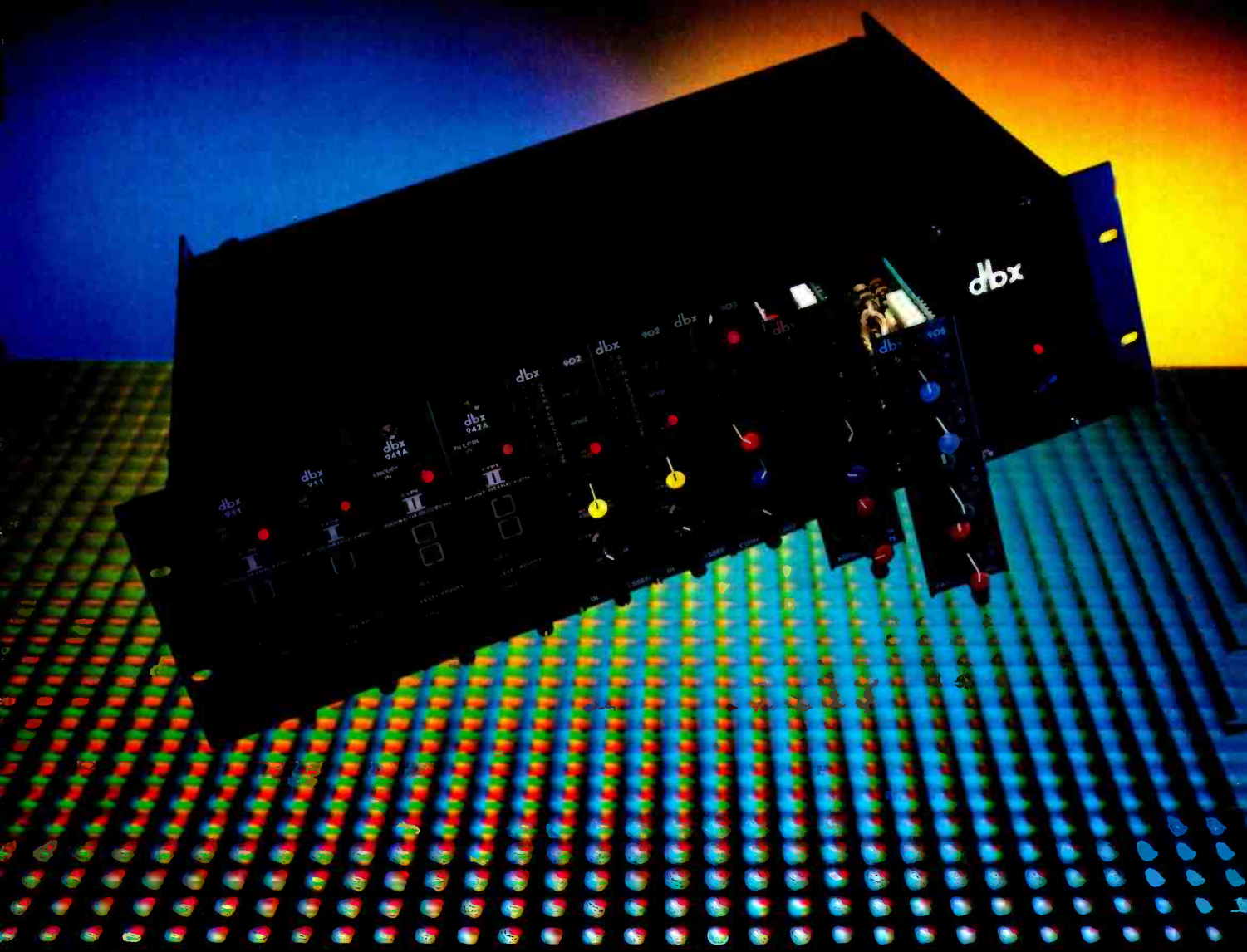
Operationally, the 252 is similar to the 251 in that it is mono-in and stereo-out. The device also uses 16-bit A-to-D conversion with 20-bit internal processing. The use of a 20-bit internal architecture allows reverb generation without the high-frequency regeneration necessary in operating systems with lower bit rates. Increased processing speed results in smoother reverb tails.

Realizing the validity of this type of math and EMT's attention to detail, I was surprised that this unit was as noisy as it was. The first thing I did was to connect the 252's outputs to the console with nothing connected to its inputs. The 252 turned out to have about 10dB more

Bob Hodas is RE/P's evaluations and practices consulting editor.

dbx

The future is modular...



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941A Type II noise reduction, 2-channel encoder
942A Type II noise reduction, 2-channel decoder
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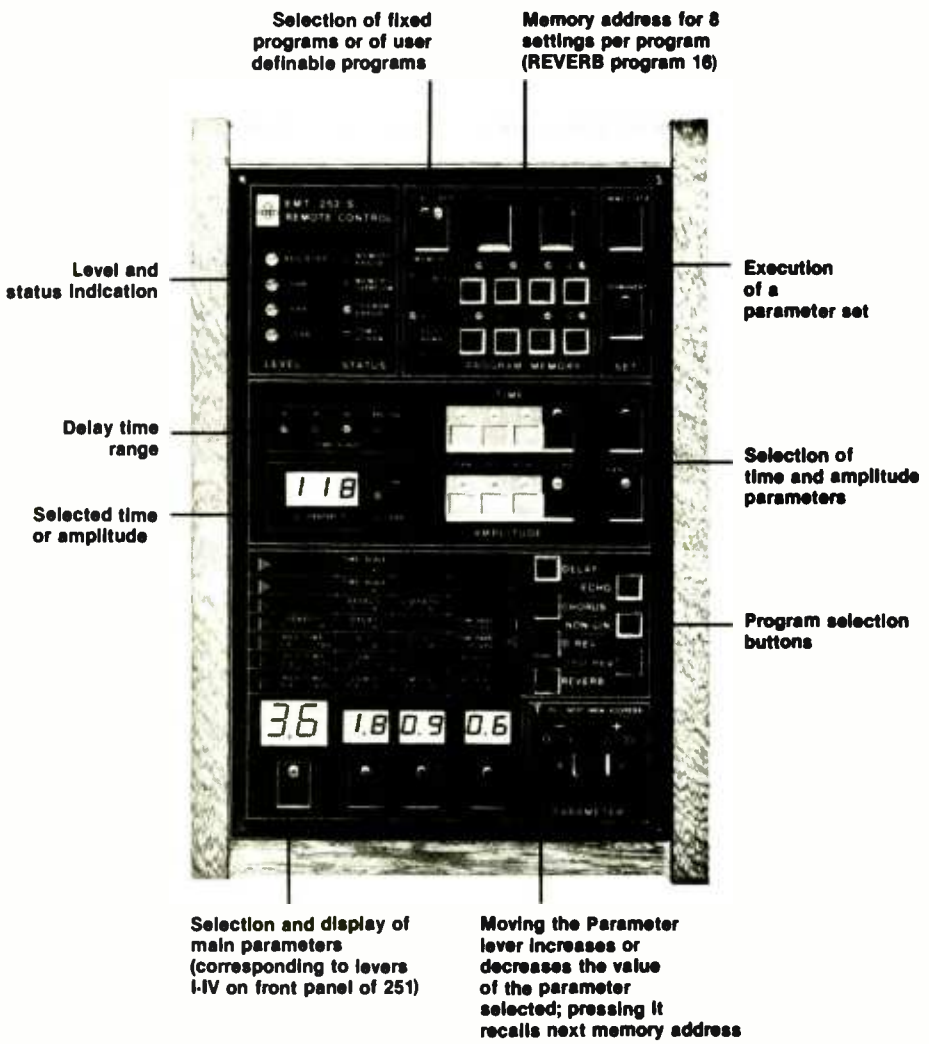
Figure 1. Layout of remote control unit.



residual noise than another high-end reverb at the studio.

Remote control

Although, at first glance, the control head may look intimidating with all its buttons and LEDs, it is actually quite simple to master (Figure 1). The unit is logically laid out and allows fast, complete control of the 252. The labels and displays provide so much information that you will probably never have to refer to the manual after the initial reading. Although it is fairly large (roughly the size of this magazine), its size allows good ergonomics at a time when buttons, readouts and panels are rapidly shrinking beyond usable size.

The input level indicator is duplicated from the mainframe. When the Register LED lights, overload is occurring. Because the input is sharply limited when this LED flashes, I found that I could push a lot of level into the 252, causing the Register LED to be on light, without experiencing the horrors of digital breakup.

The Temperature Alarm provides a warning that there is overheating in the mainframe, and that automatic shutdown will occur shortly if the problem is not attended to.

Transmission Error signals a communication error between the control head and the mainframe, while Memory Overflow indicates that the maximum storage time (480ms) has been exceeded in the programs. Memory Error indicates a problem in the dynamic RAM or a defective storage unit (more on this when we discuss maintenance).

Effects programs

The seven programs provided in the 252 are Delay, Echo, Chorus, Non-Linear, Doppler Reverb, the old 250 Reverb and Reverb. These programs are initiated by hitting the appropriate selection button.

LED pointers are then highlighted on a descriptive table indicating which main parameters may be manipulated. These parameters are initiated simply by hitting buttons I through IV, and reading the LED display as you toggle the Parameter Lever left or right. (Those of you familiar with the model 251 will recognize a lot of these controls.)

In the center section of the control head are the other parameters that can be manipulated. These correspond to Time and Amplitude of reflections (reverb programs) and delays (echo, delay and chorus). Pan (Panorama) refers to a reflection that may be panned between the left and right outputs in 11 stages. This latter is a very nice feature that allows one to locate a reflection image in relation to a panned direct signal giving the impression of room position.

Left and Right refer to fixed-position reflections, while Cluster controls the reflection cluster (six reflections split between the two outputs) that leads into the reverb tail. Four Time Scale LEDs and an LED readout serve multipurpose duties for displaying the selected Time, Amplitude and Panorama position. At any time, 40ms may be added to all of these parameters *en mass* simply by hitting the +40ms button.

The Set buttons add to the model 252's versatility. When Permanent is pressed, all parameter manipulations are heard as they are performed, which allows for setting up program variations by ear. With Immediate, parameters may be adjusted while one variation is running, and then loaded in at the appropriate moment simply by hitting the button.

There are eight factory-loaded variations for all programs—with the exception of Reverb, which has 16. The same number of user memory-storage locations are also available for each program. Variations are called up by hitting the Fix/User button, the appropriate variation number and then RCL (recall).

To access the second bank of eight Reverb programs, you need only hit a currently loaded variation number again. The storage procedure for loading the user memories is really quite simple and fast.

User memories

EMT designed the control head to store user programs on-board, which means that you could take your control head to another studio with a mainframe and have access to all of your favorite programs.

As much as I like this concept, I feel that EMT shortchanged its clients by having limited storage capabilities. Pro-

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Table 1. *Directory of the model 252's seven factory-provided programs, with names of eight variations for each (16 in the case of the Reverb program).*

Doppler Reverb	Chorus	Delay	250 Program
1 Small Room	Solo Vocal	Small Hall (Ballet Studio Effect)	Trumpet
2 Small Room	Choir 1	Comb Filter, Mono	String Instruments
3 Small Room	Choir 2	Comb Filter, Stereo	Solo Vocals
4 Small Room	Solo Vocal (Spacious Room)	Stereo Effect (Multiplication)	Slight Spatial Enhancement for Percussion Instruments
5 Small Room	Solo Stringed Instrument	ADT	Snare Drums
6 Small Room	Stringed Instruments	ADT	Small Room
7 Small Room	Solo Brass Instruments	Level Adjust (Calibration	Middle-Size Room
8 Spacious Room	Solo Woodwind instrument		Large Room
Non-linear	**Echo**	**Reverb (first 8 variations)**	**Reverb (second 8 variations)**
Solo Voice (Effect Reverberation)	Snare-Resonance	Trumpet	1 Small Room
Solo Voice (Spacious Room)	Snare-Resonance with Echo Effect	Saxophone	2 Small Room
Background Choir	Snare Double Resonance	String Instruments	3 Small Room
Choir, Present with good Intelligibility	Guitar	Solo Vocals	4 Small Room
Voice Multiplication (ADT-Effect)	Solo Trumpet	Slight Spatial enhancement for Percussion Instruments	5 Small Room
Room Program Small Room (Present)	Computer Voice	Snare Drums	6 Large Room
Room Program Middle-Size Room	Hall Effect (Sports Stadium)	Snare Drums, Echo Effects	Reverberation setting for Enhancement of Effect Programs, e.g., Non-Line
Room Program, Large Room (Background)	Small Room (Cellar Effect)	Snare Drums, Biting Filtering Effects	Background Choir

grams may not be downloaded to tape or disk, an omission that could become a problem when several engineers want to share one unit in the studio.

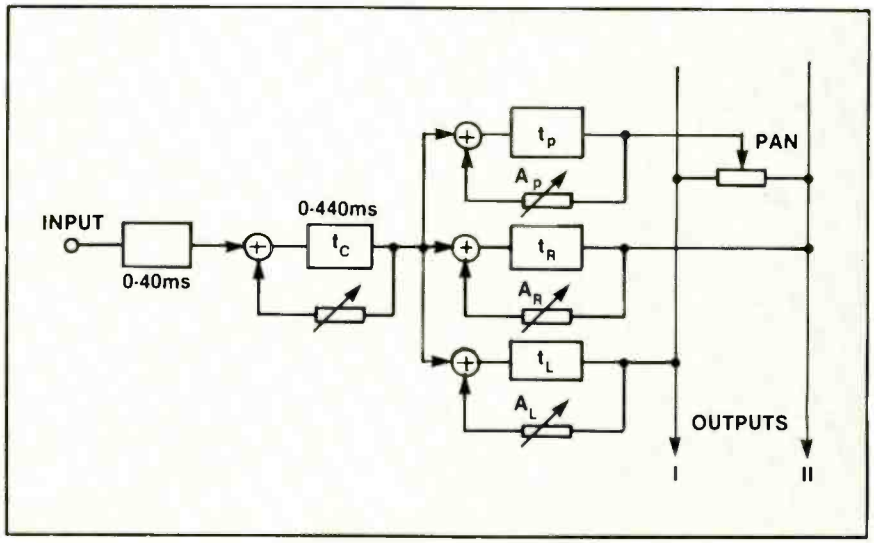
Having eight storage locations allocated to a special effect such as Chorus, while only 16 are given to a program as important and widely used as Reverb, seems like a waste. Again it appears as if EMT has not recognized the increasing use of computers in the studio.

Subjective assessments

Let's take a look at the seven individual programs provided.

Echo is an interesting program because it is not just a discrete echo. Instead, the program provides a very high-quality reproduction of the input signal with some interesting routing. Maximum combined echoes may not exceed 480ms, as the Memory Overflow LED

Figure 2. *Block diagram of Echo program.*



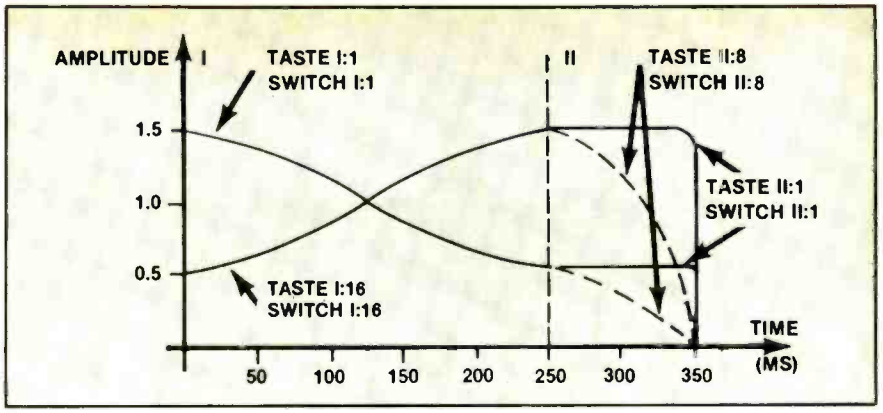


Figure 3. *Parameter adjustments for the Non-Linear program.*

will indicate. Delay times are controlled via the Time parameters with Amplitude controlling the amount of feedback (Figure 2).

Cluster acts as a preliminary delay, feeding the other controls. Pan may be panned left to right as described earlier, while Left and Right are fixed positions.

An interesting note is that the input signal is present in the Left and Right lines, appearing in the opposite channel from the echo. This is a pretty clever feature, and the program is versatile enough for many varied uses.

Delay is also a program of very high reproduction quality, and quite a nice effect. The Time parameters of Left, Right and Pan follow their logical placements. Cluster sums six reflections are split left and right, so you can actually have up to nine discrete delays here. Amplitude adjusts the relative level of each of the four Time parameters.

Bandwidth of the Delay programs is impressive, and this program is sure to be used for some very nice vocal delay effects.

Although I was pleased with both the Echo and Delay programs, I found myself creating new variations and not using the factory stored variations as much.

In the *Chorus* program, Time controls delay times while Amplitude controls feedback for each of the four delays. There are eight selections for continuous variations in pitch and position controlled by parameter button II. Variation speed (vibrato) is controlled with button III.

Once again, sound quality is very high. This is a fun program, although not spectacularly different from other chorus devices.

The *Non Linear* program is very dense and smooth. The program can be used to increase vocal intelligibility, or for the special drum effects that have become so popular. Time and Amplitude behave normally as with the reverb programs, while Parameter switches I and II shape the sound (Figure 3).

Switch IV allows you to filter the reverberation tail. I did enjoy the factory variations, especially #6, which creates a nice backward effect.

Doppler Reverb is more of a special effect reverb program than "realistic" reverb, and provides some very interesting effects. Extremely long reverb times may be set, and the Doppler shift gives the illusion that the reverb is moving around in the room. Reverb time (up to 18s) is linear for all frequencies, and eight positions each of Doppler pitch and speed

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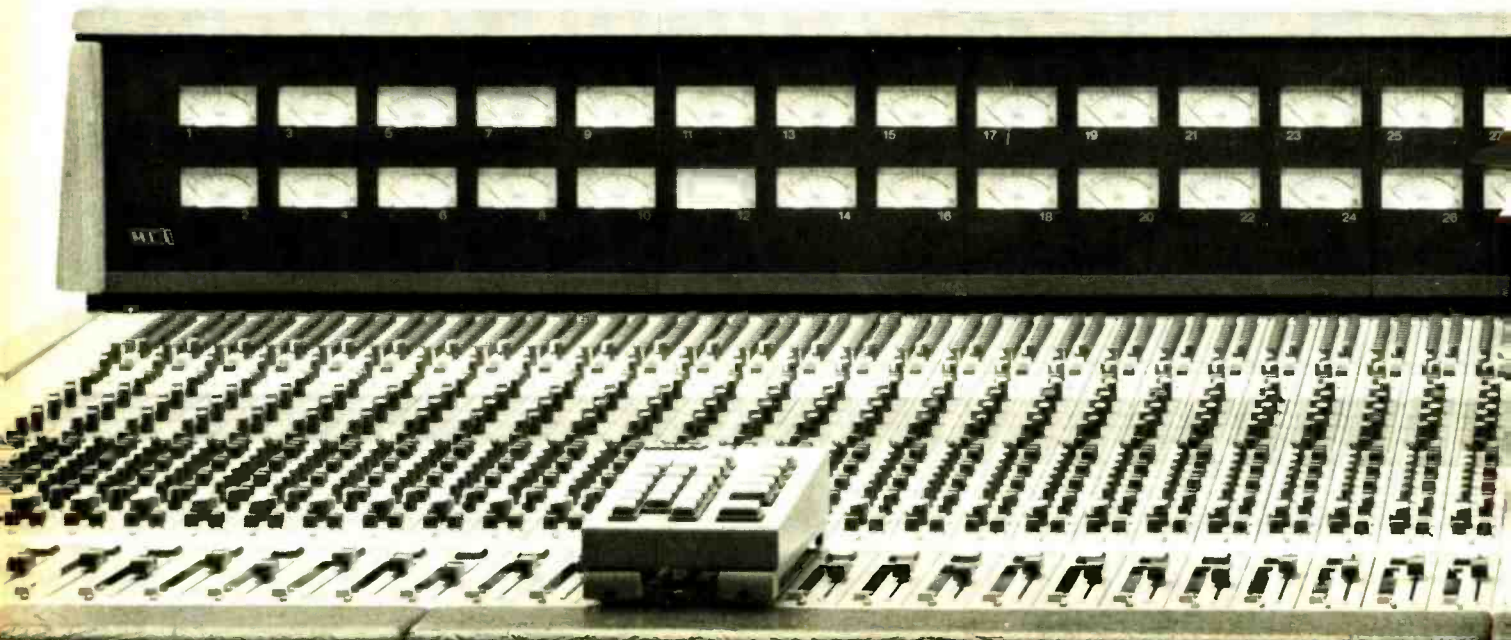

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Technical Specifications

Input impedance: *balanced, floating, minimum 3kΩ.*
Nominal level: *+6dB; adjustment range of −10dB to +15dB (0dB= 0.77V).*
Output impedance: *balanced, floating, maximum 60Ω.*
Nominal level: *+6dB; adjustment range of −10dB to +15dB.*
Frequency response of delay program: *30Hz to 15kHz; +1, −3dB.*
Overload margin: *6dB.*
Signal-to-noise ratio of delay program *(referred to nominal level rms, unweighted): 75dB; peak, unweighted, (CCIR 468-2): 70dB; peak, weighted (CCIR 468-2): 65dB.*
Signal-to-noise ratio of reverb program *(referred to nominal level rms, unweighted): 73dB; peak, unweighted (CCIR 468-2): 69dB; peak, weighted (CCIR 468-2): 64dB.*
Harmonic distortion of delay program: *maximum 0.1% at nominal level (f=1kHz).*
Power consumption: *120VA.*
A/D and D/A converters: *16-bit uniform.*
Sampling frequency: *approx. 32.6kHz.*

Circle 102 on Rapid Facts Card

may be adjusted. All Time parameters have a range of up to 80ms, and these reflections are full bandwidth. A low-pass filter is provided for the reverb tail.

250 Reverb represents the classic algorithm to be found in the EMT model 250. The only change is said to be that the reverb tail and cluster are now variable from 0ms-120ms. Reverb time, as well as high- and low-frequency time adjustments, can be made. I thought that this was a great program in the 252, and loved the factory variations.

For the last program, *Reverb*, RT_{60} at 1kHz is adjustable from 0.4s-4.5s in 16 steps. Low-, mid-, and high-frequency time adjustments are centered at 300Hz, 4kHz and 8kHz, respectively. Reflection and Cluster times can be set between 0ms-120ms, and varied in amplitude. Figure 4 shows a block diagram of the major control elements.

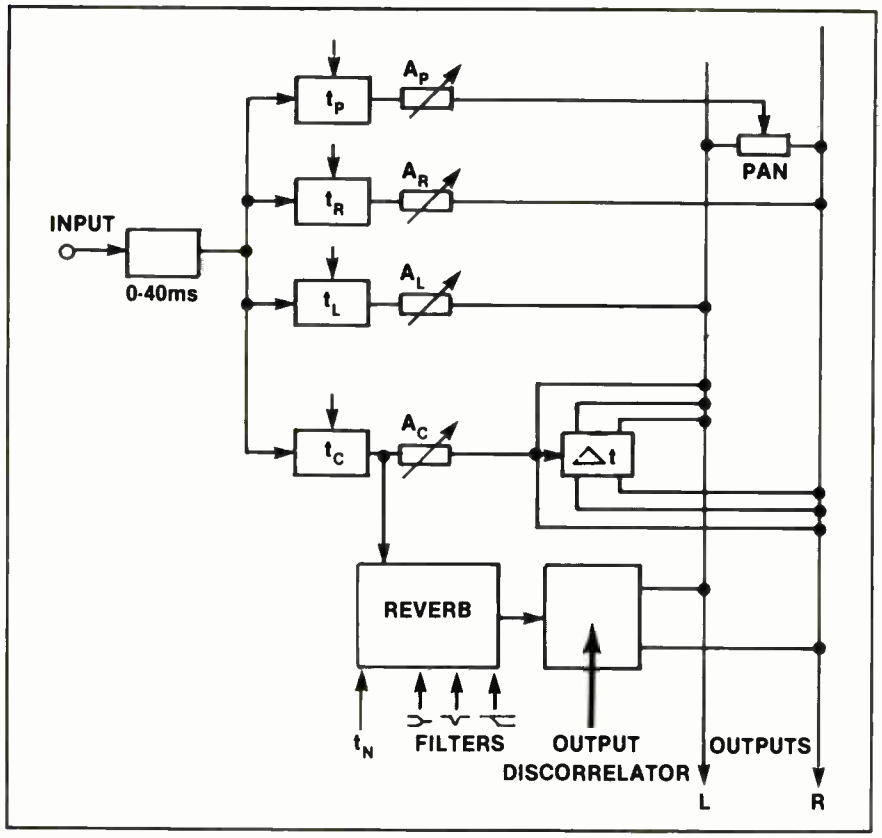
There are 16 factory-supplied variations for this program in the two banks, A and B. I found that I was definitely partial to the variations in bank B, and found them useful. The reverb tails are good, quite dense and smooth; in my book, they are EMT's strongest point. The company seems to be using a brighter algorithm than many others, and this gives a greater feeling of clarity.

The one thing I really did not like were the reflections; it may sound silly, but the reflections were actually *too* hi-fi. They were too distinct and interfered with the original signal. With instruments that have a lot of bass energy or transients, such as kick drum, the reflections turned into stutters. If I brought the reflections way back, then I tended to lose the sense of space that first reflections should impart.

The reflections did not sound real to me; they were just too good and, in many cases, got in the way. I almost felt at times that I did not have to mix the original signal in with the reverb. This experience is unique among all of the various digital reverbs I have listened to.

As I often do in these reviews, I gave the unit to a fellow engineer to check his impression. Phil Kaffel had the opportunity to use the 252 while recording vocals for the latest Huey Lewis album. Phil liked the effects programs a lot, and found the unit easy to use. He is very familiar with the EMT 250 and liked this program. He felt, however, that the original 250 reverb tails were smoother than those of the 250 program supplied in this unit.

Figure 4. Block diagram of Reverberation program.



Internal construction

Maintenance engineers will love this unit. The important analog circuit cards are immediately accessible by removing two thumb screws and folding down a hinged panel on the front of the mainframe. All level calibration may be done on these boards; a fast and simple process. Components are identified on each board and test points are provided for convenience.

If there are memory errors, an LED will light up on the digital board, identifying the offending chip. There is even correction built in so that if a single storage unit becomes defective, it will be corrected to the proper value.

The manual provides schematics on everything you will need in case of failure. In fact, whether discussing set up, operation, or theory, the manual is very informative. It was clear and concise and after one reading, I felt perfectly comfortable operating the 252. The block diagrams of the programs were especially informative.

I have mixed feelings about the EMT model 252. There are points about which I am enthusiastic, yet there are other aspects that EMT should take a more careful look at. The model 252 is probably the most expensive digital reverb on the market; I must say that I expected more for such a high price.

I would like to thank The Plant Studios, Sausalito, CA, for providing the time needed to perform this Hands-On review.

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Recording and Production Techniques for

Audio-Visual Presentations

By Brian A. Roth

Although A-V presentations can serve as a useful area of diversification for traditional recording facilities, engineers and producers need a basic understanding of audio-visual production techniques.

It seems that many recording and production facilities are missing out on a potentially lucrative market niche: soundtrack production for audio-visual presentations. A-V tracks may lack the glamour of album or jingle production ("Yuck! Sound tracks for *slide* shows?"), but they can be a steady source of income.

The intent of this article is to provide a general overview of appropriate production techniques, as well as basic descriptions of the hardware used in A-V presentations.

In many cases, the assembly of the visual portion of a presentation is handled by a person or company specializing in A-V productions. However, most of these A-V houses have extremely limited in-

The audio-video control room of Ackerman Hood & McQueen's Golden Voice production studio, located in Oklahoma City. Equipment includes a Sony MCI JH-600 console, JH-16 analog 24-track, JH-110 ¼- and ½-inch stereo mastering decks, a variety of Audio+Design signal processors, including SCAMP racks, Compex and Vocal Stresser limiters, plug Yamaha and Klark-Teknik digital reverb units.

Brian Roth has worked in broadcasting, pro-audio sales/service/installation, audio equipment design and as a technical writer. Currently, he is a consultant for professional audio and video production, and corporate data and telecommunications.

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house audio production facilities, especially if the project requires custom music production. That's when a professional recording studio can step in to fill the void. And, there are instances when a recording studio has made the investment in A-V hardware and production personnel to provide a turnkey service to their A-V clients.

Client contact

Regardless of who handles the visual portion of a project, the production sequence will follow pretty much the same steps. First of all you must have a client who wants to prepare an A-V. Finding such clients requires some salesmanship, either on the part of the studio or the A-V production house. Because much of the business tends to come from advertising agencies, you might have a foot in the door if your studio is already handling jingles.

The audio and visual production teams will then need to determine the customer's requirements. How big is the budget? What is the required timetable? Usually, it seems, there is not enough money *or* time available, but that's the nature of the beast.

Next, the type of production needs to be established; is this a one-shot extravaganza for the client's annual sales meeting, or will multiple copies of the finished A-V be sent out to the field for sales support or point-of-sales use?

In the former case, it is feasible to design a production with dozens of synchronized slide projectors, lasers, flash pots, dancing bears and other rock concert paraphernalia. However, most A-Vs fall into the latter category, where equipment portability, ease of setup and operation are as important as the sales message itself.

At this point, scripting can begin. Because they are so closely interrelated, both the visual and audio elements must be firmly established early in the project. The nature of the medium dictates that the visuals be programmed to conform with a finished audio track. It is imperative that both the audio and visual producers share the same vision of what the finished product should be *before* the first inch of audio tape is recorded.

After the final stereo audio track has been transferred to two of the four available tracks on a Tascam ¼-inch deck, the audio/visual programmer begins the task of synchronizing the slide projectors with the audio program.

Production sequence

Most A-Vs require an announcer track. The first audio production step is to record the announcer's voice-over. One of the biggest problems can arise at this stage if the visual and audio producers do not work closely together.

For instance, assume that a sales presentation for a new product is being pro-

The finished A-V production is combined with a specially constructed set, which also supports the projection screens. A recent audio-visual presentation for a Telex Computer Company sales meeting included lasers and other effects.

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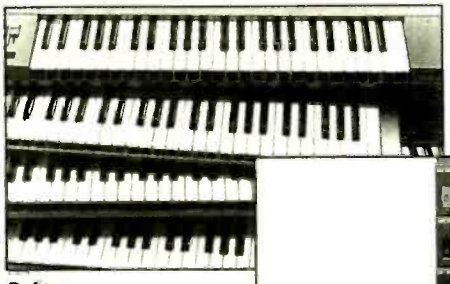

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duced. The client wants a "punchy" script that reads, in part, "New! Improved! Cheaper! Better than before!" If each of these copy points are to be accompanied by a visual image, the voice-over announcer may need to slow down his or her delivery at that point to allow the slide projector(s) to keep up with the script.

The audio cannot be recorded without paying close attention to the visuals that will be synchronized to the audio track.

From the technical side, the voice-over session should not pose any special problems. It is wise to use a moderate amount of compression—and perhaps a sane amount of high-frequency EQ boost—on the original voice track, because the final audio track will usually be a number of generations down from the original.

You can save a lot of time if you record the voice-over on one track of the multitrack. The script can be punched together and the final "read" will be in place on the tape and ready for the assembly of the music score. Otherwise, record the voice-over on ¼-inch tape, edit out the mistakes and bad takes, and then transfer the final track to the multitrack.

Once the final voice-over is assembled (and, if necessary, "blessed" by the client), the music track is created. Of course, if the project is limited by budget, there may be *no* music, or the music track may be obtained from library sources. (There are those producers who

A Crash Course in A-V Presentation Hardware

The majority of A-V visuals are generated with 35mm slides and projectors. The most basic setup will consist of an audio cassette playback deck that triggers the advanced mechanism of a slide projector. There exists a de facto *cassette format standard for this type of system: the audio program (usually mono) is recorded on what is normally considered the "A" side of the cassette, and the synchronizing tones are recorded on the remaining area of the tape where the "B" side would be located.*

Note that the entire width of the tape is used; the "top" half for program audio, and the "bottom" for the slide sync tones. Because of this format, a conventional cassette deck cannot *be used to record the sync tones (although a regular deck could be used to transfer the audio program to cassette prior to pulsing) or to play back the finished program.*

All of these simple sync systems use a 1kHz pulse of around a 0.5s duration to trigger the slide projector.

For many years, Wollensak sync recorders were widely used for A-V applications. They had the proper head format, internal sync-tone generators and detectors, an interface to trigger the side projector and a self-contained amp/loudspeaker. 3M decided several years ago to cease manufacturing these decks, but many are still in the inventories of A-V production and rental houses.

Teac has introduced a cassette deck with the correct head format, and added the capability of stereo audio. This deck, however, does not offer an internal amp or speaker.

Several manufacturers also make a 1-piece portable system that includes a slide projector, a rear-projection screen and a cassette sync/playback system. The slide tray sits on top of the box, and the pulsed audio cassette slips into a slot on the front. The Singer Caramate is one of the more common units being used, although it too is no longer in current production.

A more sophisticated A-V presentation will use multiple slide projectors. These will be set on vertical "stackers" so that the image from each projector can be aligned to perfectly overlap the others.

The 35mm slides will be distributed among all of the projectors in a sequential fashion. For instance, if three projectors are used ("A," "B," "C"), the first slide will be in position #1 of the slide tray on projector A, the second slide will be in position #1 of projector B, the third will be in position #1 of C, the fourth slide will be in position #2 of A, and so forth.

The pulse track will trigger a device called a dissolve unit which, in turn, will illuminate the slides sequentially. This results in a much smoother visual presentation because the black-out period between slides of a single projector is effectively eliminated. In fact, given sufficient projectors, it is possible to achieve a "motion picture" effect. (It is quite impressive to sit backstage and watch umpteen projectors clacking away in response to the commands of a sophisticated dissolve system.)

What makes all of this possible are microprocessor-based control systems available from a variety of manufacturers. A digital control track (not totally dissimilar to a time code or console automation track) is recorded in parallel with the audio program track, usually on a ¼-inch, 4-track reel-to-reel machine. This control track then tells the dissolve units which projector lamp to illuminate and which projector needs to advance to the next slide.

*Unfortunately, each manufacturer uses a proprietary sync format. Thus, if a large A-V presentation is destined to be used on the road, it is particularly important to determine the rental availability of suitable playback equipment at each location—*before *pulsing the show with a given brand of sync equipment. (Unless, of course, all of the required compatible gear is transported to each venue.)*

Speaking of oddball sync formats, a low tech one used with filmstrips comes to mind. Rather than using individual, mounted slides in a tray, a continuous band of 35mm film is prepared with the visuals properly sequenced. The portable playback machines often require yet another synchronizing method, and this one is a doozie.

A 50Hz pulse is superimposed over the regular audio track, and the low-frequency signal causes the machine to advance to the next image. Because the tones are being mixed with the audio program track, the entire show must be pulsed in one pass; drop-ins on the sync track to correct mistakes are an impossibility.

Because the 50Hz region is also the home of such things as kick drums and bass guitars, it is necessary to make a filtered copy of the final audio track to remove everything below 100Hz, thereby preventing false triggering of the projector.

I have found that cascading together several stages of a parametric equalizer will do the trick. One EQ stage is used to add a 4dB or 5dB bump at approximately 150Hz (to add warmth that would otherwise be removed by the following EQ stages), and is followed by one or more LF rolloff stages to create a brick wall response starting at 100Hz.

If the net response is down 15dB or so at 50Hz, false triggering shouldn't occur. However, if multiple dubs are made of the processed and pulsed audio track, be sure to spot check the dubs for proper performance. (I remember getting back some high-speed dubs that were cut at a much hotter level than the master, and the LF rolloff wasn't steep enough to avoid false triggering at the elevated levels used on the dubs.)

There are many other types of equipment used in A-V presentations, including film or videotape projectors that are fired at the appropriate time in the presentation.

A-Vs are truly a unique art form that often include a myriad of differing technologies, all under the direction of several slices of silicon.

seem to ignore the copyright laws and use commercial albums for the music tracks. I have heard *way* too many jazz instrumental albums as the backdrop for low-budget A-Vs.)

If custom music is required by the project, the composer will need to write the score so that it times out correctly with the previously recorded voice-over track. It is common practice to break the music track into several sections to avoid becoming monotonous; these break points should correspond to logical points in the voice-over.

Mix for the medium

The recording techniques will be about the same as any other album or jingle project. It is important to keep the audio presentation playback system in mind; if the audio is going to be heard over a 3-inch speaker in a self-contained projection system, then it makes no sense to record a synth track with lots of 30Hz fundamental.

The same sort of common sense also applies at the mixdown stage. *Always* keep the A-V playback system in mind. If the track is being played back in a large ballroom or hall, be sparing with reverb, because the room will add plenty of its

35mm slides are selected and laid in sequence on this vertical light table, prior to selection and loading into suitable projector trays.

own, and you can run the risk of obliterating the message with reverb on top of reverb.

Remember, the acoustics in your control room are *much* drier than a large hall. In the same vein, close-field monitoring and extremely high-monitor SPLs can result in a mix that will sound like garbage in a more reverberant space.

At the other end of the playback spectrum, most A-Vs end up being presented on small, portable systems. If your control room monitor chain consists of Godzilla SPL2000s, tri-amped with 1kW rms per channel, then you need to trot down to your local Radio Shack and buy a small, el cheapo replacement speaker and low-powered amp so that you can hear what the mix will *really* sound like.

In most A-V projects, the visual elements (such as product shots and title slides) will be gathered together while the audio track is being assembled. Once the sound track is completed (and, again "blessed" by the client if necessary), the visual production team begins the hairy task of trying to make *its* image match *your* audio.

Believe me, after going through a number of these projects, this process can be the most time-consuming, frustrating part of the whole project. Invariably, everything runs behind schedule, and the poor slide guys/gals end up putting in several 48-hour days trying to get the stupid thing out the door!

In a large A-V production, not only must the right slide be in the right tray in the right projector, hundreds or thousands of "cues" need to be entered into the memory of the synchronization equipment.

Once this hurdle is passed, The Client again enters the picture. With any luck, the final production will require little or no tweaking. Of course, clients have also been known to request a change in the voice-over script the day before the big presentation. ("You know, we really need to add a little section about our new gizmo scheduled for release later this year...")

Naturally, this type of change pretty much means starting again from the beginning and can lead to A-V producers strangling the client. That's why it is extremely important to have consistent and clear input from the client at every step of the production.

But, you hope all goes well at the client presentation, and the show is ready to ship. The folks at the sales meeting will soon see and hear the results of your handiwork, never realizing that the 15-minute presentation they are watching required hundreds of hours to create.

Presentation formats

In the case of the smaller, portable presentation, the original slides will be copied and collated into trays, and multiple copies of the audio track will be dubbed.

Interestingly enough, the large, extravaganza show is often such a hit that members of the audience will request a copy to play for the folks back home. It is usually impractical to do this, however, so a client may order a scaled-down version for such an application. Sometimes a single-projector version of the show is created for use with portable A-V systems. Or, the show can be modified to allow transfer to videotape. And, therein lies yet another pitfall.

If the audio was recorded for maximum bang in the ballroom, it just might not translate well to the small screen. A common mistake is to go hog wild with stereo effects that just cannot be wedged into a single, small speaker. If there is *any* indication that a scaled-down A-V may be required for field distribution, keep a close ear on such things as mono compatibility, or else you may soon be back at the mixing desk listening to the blasted thing for the 1,001 time.

There are so many facets involved with A-V production that it is just impossible to cover them in this brief article. However, I hope I have shed some light on this interesting market.

For a recording studio just getting started in this field, I suggest you team up with a visual production group that is lacking an audio department. Maybe the resulting synergy will put beans on your table and their's. R-E/P

All photography courtesy of Ackerman Hood & McQueen Advertising.

Recording and Mixing Tips for Audio-Video Productions

- *Unlike most pop tunes, you want your listeners to be able to clearly understand the voice portions (voice-over as well as any lyrics). Avoid the temptation to overpower the message with the music bed. A compressor/limiter with a ducker or voice-over input will keep the message out front in the mix, by establishing a preset level difference between the music and voice-over.*
- *Try to ensure that the music arrangement is not too busy under sections with a voice-over. Listeners may tend to lock in on the rhythm track rather than the voice-over. Save the musical pyrotechnics for the opening or closing sections.*
- *Because of the typical budget and deadline pressures, many A-V tracks are generated with electronic instruments (drum machines, string synths, etc.); MIDI-based equipment can make the project go faster and easier. The average listener cannot hear the difference. However, in order to create the desired sounds quickly, the musician/programmer must be* totally *familiar and comfortable with the MIDI gear; there is not time to allow six months of experimentation trying to find that* perfect *sound.*
- *Large-diaphragm microphones tend to work best for voice-overs. Condenser models, such as the AKG C-12, Neumann U-47/87 and dynamics like the Electro-Voice RE-20, seem to enhance a speaking voice and help it stand out in the mix.*
- *Compression of each individual musical instrument track, either while being recorded or during mixdown, can help keep the dynamics under control, without resulting in the squashed sound created by compressing the entire mix. If, for some reason, it becomes necessary to compress the final mix, a multiband compressor, such as those used by radio stations to process their on-the-air audio, will provide much better results than a single-band compressor.*
- *Always use appropriate monitor speakers and playback levels (see main article).*

Table 1. *Typical track sheet for a music/voice-over master.*

Track #	Assignment
1	Console automation #1
2	Kick drum
3	Snare
4	Hi-hat
5	*Drums left
6	Drums right
7	Bass guitar
8	Rhythm guitar
9	Rhythm keyboard
10	Vocals and instrument overdubs
11	Vocals and instrument overdubs
12	Vocals and instrument overdubs
13	Vocals and instrument overdubs
14	Vocals and instrument overdubs
15	Vocals and instrument overdubs
16	Vocals and instrument overdubs
17	Vocals and instrument overdubs
18	Vocals and instrument overdubs
19	Vocals and instrument overdubs
20	Vocals and instrument overdubs
21	Often used as a stereo pair for
22	"ping pong" track bounces
23	Announcer voice-over
24	Console automation #2

***Note:** Tracks 5 and 6 comprise a stereo mix of toms and a crossed pair of overhead mics.*

Behind Every Synclavier® There's a Success Story

Profile: André Perry

C.E.O. and Chairman of the Board of **The André Perry Group** and **Le Studio**

Visionary producer André Perry heads one of the most sophisticated music and video production facilities in the world. Located in a beautiful and secluded Quebec setting, LE STUDIO and THE ANDRE PERRY GROUP have proven that, with the right personnel and equipment, a studio doesn't have to be in a major urban center to stay on top. With his facility constantly booked, it's clear that André's philosophy of total service has paid off. Recent projects range from network TV series to records and videos by such leading artists as Chicago, The Bee Gees, David Bowie, and The Police.

He comments on the success of his first Synclavier Digital Audio System and his future plans: "The Synclavier was so simple to learn and use that two weeks after installing the system we did the music and sound effects for a major network Movie of the Week. It's been so cost-effective that we're already ordering a second system for our new Washington, D.C. facility."

André Perry

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Sound Reinforcement for the 29th Annual Grammy Awards

By David Scheirman

Providing high-quality front-of-house and on-stage monitor sound for this prestigious live, 3-hour telecast from the Shrine Auditorium, Los Angeles.

An estimated worldwide TV audience, conservatively rated at 50 million persons, tuned into the live broadcast of the 29th annual Grammy Awards, Tuesday, Feb. 24, from the Shrine Auditorium, Los Angeles. Produced by Pierre Cossette Productions for CBS, the annual event was a culmination of combined efforts by many of today's most talented technical geniuses.

The Grammy Awards telecast has recently benefitted from the work of sound designer Murray Allen, president of Universal Recording, Chicago, and chairman of the National Academy of Recording Arts and Sciences' Technical Education Committee. Allen has worked closely with Audiotek Corporation, based in Burbank, CA, which served as sound reinforcement contractor for the event over the past several years.

David Scheirman, RE/P's live-performance consulting editor, is president of Concert Sound Consultants, Julian, CA.

"Getting it right for broadcast is of paramount importance," Allen confides. "However, we also have to bear in mind that the actual house audience is a very critical group of people. We have gone to great lengths to coordinate the live sound with the televised and taped sound of the show, so that everybody benefits."

Working in conjunction with Allen and the NARAS national committees, Audiotek has assembled a sound reinforcement system dedicated to the Grammy Awards. This rig includes special scaffolding systems for Shrine Auditorium, a sophisticated delay-speaker array network, plus complex house and stage mixing facilities. Pre-event coordination with the Greene, Crowe and Co. and Record Plant remote truck crews has smoothed the sound for the Grammy Awards into a finely-tuned audio presentation.

Live house-sound mixer for the Grammy Awards, Audiotek president Jim Showker first became interested in audio while attending the University of Virginia School of Engineering.

"Most of my audio education is actually self-taught," advises Showker. "I was always interested in different sound equipment and the theories behind actually building it. Upon moving to California, I gained access to the engineering library at Cal Tech; I got into building my own crossovers and loudspeaker systems."

Showker's compact sound systems and his interest in mixing televised events began to pay off; in 1977 he worked on the *Golden Globe Awards*. Several years in partnership with fellow soundmixer Bruce Burns led to work on many televised events, including *Don Kirschner's Rock Concert*.

In 1983, Showker formed Audiotek Corp. Recent work, in addition to the Grammy Awards, has included the Boston Pops for Liberty Weekend, and industrial theater events for corporations such as the Pontiac Division of General Motors.

The sound reinforcement system in use

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Figure 1. Audiotek president Jim Showker served as house PA soundmixer for the 29th annual Grammy Awards.

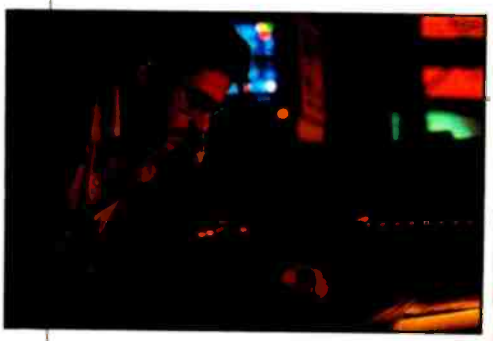

Figure 2. Scott Harmala of Audiotek handled stage monitor mixing duties.

for the 29th annual Grammy Awards included loudspeaker systems designed and built by Audiotek, along with a 40x16 dedicated stage monitor mixing console conceived and constructed by Jim Showker and Scott Harmala, who served as the primary stage monitor mixer for the Grammys (Figure 1 and 2).

Cooperative effort

An event as complex as the Grammy Awards telecast involves a host of specialists and a battery of technical production equipment, all brought together to the same place at the same time.

"No one single person can take credit for a subject as broad as sound for the Grammys," Showker says. "It just plain wouldn't happen without a team effort."

In addition to Audiotek's rental sound system, this year's event made use of sound reinforcement and communications equipment from Burns Audio, A-1 Audio and McCune Audio-Visual; remote trucks from Greene, Crowe and Co. and the Record Plant were on hand for audio and video taping.

Ed Greene mixed the show's music for telecast, with Don Worsham and Paul Sandweiss handling tape cues and podium microphones. Rich Breen of Universal Recording, Chicago, coordinated the truck sound with the live PA.

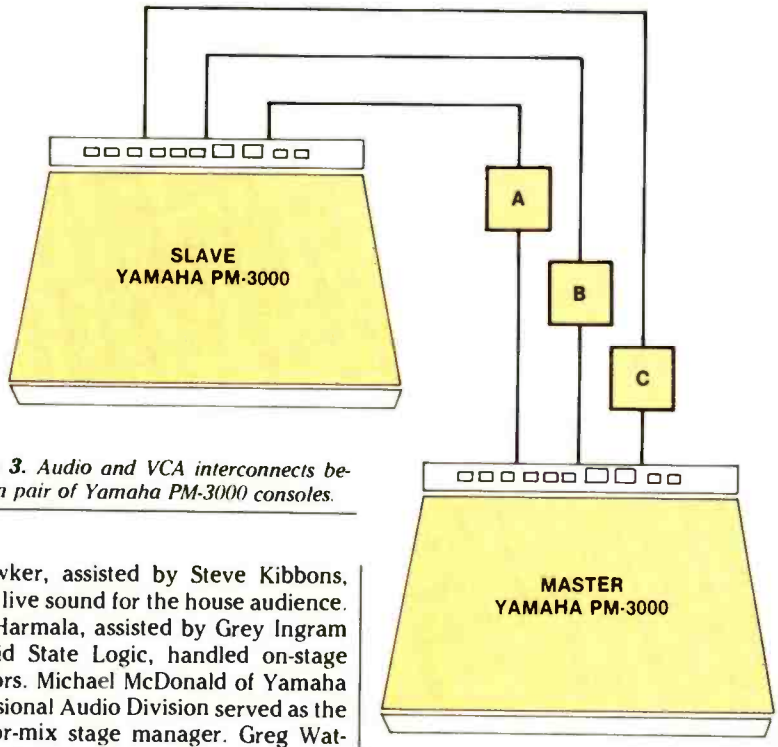

Figure 3. Audio and VCA interconnects between a pair of Yamaha PM-3000 consoles.

A) Slave stereo left and right outputs return to master stereo left and right sub in.

B) Slave cue left and right buss outputs return to master aux in 1 and 2.

C) VCA/mute logic control via 24-pin interconnect cable.

Showker, assisted by Steve Kibbons, mixed live sound for the house audience. Scott Harmala, assisted by Grey Ingram of Solid State Logic, handled on-stage monitors. Michael McDonald of Yamaha Professional Audio Division served as the monitor-mix stage manager. Greg Watkins and Steve Huntley assembled and supervised communications equipment.

Technical assistance for the event's multiple set changes, on-stage equipment setup and microphone positioning was provided by members of IATSE Local #33 (Alan Metcalf, James Bonetti, Greg Samoyloff, Bill Young, Tim Chavez, Joe Doucette and David Van Geisen) and Local #695 (Jeff Fecteau, Bart Chiate, Murray Siegel, Ric Teller, Mark Webber and Klaus Landsberg). The Los Angeles area Local #695 is perhaps the world's only local dedicated to sound technicans for film and television.

House PA mix

With the advent of stereo television programming, televised broadcast audio is becoming more important than ever before. The increased scrutiny in the broadcast area also has its effects in the live audience sound.

"Whatever we do with the live PA inevitably will affect what shows up in the broadcast trucks," Showker explains. "Any little hums, buzzes or feedback squeals are not tolerable. The PA mix *has* to be exceptionally clean [to prevent] a negative effect on the televised sound...the two go hand in hand."

Audiotek supplied a pair of 40-input Yamaha PM-3000 consoles for the front-of-house position to receive stage inputs from five separate 27-pair snake cables; the brass, string, woodwind and horn sections were mixed in the remote truck and the submixes returned to the house PA position. The two PM-3000s were linked together, affording Showker the ability to control group levels and main stereo outputs of the second console directly from the primary console VCAs (Figure 3).

The "slave" PM-3000, on loan from Yamaha International, was located directly behind Showker at the mixing position; once inputs were grouped and assigned, and a music mix set during technical rehearsals, the actual show mixing was done primarily with the front console (Figure 4).

"This is perhaps a first," Showker notes. "The PM-3000 console has been available for approximately one year; they tell me that our event is the first known use of the 24-pin interconnect cable to link up a pair of 40-channel boards for simultaneous VCA/mute logic control operation. The programmable mute and VCA control function is a great new technology; it certainly is helpful on a complex show like this one."

Outboard signal processing gear used for house mix included Yamaha Q-2031 third-octave graphic equalizers, dbx model 166 compressor/limiters, White sixth-octave filter sets for channel-insertion on the podium microphones and a Yamaha REV-7 digital reverb.

"The podium microphones are actually one of the most important parts of the

show," Showker advises. "If the audience cannot hear the dialogue and announcements, then the show doesn't work at all. We use a pair of Schoeps condenser mics on each of the two podium positions; then we turn up the gain and really go to work with the Whites to get rid of feedback rings." (Figure 5.)

For mixing tape playback cues and the podium microphones, a 16-input Soundcraft 200-B console operated by Steve Kibbons was patched into the main Yamaha console.

House speaker system

The primary sound source for the audience area mix comprised left and right loudspeaker stacks on custom-built scaffolding platforms. The Shrine Auditorium's architectural characteristics require that the speaker system be elevated above the stage level, yet projecting side balconies interfere with traditional stacking methods and arranging hanging points for the main left and right clusters is not feasible (Figure 6).

To solve this challenge, Audiotek designed scaffolding that allows the assembly of a speaker array each year, with precisely-aimed coverage patterns with compact enclosures. The scaffolding is stored for use at the next year's event.

Speaker system components included three low-frequency enclosures per side, each containing four Electro-Voice DLX-15 15-inch speakers, and three mid/high frequency enclosures per side, each containing two JBL model 2385 horns on 2445 drivers, and a JBL model 2425 compression driver mounted on a custom Audiotek horn. An overhead center cluster of McCune SM-5 cabinets was positioned from rigging points in the ceiling.

Crown and Yamaha amplifiers powered the speaker system; the electronic crossover selected by Audiotek was the new 24dB per octave filter unit from TDM Design. Housed in the power amplifier racks, the TDM units offer 4-way configuration in one rack space.

"We used to build our own crossovers," Showker says. "The cost of the parts has really gone up now and today it's possible to find some excellent commercially built units."

Delay speaker system

In addition to the left, right and center loudspeaker clusters, five separate delayed matrix outputs from the main PM-3000 mixing console were used to

Photo by John Locke III

Figure 4. *The house mixing position featured a pair of Yamaha PM-3000 consoles and a Soundcraft 200-B submixer.*

Figure 5. *Two podiums were each supplied with a pair of Schoeps condenser microphones. Channel-insertable White filters sets were provided for podium mic E.*

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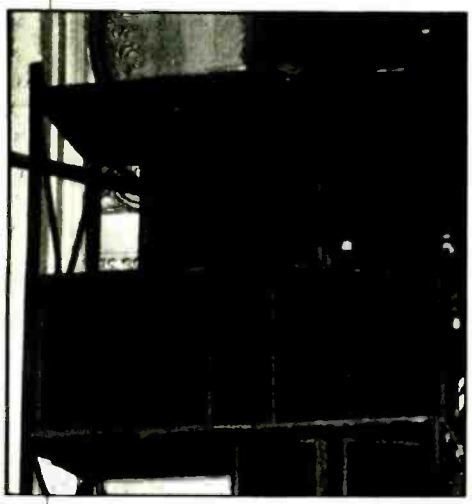

Photo by John Locke III

Figure 6. Custom loudspeaker stacks were arrayed on specially constructed scaffolding platforms, made to cover the Shrine Auditorium.

distribute the house sound evenly to various seating areas. In addition to program content and equalizations, the arrival time to various listening areas throughout the house was adjustable. A Yamaha YDD-2600 4-in/8-out digital delay unit was used to provide outputs to various speaker clusters (Figure 7).

A pair of Audiotek ATK M-2 compact enclosures were provided for downstage center front fill; four ATK M-3s were suspended beneath the balcony lip for under-balcony coverage. Each hanging M-3 was equipped with an E-V DLX-15 low-frequency component and a JBL model 2445 driver. The smaller M-2 units house a 1-inch 2425 compression driver.

Stage setup

To make the show flow smoothly, backstage technicians pre-set each live performance group's equipment on rolling carts. Stored in a backstage hallway until needed, each cart contained drum sets, guitar amplifiers, keyboard racks or whatever was required in different positions for each portion of the show. As entertainers such as Simply Red, Dwight Yoakam, Luther Vandross and Janet Jackson took the stage during the telecast, stage sets were quickly re-arranged to reflect each artist's needs.

Over 200 microphones were available in a collective pool from Audiotek and the remote trucks; stands and cabling were pre-set on each rolling cart. Shure SM78, SM57 and ECM50s, Sennheiser MD-416, 421s and 441s, AKG C-451E and C-452 condenser mics, and Countryman miniature cardioid and omnidirectional units were available in abundance.

All hand-held vocal microphones were Cetec-Vega R-42s on wireless links; a dozen separate RF channels were available, with each unit being activated and ready for use. Performers were pre-as-

Improving Live Television Sound

A Personal Observation by Murray R. Allen, Grammy Awards Sound Designer

In a review by David Gritten that appeared in the Los Angeles Herald Examiner *Feb. 25, 1987, sound for the 29th annual Grammy Awards was described as follows: "All the music, in fact, sounded splendid, even without the benefit of a Stereo TV—sharper, clearer and with better definition between instruments than on previous Grammy shows. It helped considerably."*

The only major change we made this year was the use of a Solid State Logic SL6000E console with Total Recall as our source for monitor mixing. Normally, monitor mixing for a live TV show can really be a big headache. Act one might comprise 18 microphone and direct inputs. Each input source needs 4-band equalization. From these 18 discrete sources the act might require six or seven different monitor mixes. Act two has 20 inputs with similar equalization and monitor mix needs.

If the amount of time we have between act one and two is seven minutes, we have to diddle 430 knobs in 420 seconds. To make this task even more difficult, we are usually working in an area without much light, and are resetting these 430 knobs while referring to some hand-written track sheet made out at rehearsal. To reset all of the many dozen controls to the proper setting in the allotted time cannot be accomplished, not even by a Gold Medal Olympic Mixer.

So what happens? The three days of individual rehearsals are finished. Now it is time to put it all together in real-time. We start the dry run the morning of the show. Act one is happy—after all, we had the entire night to reset this act's monitor mix! Act two is really unhappy because we only had time to put up 75% of the mix. The musicians and singers, being quite stoic, proceed to perform as best as they can.

To offset the strange monitor mix they are hearing, they make compensations by playing and singing at different levels than at rehearsal. This automatically throws the mix in the house PA and the mix in the broadcast truck up for grabs. Of course the act, while performing is making nasty glances and obscene gestures at the monitor mixer, who is probably trying his best to get the rest of the mix back to where it was at rehearsal.

As the mix returns, the act once again changes its levels to uncompensate for the bad compensations made while they were going through their stoic effort. The house PA and broadcast mixer are now praying that this act will finish early to spare them anymore embarrassment. At last they finish as scripted.

Now to reset for act three. This time we have 700s with only 756 diddles.

Not every act change might be this difficult; however, try to reset a console to 0.25dB tolerances throughout all level and equalization parameters and see how long it takes to be 100% accurate. Remember, just one mistake of a few decibels might throw the whole thing up for grabs. Now you have to go through the whole mess to find your mistake.

I felt that if I could solve the monitor problem, everything else would go better during the telecast. The obvious answer was to use a Solid State Logic console with Total Recall automation. During downtime in rehearsals, the monitor mix engineers would practice their changeovers. I asked them if they could make the most difficult resets in under five minutes.

After practicing these turnarounds, the monitor engineers were setting new speed records with the Total Recall system. The most difficult changeover took only 210s. Throughout the dry run, we kept hearing mystery applause. Later we found out that it was caused by a small group of visiting engineers sitting near the SSL—they were applauding the speed of our monitor mixers!

The result was as we predicted. Every act was happy with the monitor mix during the dry run and the show. When they came on-stage, the performers knew they would hear exactly what they heard during rehearsals; they automatically performed at their best. Because a musician who performs well makes any sound mixer sound better, a consistent monitor mix gave the house PA, as well as the broadcast mixer, a better shot at everything while making life easier for the on-stage performers. And, there was not one feedback in the stage monitors during the dry run or live-broadcast.

This was the best sounding Grammy Show ever, if not the best sounding live show ever. And, to make it even more exciting, the press recognized the improvement. When was the last time you ever saw the press comment on the sound quality of a television show?

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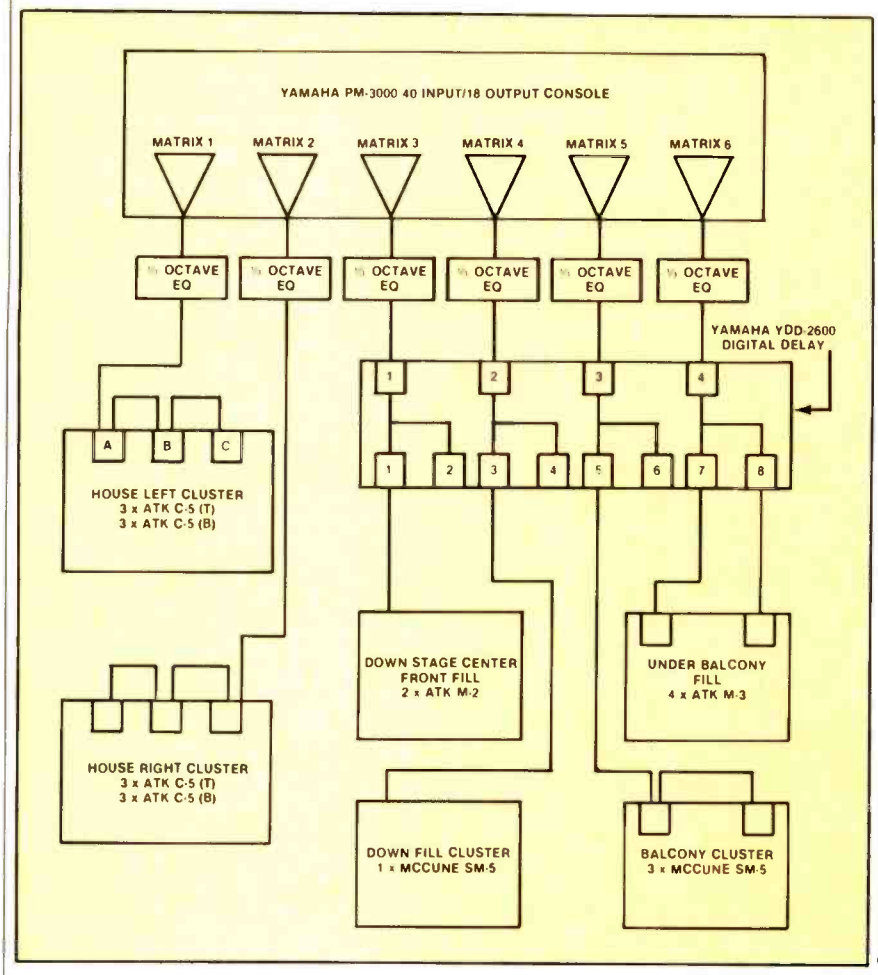

Figure 7. *House speaker delay assignments.*

Photo by John Locke III

Figure 8. *A wireless microphone monitoring position was provided to maintain a constant watch on the 12 RF mics; here, technician Klaus Landsberg mans the Yamaha M-916 board.*

Figure 9. *An SSL SL6000 E 32-input console was used to submix live performance band microphone inputs; the board's Total Recall system made set changes instantaneous.*

signed an RF channel, and cue sheets advised the trucks and the sound reinforcement mixing positions as to what voice should be appearing on what microphone. A Yamaha M-916 console located near the stage-monitor mix position was dedicated to handling outputs from the various wireless microphone channels.

"The main board operators aren't really able to do critical soundmixing and worry about wireless mic channels at the same time," notes Klaus Landsberg, who manned the wireless monitoring position (Figure 8).

"We keep fresh batteries in each unit, changing them about 30 minutes prior to each rehearsal and performance segment; if one of the wireless channels starts to drift, we alert the crew onstage through the intercom system and all board positions are informed as we make a change from the cue sheet."

Stage monitoring system

With up to 10 live bands appearing on the same stage within a 3½-hour period—each expected concert-quality sound but had insufficient time for a soundcheck during the televised event itself—the stage monitoring system for the Grammy Awards presented quite a challenge. Operated by Scott Harmala of Audiotek and Grey Ingram of Solid State Logic, the monitor system was both simple in its design format and complex in its flexibility.

"The decision to incorporate a Solid State Logic console with Total Recall automation," Harmala notes, "was based on our need to be able to set up different audio scenes for each different live act, and then have those be absolutely repeatable, time and again, as we went through the technical rehearsals that led up to the televised event.

"The 6000E's Studio Computer gave Grey [Ingram] the ability to keep a computerized record of the various board functions for a certain act; as we went through set changes, the computer re-set the console instantly. Changes can be made in real-time, of course, as needed," Harmala says. "As the computer is addressed to make an EQ or fader position change, the color monitor displays that change as it is graphically depicted." (Figure 9.)

The SL6000's I/O (input/output) module contains two signal paths that provide complete channel input, output and monitoring facilities. During standard operation, the channel level is controlled by a large VCA fader and the monitor level by the smaller audio fader.

Seven signal-processor routing pushbuttons in each module allow the 4-band parametric equalizer, pass filters, onboard compressor/limiter and expander/gate circuits to be switched into either the large or small fader signal path in over two dozen combinations.

Ingram mounted a full-color CRT monitor above the console's meter bridge; an on-board switcher enabled the operator to go back and forth between the televised video program and the SL6000E's Total Recall channel display program, along with the Real Time System "preset list" that displayed pre-programmed information.

Seven bus outputs from the 32-channel SL6000E were taken into Audiotek's custom ATK-4016 40-input/16-output monitor console. Designed and built by Audiotek's Jim Showker and Scott Harmala, the ATK-4016 was used to supply eight separate stage output mixes. On-board parametric EQ is available on each of 16 available mix outputs (Figure 10).

"Mixing the stage monitors for this show is actually the hardest job of all when it comes to setting up the sound reinforcement," Showker confides. "Feedback absolutely *cannot* take place, and having the mix EQ controls right at the operator's fingertips, on the console face, can mean the difference between a 'squeak,' or catching it in time."

Audiotek's custom floor-monitor speakers were hidden throughout the

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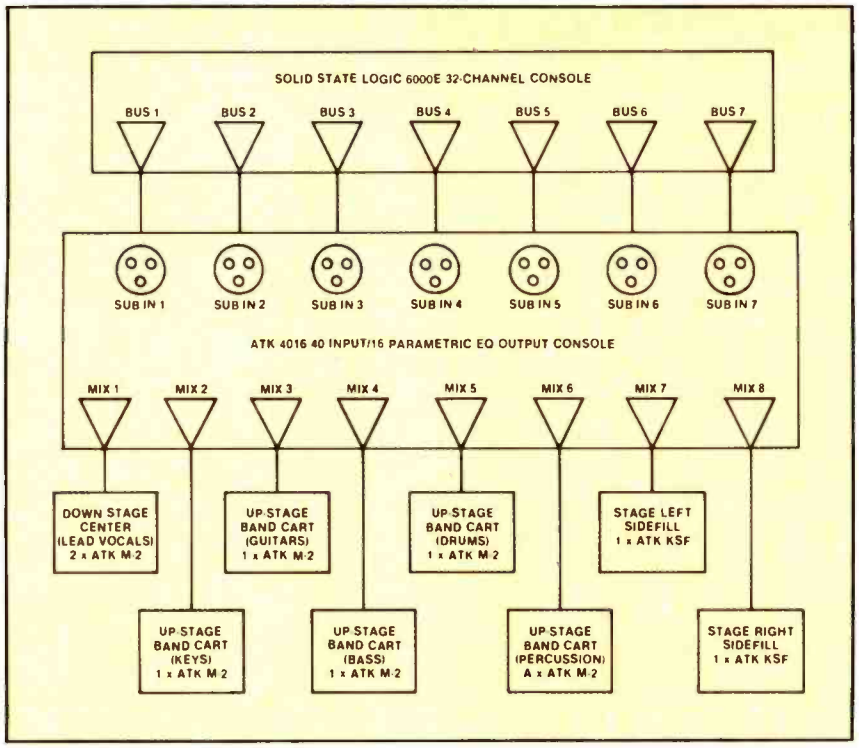


Figure 10. *On-stage monitor console patching.*

stage sets; advance planning and coordination with the show's art director enabled Showker and Harmala to determine the optimum position for each cabinet.

"Many of the performers are relying on tape playback," Harmala notes. "If the monitor speaker is too far away there can be a problem with delay, and it throws the singers off; if they are too close, the level can bleed into the mics affecting the broadcast sound, and the visual effect for television is not as good."

Sidefill speaker systems on rolling carts were positioned as needed throughout the event; a stereo left and right mix was available from the ATK-4016 monitor console.

Mobile interface

Of primary importance in a televised event is communications between the broadcast and taping trucks, and the sound reinforcement mix positions. Vocal and instrument line assignments, tape playback cues and in-show emergency changes all require instant and up-to-the-minute information exchange.

"On events like this one, the headset communications setup is practically turning into its own department," states technician Steve Huntley. "One used to see carpenters, electric, sound [technicians] and so on; the communications systems are getting so specialized now for shows like the Grammys that it has become a special group of technicians in its own right."

While much of the microphone cabling was pre-set onstage with multipair boxes on the rolling carts, there was a significant amount of "hot-patching" to be done during the event itself. Multipair cables with a common numbering system and wiring setup for each splitter were supplied by Audiotek and the two remote trucks.

"A lot of credit goes to Jack Crimes, who worked on the wiring and setup for most of the Record Plant trucks," concedes technician Michael MacDonald. "Jack came up with the idea that if the people who were working on and supplying equipment for these various major events were to all *standardize* their cabling systems, these remote recording dates would go more smoothly for both the PA and the truck crews.

"As it happens, everyone supplying multipair cabling for the Grammys is now using the same basic type of snake system."

Pre-event setup

Equipment load-in began four days prior to the Grammy Awards Telecast. Band gear was rented from Studio Instrument Rentals, Hollywood, and portable carts were set up for a technical rehearsal run-through. Scaffolding for the loudspeaker system was erected, and the under-balcony and center delay clusters suspended.

"No matter how much advance preparation goes into something like this, there are *always* last-minute changes," Showker explains. "We had a dedicated center cluster ready to go in the shop. As it turned out, there were some changes in what size of temporary speaker system would be allowed to hang from the ceiling over the audience, and we brought in a smaller rental setup to make things work.

"Putting together a smooth production, and being flexible enough to make sure that all involved parties are comfortable with the end results are what is important with this type of event."

Showker has found that the type of events his company handles often requires a certain degree of finesse that is hard to find in other parts of the sound reinforcement industry.

"What it often comes down to is sensitivity to particular situations," he says, "and a willingness to compromise, always looking at what is best for the whole production instead of just for the PA system and its operators.

"Whether it is placement of speakers, or overall show level, or a particular type of mic stand, we always take everyone's needs into account...the show producer, the art director, the working crews and the artists.

"A truly fine production like the Grammy Awards is like an intricate puzzle," Showker says. "It *is* possible to make it go together smoothly and have all the pieces fit the first time, provided you look at the effect the sound system will have on other parts of the show."

After extensive planning, multiple meetings and the shuttling of input lists and stage plots back and forth, the 29th annual Grammy Awards puzzle did fall into place smoothly. The combination of extensive house and stage-mixing control and dedicated delay/EQ zoning setups for the audience-area speaker system gave Audiotek the ability to lock in the right program mix, and then tailor the sound of the show to suit each different seating area in the Shrine Auditorium.

"There just is no way that a 'one-nighter' mentality or attitude will work here," Showker says. "Even though the actual event is just a few hours long, there are thousands of man-hours of preparation. For example, just setting the delay outputs and EQ for the different zones—I believe we had five distinctly different seating areas to work with—took most of one day to set up correctly."

Once the house system was ready, rolling carts and stage monitor mixes set, and all lines to the trucks confirmed, full rehearsals with the stage orchestra, guest bands and singers were scheduled. Particular attention was paid to any effects the sound reinforcement system might be having on the broadcast mix.

"The sound from the PA system has really not been a problem," advises broadcast music mixer Ed Greene. "Audiotek's system has been designed specifically for this event; it all works well together. We use many direct inputs, plus close-mic techniques; there really is

no noticeable bleed of the PA sound onto the air."

In fact, Greene had a pair of microphones suspended above the stage on flylines to provide master control of the ambient musical sound.

"We actually get a pretty dry sound in the truck," he explains. "Since this is a very enthusiastic audience, during the live musical numbers the audience sound can actually cover the house PA sound. We bring in the overhead stage mics to pick up a little more musical 'body.' "

During the morning of the show, final monitor "tweaks" were made on the SSL Studio Computer and the ATK-4016; wireless mic channels also were checked and re-checked for possible interference. A final run-through of the upcoming telecast with clocked tape playback cues and stand-ins in place to confirm camera angles and possible podium mic feedback problem frequencies was staged.

As millions of television viewers can testify, the 29th annual Grammy Awards sounded *good*. The attention to detail that is now being paid to both broadcast and live PA sound for important televised events is making a difference; sound is no longer taking a backseat.

Of particular interest at this event was the use of a SSL console for sound reinforcement use; does a 2,200-pound, quarter-million dollar console really have a place in the PA industry?

"We feel it does," advises SSL's Grey Ingram, assistant stage monitor mixer for the Grammy Awards show. "For instance, here we have only four minutes total time to make a complete set change between Simply Red and Luther Vandross' band. The rolling carts and the backstage patching are no problem, it's a breeze for them. But, if you have ever tried to completely reset a large console for major acts in that amount of time, then you know that it's high time that computer technology was used to speed up the process."

Audiotek soundmixers Jim Showker and Scott Harmala both expressed the opinion that improving the primary board operator's ability to focus on mixing sound, instead of re-setting, patching and troubleshooting, helps lead to a more perfect show.

"The improvements we made this year in the actual console technologies—the onboard parametric EQ on the ATK-4016 for monitor outputs, the slaved Yamaha PM-3000-40s with VCAs and programmable mutes and the SL6000E Total Recall System—all added up to a big plus," Showker says. "The easier it gets to actually *mix* on the systems, the less tension and the smoother the results."

Whether or not console computer automation for live-concert sound makes further inroads in the next few years, one thing is certain: technology is currently very expensive. The cost-effectiveness of such new console features will be heavily leveraged against the actual profitability of the events for which it seems to be required.

If the ever-expanding net of global mass-media communications continues to combine live-concert sound for contemporary artists with televised broadcasts, and if those broadcasts continue to work on audio improvements, then the system assembled for the 29th annual Grammy Awards may very well turn out to be a prototype for a new generation of concert mixing systems for globally televised entertainment events. R-E/P

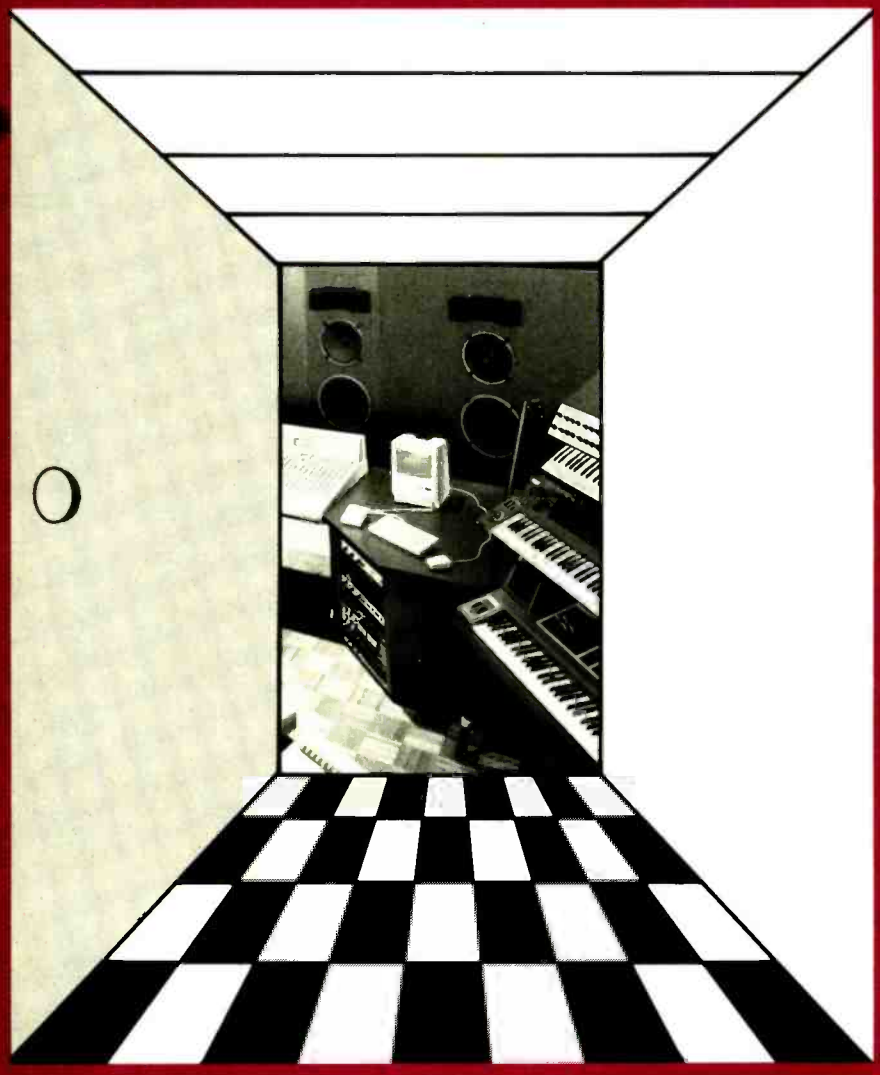
Photos by David Scheirman.

Author's Note: The mention of specific manufactured audio products and service companies in this feature is made with reader interest and education in mind. No endorsement is offered or implied – *DS*.

The Future of Electronic Music Production

By Paul D. Lehrman

The time: Five minutes, or maybe five years, from now. The place: Right next door.



It's 8:30 a.m. when Sam, the second engineer, arrives for work at the studio. He takes a quick look at the day's schedule, then walks over to the library and pulls out the five optical audio source disks, the two floppies, and the video reel required for the morning session. He goes into the clean room, where the stacks of hard disk drives are located. They've been spinning quietly all night, as they do every night, so he doesn't have to turn anything on. The front-panel lights are all showing green, but he runs all of the drives through status checks anyway. In the machine room, he loads the reel of tape marked Rough 1 onto one of the ¼-inch digital videotape transports. Then, in Studio A, he warm boots the console, and the large, high-resolution color CRT lights up.

On the console's alphanumeric keyboard, Sam types in his access code, and then the relevant codes for the client, session engineer and project. Then he inserts the floppies. On the screen appear the names of the 133 tracks in the current project, in alphabetical order. With the mouse or track ball, he points to the first five tracks to be worked on today. A new screen appears, showing the names of the 30 audio source files, the 16 synthesizer modules and the 40 banks of voices used in the five tracks, all in the order in which they are to be accessed. He confirms the information with a keystroke.

In the corners of the screen appear four smaller windows, each accessible with a single mouse click. These are the custom screens that the engineer has designed for this project, which reconfigure the console layout and functionality into the ways that he likes when confronting various production tasks. Like all of the control information, setups for the custom screens are stored on the floppies.

Finally, the laser printer next to the console quietly comes to life, and prints out four copies of all the information: two for the engineers and two for the client. The studio is ready.

The music production studio of the near future will not have to wait for any radically new technology; the technology to support the next 10 years is already here. But the best and most efficient ways to use it are what remain to be developed.

Everything, of course, will be digital—the only analog devices will be microphones (and their pre-amps, if they need them), power amps and monitor speakers. The two overriding philoso-

Paul D. Lehrman is a Boston-based free-lance writer, electronic musician, producer and a regular **RE/P** contributor.

phies will be modularity *and* integration. *Like today, there will be many types of devices, each suited for its own purpose, but they will all be part of a whole, and all will be able to interact and relate to each other.*

Many, if not most, will be black boxes, or even just plug-in circuit cards, designed to perform a multiplicity of functions, under the control of a single console-like device, linked to a number of powerful microprocessors, many storage devices and a prodigious amount of memory.

Defining instruments and sounds

When Ed the engineer and Clint the client arrive, the first track is waiting for them.

"I was listening to the mix on my R-DAT player in the car last night," says Clint, "and I'm not happy with the bass sound. Let's look at it. Was that FM?"

"Yeah," Ed confirms. He mutes all the tracks except for the bass and hi-hat, and puts on the screen a representation of an FM synthesizer with 12 operators.

"I think it's got a little too much bite," Clint offers.

"How's this?" Ed asks as he moves a mouse to the operator box labeled "Attack mod/freq=3.0." As he grabs a vertical bar labeled "output" and drags it downward, the sound starts to mellow out.

"Good," Clint considers, "but don't let it get too muddy."

"You got it," comes the reply, as the engineer moves to another box labeled "Sustain bottom/freq=0.5" and pulls the level on that down as well.

"That's fine," says the client, and Ed records the new settings on the floppy by typing in "Bass 1c" and the date.

MIDI synthesizers and keyboards will be entirely separate animals. Besides a range of keyboards representing a variety of styles, from feather-touch organs to heavily weighted concert Steinways, the studio will have a multitude of other types of synthesizer controllers. These will include devices that look like mutated guitars, marimbas, flutes, tiny trumpets, zithers and huge metallic glove-like objects, which can be hauled out when needed.

The synths themselves will simply be black boxes in a rack somewhere out of sight. Like many of today's synths, they will be essentially digital-to-analog converters, but with a completely open architecture that will allow multiple voices, configurable with multiple timbres, and the exact numbers of each will depend on the complexity of the desired sounds. Programming the synths will be done primarily off-line, first by specifying the type of synthesis used—FM, wavetable, linear-predictive, additive, subtractive or sampling—and then organizing the synthesizer parameters.

But with MIDI 3.0, which will allow 1,024 data channels running at 2MHz, changes in the synthesizer programs can also be handled in real time, so that adjusting a patch to suit a track is no more complicated than turning the knobs on an equalizer. These changes can be recorded and automated.

Sampling and synthesis

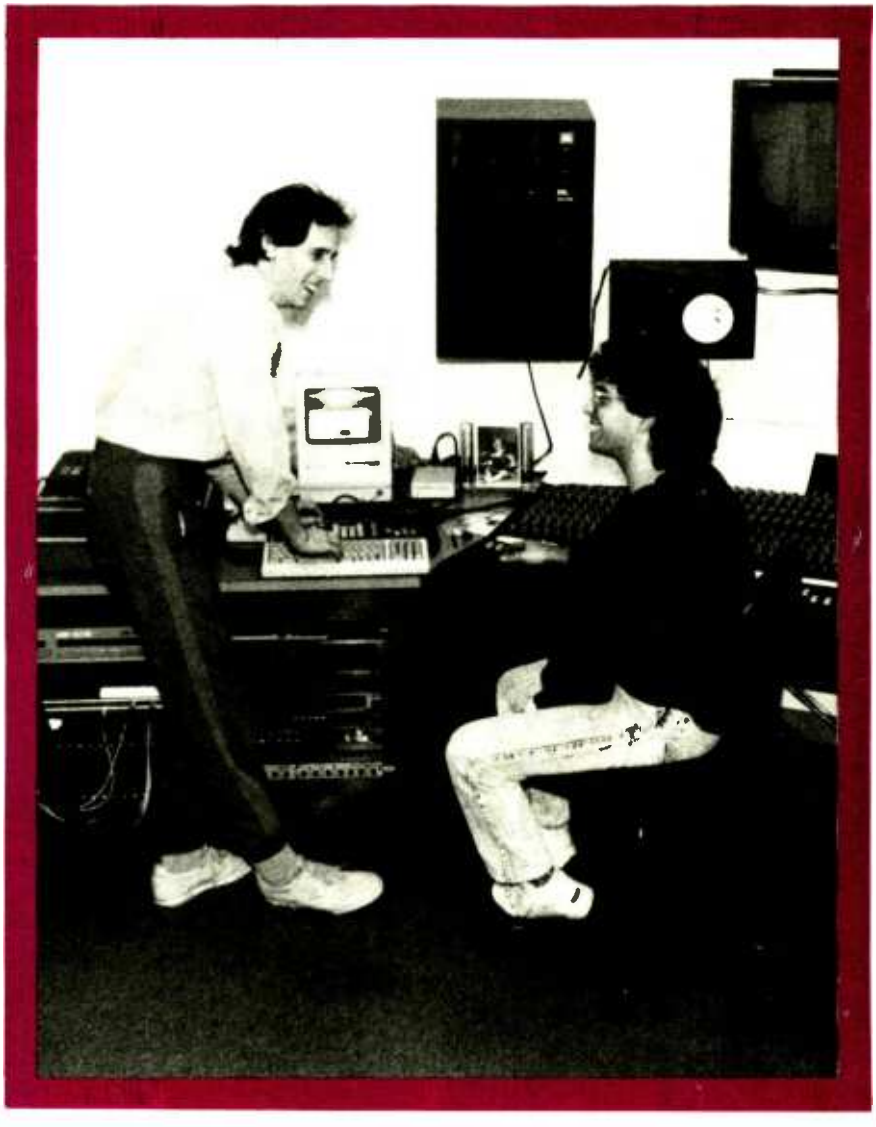
"OK, gimme some of the guitar," says Clint. "I like that sound. Where did you get it?"

"Oh, that's something we had on optical disk," comes the reply. "We have a whole library of different types of strums and chords. Although, by now, most of them are in the machine as models."

The definition of a "sample" will undergo a profound change. Although, originally, a sample file might consist of an entire guitar chord, under computer control the individual notes can be extracted and dealt with one at a time. From the material in one sample chord, entire phrases based on any combination of strings can be built, with control over rhythm, speed, order, dynamics and pitch, just as today's MIDI sequencers play synthesizers.

The distinction between sampled and synthesized sounds will become less significant. Modeling programs in the com-

For more "modest" electronic-music composition and production sessions, a facility such as the new microPLANT, which recently opened for business at the Los Angeles Record Plant, is intending to provide a viable alternative. Production hardware includes a 32/8 TAC Scorpian console, JBL and Yamaha monitors, Fostex E-16 ½-inch 16-track, time code interlock, and a variety of MIDI-based synthesizers linked via a MAC+ PC. Pictured here are composer/arranger and producer Randy Miller (left), who recently completed the score for The World of the Talisman, *a cable TV feature, and microPLANT's owner/engineer, Steve Deutsch.*



puter will allow a sampled sound to be analyzed and then resynthesized and modified, using whatever synthesis technique is best suited for the job at hand. If, for example, you wanted a long, sinuous background sound based on a guitar timbre, the resynthesis model might be subtractive; if bell-like tones were what you were after, you'd try FM; and if you wanted a "talking guitar" effect, you'd use linear-predictive.

"It does sound a little mechanical," Clint concedes. "Can we get it more laid back?"

"Let's try this," Ed offers, as the guitar track appears on the screen. The chords show up as vertical lines, as a time scale scrolls across the bottom of the screen. He selects four measures, and then with the mouse takes the lines representing every second chord in each of the four measures, and moves them ever so slightly to the right. He presses the Play button, and the four measures repeat a few times in perfect rhythm.

"I like it, I like it!" smiles Clint.

Ed smiles too, as he pulls down a menu and selects "Global" to make the change effective over the entire track.

Centralizing and decentralizing hardware

A small icon at the bottom of Ed's screen shows that Carl, the composer, has entered the facility, and is working in Studio B. Ed picks up the phone and punches two numbers.

"How're you doin'?" he asks.

"Good," comes the reply. "I did the sweetening for the finale late last night. I'm just cleaning up the string parts a little. You want to hear it?"

"Sure," says the engineer. "How many generators you need?"

"I could use about six more from you," says Carl.

"Fine," says Ed, and allocates six of the D/A converter modules he's been using to the other studio, at the same time turning control of his console over to Carl.

"Hi Clint!" comes Carl's voice over the monitors, "you're going to love this," as the music fills the room.

Local area networks are already a fact of life for offices, where storage and input-output facilities (like printers) are shared among several users. In the multiroom music production house, with multiple-duty hardware completely under remote control, it makes sense that devices not being used by one studio should be available to another at the flip of a (software) switch.

Storage

Clint is pleased. "Print it!" he says.

"No, I don't want to put it on optical yet," Carl replies. "I want to make sure it balances correctly with the effects. We'll check that out tomorrow and, if it's good, we'll get it off the hard disk and onto optical."

With the development of write-once (WORM) optical discs, materials that are completed, that will be used often or that need to be transported to other facilities, can be stored off-line, relatively inexpensively. While hard disks will be the medium of choice for on-line materials, optical discs will serve for everything from effects libraries to finished masters.

Hard disks will be the medium of choice for on-line materials, optical discs will serve effects libraries and finished masters.

Floppies will still be used for non-data-intensive applications, such as instrument definitions, catalogs and configurations, as well as for certain types of real-time information. These are like automation sequences, which can be easily transferred to hard disk for a session and then moved back to floppy for security or transport.

Composing

The client and engineer go back to playing with the finished tracks, while Carl looks at the next cue he has to write. He presses "Record" on his console, and a yellow light appears on one of the hard disks in the machine room. He picks up his guit-troller and starts to tap on the 12 strings with his two hands.

A melodic pattern begins to emerge that he likes, so he stops and plays back the last few seconds. As he listens, he thumps out a rhythm on his touchpad. Small bars representing the notes appear on the screen, and vertical lines showing where he is inserting the beats appear behind them and gravitate to the notes, forming them into a regular pattern. He pulls down a menu, and the notes repeat, with slight variations each time around.

He wheels over a keyboard and starts to play a bass figure, which then also repeats by itself. He pushes a button on the keyboard and the sound changes to a lush, burbling wash, with which he plays background chords.

As he picks up the guit-troller again, he chooses a pure, almost glassy sound from his patch menu and then plays a soaring lead, full of fast flourishes, bends, vibratos and slides, over the previous tracks. When he's done, he decides to clean up the track before moving on.

First, he tells the system to eliminate all notes shorter than 1/25th of a beat. "Do you want to preview?" comes up on the display and he presses "Yes" on the console. The display changes back to the horizontal bars, with the very short notes highlighted. Each time one occurs, the display shows the measure surrounding it. "Play, delete, or leave alone?" the system asks, and Carl chooses what he wants to do.

Next, he does the same process with notes that he played very softly, whose relative level is less than 25% of the mean level of the solo.

Finally he plays a musical scale on the keyboard, and instructs the computer to make all of the notes in the solo conform to the scale.

Now he looks in the corner of his screen and notes the elapsed time for the piece. He calls up the hit list for the scene, and sees how the melodic accents of what he has been playing coincide with the camera movements. He notes that one phrase peaks too early, another too late. He transforms the solo into a line graph, like a profile of a mountain range, grabs the highest peak and moves it over to line up with the time associated with the visual cue. He hits "play."

The melody has been recomposed, as has the harmony and bass line. He changes a bass note from a C to an A flat, then specifies that all of the D^7 chords preceding G chords should be changed to $F\#0^7$s.

With the melody and harmony set, the composer dials up a pattern from his custom percussion library and starts it up with the music. As it plays, he inserts accents at appropriate times by slapping on the touchpad. From a list of items including "Conga hi open," "Dishpans on parade" and "Phil in a barrel," he selects his percussion pallete and, with a multicolored grid that comes on the screen, assigns the instruments to the beats.

He pulls down another screen showing fader movements and makes a few level adjustments. He hits a button labeled "Save" and the raw materials of the music, as well as the directory of instrument files, the repetition patterns and the fader moves are all stored together on the hard disk, and backed up to floppy.

Now he discards everything but the melody and, with a collection of Balinese bell samples, tries converting it to a rhythm pattern, with the highest notes turning into the loudest bongs, and the longest notes turning into low-pitched booms. The result is a completely differ-

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ent piece of music, but one that somehow has a distinct relationship to the original. He chuckles, and stores it away on another floppy he puts in his pocket. He'll get back to it later.

Computer-aided improvisation and composition software will allow any musical idea to be stored, retrieved, transformed, varied, and concatenated and layered with other ideas. The composer will be able to essay unlimited numbers of different ways of using the same basic materials. Automatic counterpoint and harmonization will be built in, with the composer allowed to keep a catalog of his own custom styles for instant recall.

The actual music will not be stored anywhere until the finished product is ready to leave the studio; instead, the files will contain the raw materials—sampled sounds, synthesizer parameters, raw performances and complex controller movements—and various pointers for how they will appear and when.

Mixing and automation

Back in Studio A, Ed and Clint are working on the mix. Displayed on the screen is a multicolored track sheet and a diagram of 32 bargraphs. Above the console faders, the alphanumeric displays show the names of the tracks: "Solo Gtr," "Cymbls Lft," "Pno 2nd vrs" and so on.

"Let me hear the third verse," says Clint. Ed moves the mouse about two-thirds of the way down the screen and clicks. The faders immediately move to new positions and take on new names, and a visual timer starts to run. The music comes in right on the downbeat of the third verse.

"Too much horns right at the beginning. Can they come in a little more slowly?" asks Clint.

"They're up high at the end of the second verse," Ed replies, pulling down the menu labeled "History" and typing the track number. "See, they're really loud at the climax. Where would you like me to pull them down?"

Like the melodic graphs that Carl works with, Ed can see fader movements of a whole track, or several tracks, in profile. The client peers at the screen and frowns.

"Can you get them to go down smoothly, maybe so they're just under the strings at bar 78, then bring them up again until the middle of the verse, around 113?"

"Sure. You just want a straight fade, or would you like me to smooth out the sound as well?"

"Whatever you think will sound best."

The engineer nods, and draws a line from the climax at bar 54 to bar 78. Then he types in the start and end levels, and pulls down two items from the "Fade factor" menu. To "Volume" he assigns "60%/log," and to "Attack brightness" he assigns "40%/lin." He presses "Play," and the track starts in the middle of the second verse. After the climax, the horns sound like they are pulling away into the distance, then coming back again as the third verse builds.

"Perfect," says Clint.

With all of the music synthesis controlled in software, distinctions between volume changes and timbral changes will no longer exist. Whereas now we can use MIDI velocity to control several factors besides volume, in tomorrow's studio any type *of control data can be used to control any aspect of the sound.*

Synchronization and editing

"Let's roll it with the picture and the effects," Clint suggests. Sam, who has been quietly taking care of full ashtrays and empty coffee cups, places the WORM discs marked "Effects 27" and "Effects 62" into their players.

Ed calls up the effects controller track on his console and specifies its start time to coincide with the beginning of the music track. The computer calculates the offset and flashes it back to him for confirmation. Also at the same time, the tape on the digital video recorder in the machine room autolocates to the beginning of the scene.

The overhead video monitor goes black except for a timing strip counting off the seconds at the bottom and then the picture fades in. A 5-second countdown appears on the video screen, "Sequence start" flashes on the console CRT and the music comes up. "Effects A1 ready" appears on the console screen and the laser pickup in one of the optical disk readers positions itself at the track specified in the edit list. "Effects A1 start" flashes and the sound of wheezing heavy machinery rolls through the control room and fades. As it goes away, "Effects B1 ready" pops up, the other disk reader cues itself and soon a thunderbolt crashes off to the left.

"Hold it," says Clint. "I want the thunder earlier than that and it's a little too 'rumbly.' Can we overlap it with the factory and punch it up a bit?"

"Sure," says Ed, "but let me take it off the optical."

He presses a few buttons and the thunderbolt is silently recorded on hard disk. He moves to the effects edit list, changes the destination of the cue to the hard disk and subtracts three seconds from its

Stage L, a new synthesizer and EM production room operated by Record Plant Scoring on the Paramount Pictures lot, Hollywood, features an impressive array of digital synthesizers and sampling instruments, including a New England Digital Synclavier, Fairlight CMI Series III and a MIDI-controlled Apple Mac+ running sequencer software.

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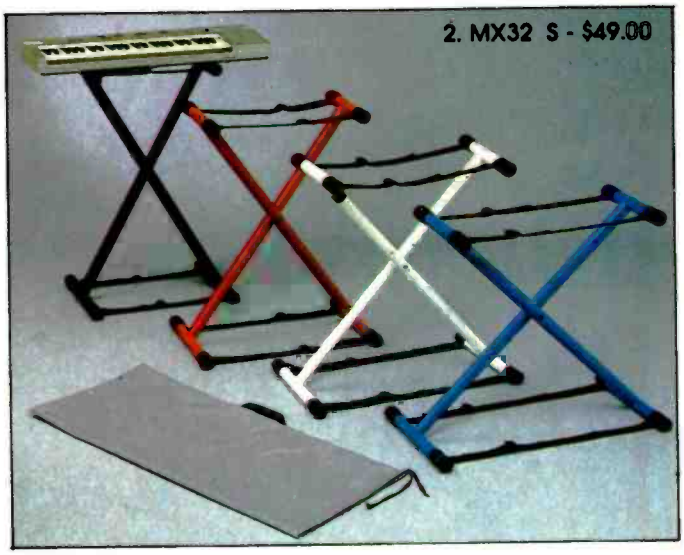

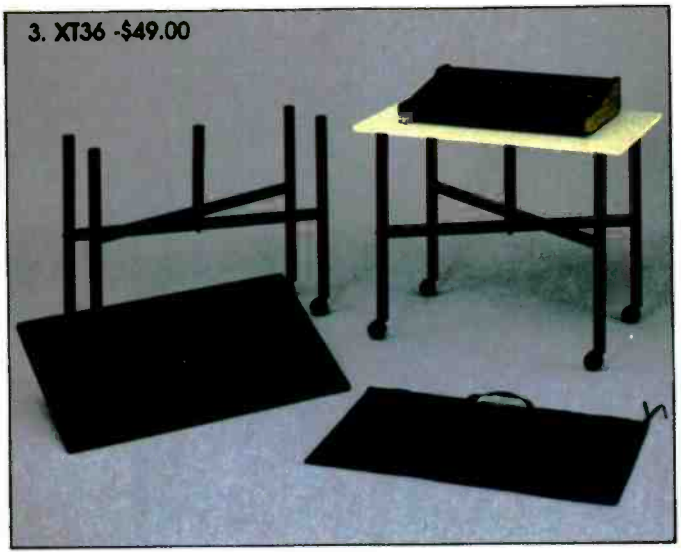

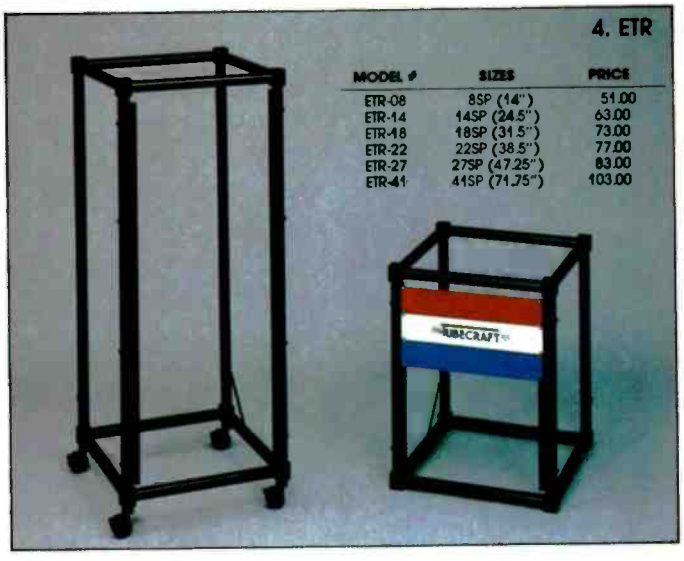

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start time. At the same time, he adjusts the "Playback pitch" to +15% without changing the playback speed parameter.

He then pulls down the mixer screen and with his mouse reroutes the input on the effect from optical to hard disk.

"Done," he announces. He pushes play and the scene runs again.

The ability to transfer data quickly and accurately between permanent and non-permanent media, and between volatile and non-volatile memory, will be a high priority for tomorrow's production studio, both in the creation of materials and in their assembly. Keeping everything within the digital domain, of course, will ensure the highest quality.

But for optimum efficiency, the most advantageous location for an individual piece of data must be determined beforehand—a musical sequence for a scene that is still being edited visually does not belong on an unerasable optical disk, while an effect that's used once a year should not be taking up space on a hard disk.

In the music studio, Carl is using every tool at his disposal to dissect and rebuild a troublesome vocal track. The singer had a bad week—one day, she couldn't make it through two phrases without coughing, while the next day she wouldn't sing into the mic, and sounded 10 feet away. Another time, her delivery and sound were perfect, but her pitch was off.

As he looks through the catalog of takes, Carl selects the ones he thinks he can work with and lines them up on his screen. First, he calls up one of the tracks with a cough in it. He looks at it on an oscilloscope-like display, then carefully outlines the cough with his mouse and replaces it with a piece of room noise

Wildcat Studios is a 24-track Los Angeles facility that specializes in synthesized film scores and record productions. Equipment includes two Kurzweil K250 sampling synthesizers, a Linn 900 drum computer, a Mac+ running Mark of the Unicorn, Performer and Composer software, Yamaha TX-816 modules, a Yamaha DX-7 FM synthesizer, a Sequential-Prophet V synth, a Chroma Polaris, a Roland SBX-80 SMPTE-to-MIDI converter, an Atari PC running Hybrid Arts DX/TX sound librarian, and two Korg EX800 modules. Soon to be installed is a Fairlight CMI Series III digital synthensizer. Control room recording hardware comprises Trident Series 80B console, Otari MTR-90 MRII 24-track, MTR-12 4- and 2-tracks, Lexicon 224XL, Yamaha REV-7 and Lexicon PCM-60 digital reverb units.

copied from the end of the track.

From the "Splice" menu, he chooses "Crossfade" and then specifies "In: 130ms." He carefully finds the beginning of the next phrase, and with the mouse splices it into the end of the silence, at the same time specifying "Out 2ms."

To deal with one of the phrases that was off-mic, he does a quick spectrum and impulse-response analysis of the phrase, and then compares it to analyses run on another performance of the same phrase recorded the day after. He tells the computer to make the frequency and ambience characteristics of the earlier performance conform with those of the later one.

For an off-pitch phrase, he starts by analyzing the track in 50ms chunks. In the early segments, he simply specifies a pitch change for each one and has the changes interpolate into each other, so that there are no quick, tiny jumps in the pitch. At the end of the phrase, he adds a little frequency-based vibrato, which both effectively masks the problem and gives the line some added life.

Working like this, making sure that the computer memorizes every command as he goes along, Carl has a finished, corrected track in surprisingly little time. When he's done, he flashes Ed's console so that Clint can hear it and approve. He leans back and congratulates himself on a job well done.

In the meantime...

Whether or not they will bear any resemblance to what you've just read, production studios in the near future will use technology already known today. Therefore, there are plenty of aspects of music production already in use that any engineer who hopes to keep his job for long would do well to master.

One thing to learn is synthesis techniques, and what their significance is in context with other sounds. Certain types of techniques result in harmonic structures that make a sound stand out, even if it's placed relatively low in a mix, while others will always be buried, no matter how loud they are. Learn about sampling, its advantages and disadvantages. Especially learn its limitations.

Learn also about storage techniques—videotape, hard disks, floppy disks and optical disks—what each can do and how you can use them both now and when they get cheaper. While you're at it, learn all you can about digital audio, if you don't know it already. Learn about oversampling, anti-aliasing filters, and quantization noise. Understand the difference between musical silence and digital silence. Learn what sound ***looks*** *like; visual editing will become more and more commonplace and being able to isolate and alter a sound quickly from a visual display will soon become a required skill.*

Finally, learn what MIDI is all about. Although you don't have to memorize each data type, an understanding of how it is used, and how a performance can be broken down into different elements of pitch, rhythm, intensity, timbre, modulation, and ambience, all of which can be addressed separately, will be essential to working in tomorrow's studios. Learn the structure of a MIDI sequence, with special attention to how controllers, patches and notes work with each other to create and recreate music.

What you have read here is simply an extrapolation on tools and techniques that already exist. If history is any teacher, the reality of the future will be even more wondrous and strange. I look forward to seeing you there. R-E/P

Author's note: My special thanks to Rod Revilock of Lexicon and Steve Cunningham of WaveForm for their invaluable assistance in the preparation of this futurist article—*PDL*.

Film Sound in the People's Republic of China

By Larry Blake

Last year, RE/P's film sound consulting editor visited Chinese filmmaking facilities and spoke at *Beijing Recording '86*, the first pro-audio conference to be held in China.

In the United States, film-sound procedures have progressed in an orderly, evolutionary fashion. Most changes can be traced to technical developments—electrical recording in 1925, magnetic recording in the late Forties—while only one era, the heyday of wide-screen systems and stereophonic mixing in the mid-Fifties, has roots outside of the realm of technology. In this case, it was the growing popularity of television that scared film studios into bigger and better theatrical presentation.

The history of filmmaking in China, on the other hand, has seen techniques and subject matter dictated from the highest levels of government. To be more precise, the 30-year period since 1949, which included the founding of the People's Republic of China and the reopening of relations to the West in the Seventies, saw few standard narrative feature films produced.

The filmmaking community had almost no contact with the outside world. What had been a flourishing filmmaking community before 1949, with private studios and the importing of films from Hollywood, became a mouthpiece for the Communist party under the rule of Mao Zedong (the current preferred romanization of Mao Tse-Tung).

The situation came to an ugly head in the mid-Sixties with the beginning of the Cultural Revolution, one of the saddest misnomers in world history. During this 10-year period, activity in a wide spectrum of culture, from education to books to film, wound down because the only ideas permitted were those from the pen of Chairman Mao; all bourgeois influences were to be eradicated. (If you read anything, it was one of Mao's famous "red books.")

Current official reports place the number of people affected by the Cultural Revolution at 200 million. The scars of this era are evidenced by the hundreds of contemporary books and films set dur-

Larry Blake is RE/P's film sound consulting editor.

Miao Zhengming and an unidentified staff engineer of Beijing Film Studios Recording Department at the facility's Quad-Eight re-recording console.

ing the Cultural Revolution.

The films made, by all accounts, were stilted propaganda. (For a 2-year period at the era's beginning, no films at all were produced.) Mao's wife, Jiang Qing, took control over theater and film, with all story lines emphasizing, with no room for ambiguity, the heroic achievements of the proletariat.

Naturalistic settings and production recordings were eschewed in favor of filmed operas utilizing entirely post-synchronized dialogue or prescored music. To make sure that the films had the widest possible distribution, a new film format, 8.75mm (35mm÷4), was developed to reduce the size of the "mobile projection units."

What was *not* seen, of course, were films from the United States and elsewhere. In fact, filmgoers and the film community in China saw *no* films from the United States during the 25-year period from the mid-Fifties until the late Seventies. When film studios in China started reopening in 1974 and 1975, the technique of production-sound recording had been lost. As late as 1979, 35mm optical sound reproducers were used for playback during shooting.

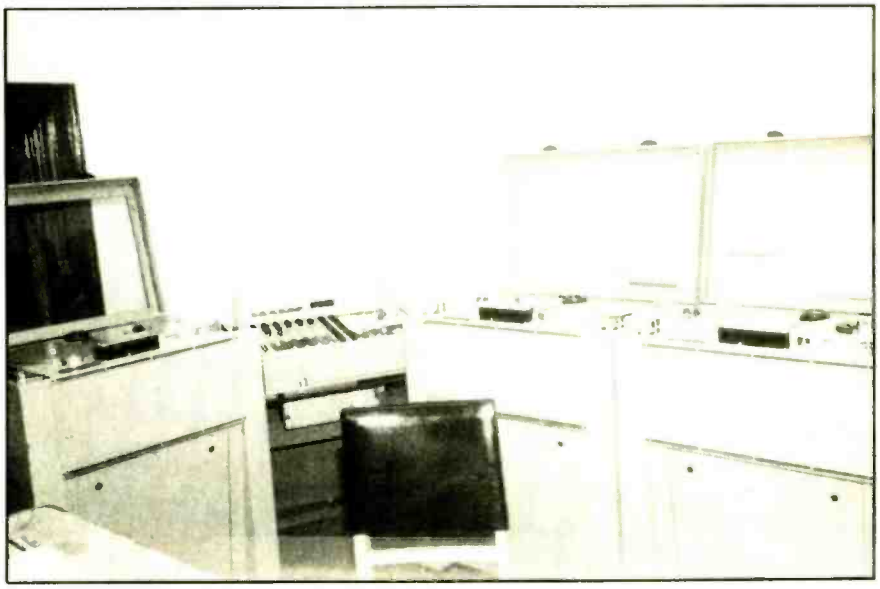
In recent years there has been an upsurge in interest in recording sync location tracks, not just as an aid in looping (more about this later), but for use in the final film. One such film was *Wild Mountain*, which won Golden Rooster awards for best picture and best sound. (You guessed it: this is the Chinese Oscar; the name comes from the fact that its first year, 1981, was the Year of the Rooster.) I had the opportunity to watch this film, and the quality of the audio track came across even on a ¾-inch videotape copy.

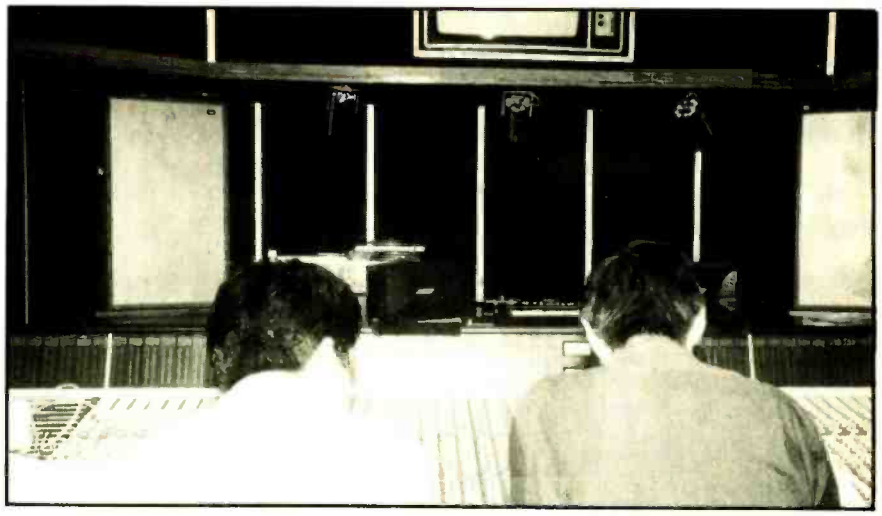
The tide might be changing, slowly, in favor of location recording, possibly because the younger filmmakers have had more exposure to the production tracks of films imported from the United States and Europe.

Sound recording and editing on *Wild Mountain*, produced at the Xian Film Studios, was handled by Liang Hua; it was his first feature film after graduating in 1983 from the Beijing Film Academy. This academy, China's only film school, recently moved into new facilities in the northern part of Beijing. The full-time curriculum has 4-year courses in directing, acting, screen literature, sound recording, cinematography and art design. A division of the academy, the Beijing Youth Studio, produces two feature-length films a year using the talents of teachers and students.

One of the highlights of my trip was a screening of *Xiao Xiao, Girl from the Hu Nan Province*, produced by the youth

Two-track recorders of Chinese manufacture at the China Record Company, Beijing.





A Solid State Logic SL4040 console at the China Record Company. Up front are two Chinese loudspeakers and a Mitsubishi X-850 PD-format digital multitrack.

studio. The director, Xie Fie, is the deputy director of the academy and has been in Los Angeles this past year as a visiting scholar at USC; sound for the film was by BFA instructor Zhai Ming.

There seemed to be a more tangible sense of cooperation between the BFA and its professional fimmaking community than there is in the United States between film schools and Hollywood. Indeed, professional filmmaking experience is required of the teaching staff, unlike most film schools in the United States. (This attitude is sort of the flip side of George Bernard Shaw's famous "those who can, do, those who can't, teach" axiom: the best teachers are those who also do.)

Filmgoing in China

The Chinese people have a hungry appetite for moviegoing, resulting in more than 25 billion admissions a year. Contrast this to the U.S. industry, where a population of 220 million spends almost $4 billion yearly, totaling approximately 1 billion admissions.

In China, most films cost less than 40 fen, or approximately 10 cents, with anamorphic wide-screen films commanding top prices.

This situation points to the severe standard-of-living differences between China and the United States: a Chinese salary of 125 yuan (about $30) per month will allow one to live fairly comfortably. A friend in Beijing has a rent of two yuan a month, leaving him sufficient money to support his VCR habit that rings up a 25 yuan electricity bill.

All filmmaking and radio/TV production is government-sponsored under the umbrella of the Ministry of Radio, Cinema and Television. Film production takes place at government-owned studios throughout China, with the largest in Beijing, Xian, Changchun and Shanghai. There are also studios in Shanghai that specialize in animation and foreign-language dubbing. Approximately 150 feature films are produced annually.

Film sound today

Film sound recording, as practiced at the Beijing Film Studios and throughout China, differs from standard U.S. practice not so much in equipment as in procedures and division of labor. First and foremost, dialogue for almost all films is looped—literally. They use the time-honored technique of breaking the 35mm picture and the mag recording units into loops of identical length, with each set corresponding to one line.

Where this procedure differs from Western practice, however, is that there is *no* guide track of any kind recorded during production. Regardless of how much dialogue there will be in a film, it is shot and edited as if it were silent. After the picture is locked, the workprint will be broken down into loops, line by line, according to the detailed transcription taken by the script supervisor during shooting.

Considering these obstacles, I was quite amazed not only by the tight sync, but also the performances that the actors delivered at the looping sessions.

Another interesting characteristic of Chinese film-sound practice is that the soundtrack is created almost in its entirety by one person. Although, as noted above, there is no sync dialogue recorded during production, the sound person

Shen Jianqin, Beijing Film Studios, and David Watts, Dolby Laboratories, adjust the DS-4E recording/monitoring unit prior to the mix of the first Dolby Stereo film in China.

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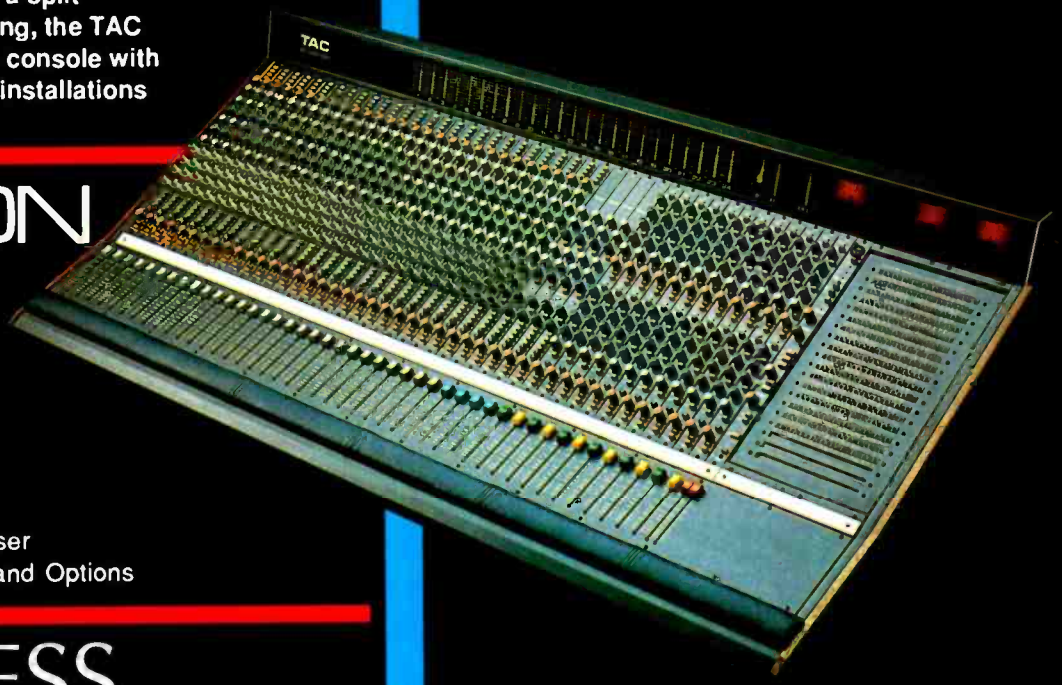

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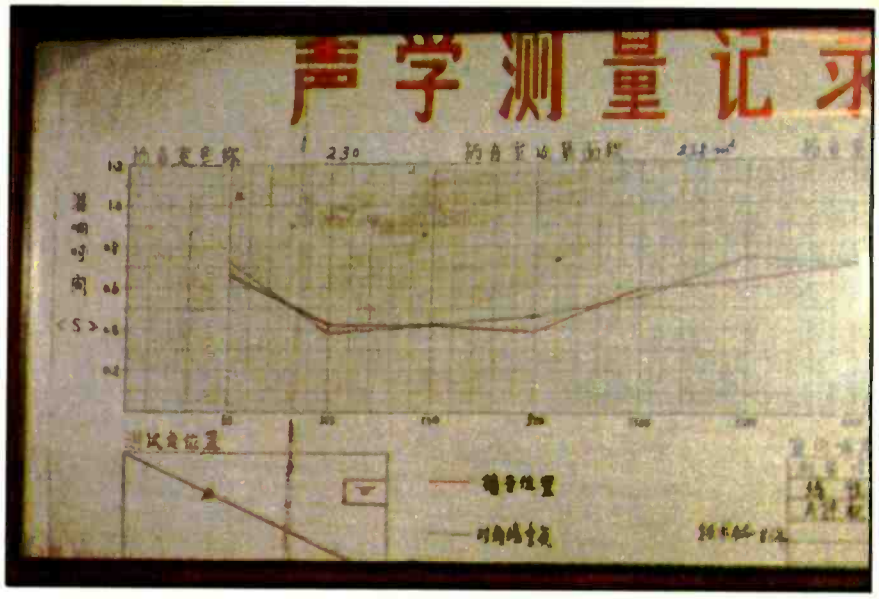
will frequently go on location to record sound effects. Later, they will record and edit all music, sound effects, dialogue and Foley, the latter also using the looping method. Finally, they will mix the film in mono to 35mm 3-track, using one track as a composite mix and another as a M&E (music and effect) "international" track.

Almost all Chinese films are produced and distributed in Mandarin, China's official language. (Mandarin is derived from what is known in China as the Beijing language.) The more popular films are dubbed into the languages of a few of the 55 national minorities; these are entirely different languages, and are not merely different dialects of Mandarin. The larger national minorities include the people of Hui, Miao, Inner Mongolia, Tibet and Uygur. Dubbing is used instead of subtitles because of the high illiteracy rate in these areas.

Each studio in China has a laboratory where the production negative is developed and release prints manufactured. Although prints are usually made directly from the cut camera negative, if more than 40 are needed the studios turn to one of the two facilities (in Shanghai and Beijing) that employ the fabled Technicolor dye-transfer printing process. (Technicolor phased out its proprietary dye transfer—"IB" for imbibition—printing in Hollywood, London and Rome during the Seventies. Its release prints today use standard emulsion-to-emulsion contact printing.)



A reverberation time vs. frequency chart is located outside all studios at the China Record Company.

Most foreign films coming into China are dubbed into Mandarin at the Shanghai Film Studios. A professor at the Beijing Film Academy told me that a certain style of dubbing has evolved there, resulting in artificial intonation that is not quite accurate, everyday Chinese. He believes that this is a reason why some foreign films are not well received. (Perhaps the same can be said for the dubbing that we get for films from Europe.)

Another, insurmountable translation problem exists in the differences between the English and Chinese languages: Some sentences and phrases that are long in one are short in the other, and *vice-versa*.

Getting racy subject matter past the censors is one reason that more films are not imported by the Chinese. Perhaps a greater deterrent to U.S. films being seen by the movie-hungry Chinese audiences is that the major studios want more money than the China Film Export and Import Corporation is willing to pay. In ad-

A 35mm looping recorder at the Beijing Film Studio used in Foley and dialogue replacement.

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dition, there is no per-ticket royalty involved. They purchase the right to make as many prints, and to show them as many times as they wish in usually a 5-year period. Most of the recent U.S. films exhibited in China have been from independent distributors. Paramount and Universal have agreed to "rent" out older films (*Love Story*) and television shows.

In China, most films cost less than 40 fen, or approximately 10 cents, with anamorphic widescreen films commanding top prices.

Dolby Stereo

While I was visiting Beijing last year, the first Dolby Stereo mix in China was taking place at the Beijing Film Studios recording department for the film *First Woman of the Forest*; handling the sound was staff recording engineer Lai Qi Zhen. David Watts, Dolby applications manager in London, was in Beijing helping the engineers. Miao Zhengming and Shen Jianqin, interface a DS-4E monitoring/recording unit to the facility's 24-input, 4-output Quad-Eight re-recording console. (He brought along a standard fixture in U.S. re-recording stages as a gift: a $40 Tandy SPL meter.)

Although there are currently only about 40 theaters in China equipped with Dolby Cinema Processors, there are approximately 3,000 theaters in the country, in addition to many others in clubs and meeting halls. There are plans for several other films to be mixed in Dolby Stereo at the Beijing Film Studio. Other studios may obtain DS-4s if the need presents itself.

The BFS recording department contains an interesting mixture of familiar Western and custom Chinese equipment. The dubbing stage features Magna-Tech Electronics and RCA mag film dubbers and recorders, in addition to the Quad-Eight console. The Foley and ADR stages use a controller and looping recorder of Chinese manufacture, with Dolby 362 A-type noise reduction units. Fullcoat mag film is used exclusively, although single-track recording is standard at all stages of post-production except final dubbing.

Although, as we have discovered, production recording is rarely used in China, Nagra portable recorders are commonplace, and the recording department at the Beijing Film Studio seemed interested in using its Nagra IV-S machines to capture stereo sound effects.

The scoring stage, reportedly the largest in Asia, has a Neve model 8128 console with NECAM 96 fader automation. (Two Neve model 5104 television production consoles can be found down the street at the Centre Newsreel and Documentary Film Studio.) The recently purchased Otari MTR-90 24-track is used for scoring sessions, and is mated with a Dolby SP-24 noise reduction unit. Monitoring is provided by JBL model 4435 loudspeakers, while the re-recording stage recently installed three JBL model 4675A speakers behind the screen.

Non-film music recording and distribution is the responsibility of the China Record Company, founded in 1976. A tour of the Beijing office in the large broadcasting building on Fuxingmenwai Dajie revealed two large multitrack recording studios, plus small production and editing rooms. The main studio features a Solid State Logic SL4040-E console equipped with Total Recall automation, plus Studer A-800 analog and Mitsubishi X-850 PD-format digital multitracks. Mixdown is usually done to one of the three Mitsubishi X-80 2-tracks. The other studio contained a Sony MCI JH-600 series console.

SSL 4000-E consoles are also in branches of the CRC in Shanghai and Guangzhou. All together, more than 1,000 LP and cassette titles are released every year, with total sales nearing 10 million units.

Beijing Recording '86

Co-sponsored by the Beijing Acoustics Society and the Beijing Acoustic Technology Development Center, *Beijing Recording '86* was attended by distributors such as Studer Revox (Far East), Audio Consultants Company, Advanced Communication Equipment (ACE) and Power Source Development. Although perhaps small by AES or SMPTE convention standards, the exhibit hall at the Cultural Palace of Nationalities was mobbed by hundreds of sound professionals from China, who were taking their first opportunity to see such a selection of pro-audio hardware on display.

I spoke at three of the papers sessions, covering the use of stereo sound, digital recording and time code in film sound. Translation was provided by Lou Dashou, who works at the Centre Newsreel and Documentary Film Studio in Beijing.

Fullcoat mag film is used exclusively, although single-track recording is standard at all stages of post-production except final dubbing.

I was surprised that he knew exactly how to express the most arcane technical terms; the only time I remember his being stumped was the title of the film *Never Cry Wolf*. He also possessed a near-photographic memory of back issues of **RE/P** and, in general, I was pleased to see how many avid readers we have in China. (The recording department of the Beijing Studios has even translated two of my articles into Mandarin for inclusion in a handbook on film sound.)

In addition, I attended a question and answer session with the Beijing Film Studios recording department, with topics including production recording, optical transfer and 70mm release. Probably, most questions concerned the panning of sounds for a Dolby Stereo mix. (I lost a $5 bet to a friend who predicted that this topic would come up.)

My trip was made pleasurable by the assistance and translation provided by my guides and friends Ding Huie, a student in acoustics, and Sun Xin, who is an instructor at the Beijing Film Academy. Along with the secretary-general of *Beijing Recording '86*, Lin Da Kun, they made the difference between a good trip and a great one. I regret to say that only a handful of other people from the United States were able to attend *Beijing Recording '86* despite a very broad invitation offered to the pro-sound community. Should another exhibition be held in China, I can assure anyone thinking of attending that they will receive a warm welcome from our colleagues on the other side of the Earth. R-E/P

Upgrading the Association of Baptists for World Evangelism's Audio Production Facility

By David G. Meyer

Having outgrown its existing audio/video production facility, the ABWE recently re-equipped and upgraded to include a separate control room area, which now features a complex time code synchronization system and narrow-gauge multitracks.

Recording and production equipment available at the Association of Baptists for World Evangelism's Media Center includes a Yamaha RM2408 console and various Otari MX-5050 and MTR-10 multitrack and mastering transports. Pictured here in the central control room area is Bob Henry of the ABWE production staff.

The Association of Baptists for World Evangelism (ABWE) is, as the name suggests, a worldwide Christian evangelical mission, headquartered in Cherry Hill, NJ. The association recently upgraded its existing production facility as part of an overall building expansion project.

The organization was founded in 1927 by Dr. Raphael Thomas. Initially working as the Association of Baptists for Evangelism in the Orient, the mission worked only in the Philippines; however, Dr. Thomas soon realized his call to minister to the spiritually needy reached all corners of the globe. When the organization grew into South America and beyond, it became known as the Association of Baptists for World Evangelism.

After the ABWE initially sends missionaries into the field, the churches the missionaries establish are expected to function independently. Part of the ongoing support provided by the ABWE's home office to missionaries and churches is through media: audio tapes, slide shows, 16mm films and other audio and visual materials.

Carl Brandon, director of communication for the ABWE, is in charge of the Media Center at Cherry Hill, and was given the task of upgrading the production facility. He describes the ABWE as "a

David Meyer is a free-lance technical writer, musician and session engineer, and is with the Audio/Video Division of Peirce-Phelps, Philadelphia.

growing ministry, and one for which visual and sound communications are very important."

When planning for this upgrade project began, Brandon already had a fully functional recording studio. He recalls that was not always the case.

"When I came to the Media Center [in 1974], I saw that communication was needed in two directions. Number one, for the missionary, communicating with the churches, and also for the home office to be communicating with those churches, Bible colleges and also individuals that support the ABWE.

Production through the mid-Seventies was handled primarily by outside houses. Any in-house work done by the ABWE was with a UniSync Trouper console, a Sony consumer-grade 2-track and some other consumer audio equipment. The first major purchases, in 1977, were a Biamp model 1621 mixer and an Otari MX-5050B 2-track, which immediately gave the ABWE much more flexibility as well as an improved final product.

Then in 1983, two more machines were added to the system: an Otari MX-5050BQII ¼-inch 4-track and an MX-50-50MkIII-8 ½-inch 8-track. since that time, a number of auxiliary devices have been purchased, including four channels of dbx Type I noise reduction and a Teac PB-64 patch bay. While these acquisitions helped, there was still a long way to go.

Production requirements

The ABWE functions in much the same way as an advertising agency, in that it produces promotional audio and visual material. The major difference, of course, is that rather than serving a number of clients for small-scale production, the ABWE serves only one client—itself.

"We produce a quarterly audio tape program that we send to our missionaries out in the field," Brandon explains. "We produce at least one film a year, in 16mm, that we release to our churches."

As the ABWE grew, Brandon and his staff soon realized they had, at best, limited capability, including the space in which the production staff had to work. Because he had been doing business with me ever since my days at Dimension Five, a small professional audio supply house, Carl Brandon sought out my services when it came time to plan the new facility.

The first order of business was to raise the necessary funding. Because it is a non-profit organization, the ABWE is not permitted to rent out unused studio time to generate operating capital or money for new equipment. The money must come from other sources, as Brandon explains.

"Most of it comes from individual gifts; there are various individuals within our churches who agree with what we are doing as far as trying to communicate effectively. It's not always the same people, but most of the gifts come from individuals, businessmen, even local corporations."

"Any time an organization goes through this [kind of project], there's always the unknown. It was a team effort in putting this facility together."

Oddly enough, very little funding for this type of special project comes from the local churches, and none comes from the overseas churches. Instead, all overseas money stays in the local area, rather than being sent back to the United States for domestic projects.

The projected budget for the production equipment itself was $50,000, and a special fund-raising campaign was launched to raise the necessary monies. Brandon explains further that the churches who did contribute to this fund did so not out of obligation, but because they too believe in supporting good communication.

"One of the reasons we've been able to expand," he offers, "is because the quality of the presentations we are producing here effectively communicates what the missionary is accomplishing out in the field, and therefore makes those churches feel a part of the entire picture."

Design brief

The Media Center provides the A-V support needed to help the missionaries make effective presentations. In addition, Brandon and his staff conduct workshops on multimedia presentations. These workshops take the missionaries through all phases of production, from initial script preparation through mixing and editing the final product. By the time missionaries have completed this training, they are able to produce their own programs, and for a fraction of the cost of outside production.

When the ABWE decided to expand its headquarters in 1985, Brandon's attention focused on upgrading the production studio. While the existing capability

ABWE director of communications, Carl Brandon, handled the task of upgrading the Media Center's production facility.

was adequate in terms of available tracks (eight on ½-inch), Brandon was not satisfied with the final product coming out of the facility.

"It wasn't clean; it wasn't crisp. It was really diminishing in quality after two or three generations. We wanted to make sure that we were getting the optimum quality in the end product, which would often be a cassette tape. We wanted to go with something that would give us that quality."

I was called in to help design the new studio package. The ABWE already had a good core of equipment available for the new room. Basic tracks were being recorded on the Otari BQII, with the MkIII-8 available for larger productions. All tracks were mixed down on the MX-5050B, and cassettes were being mastered on a Nakamichi model 1000II deck. A Nagra IV-L portable reel-to-reel gathered the audio for 16mm film production, and a set of Bose model 802II speakers (powered by a Bose model 1800 amplifier) served the dual function of studio monitors and sound reinforcement speakers. The Teac PB-64 patchbay allowed the 2-bus Biamp mixer to feed individual tracks on the MkIII-8 and the BQII, as well as allowing signal processing equipment to be patched as needed.

Facility layout

Several decisions were made during the project's planning stages. First, the studio would be constructed with the control room separate from the studio. This decision meant we had to pay close attention to acoustic isolation, as well as providing a coherent way of routing cables from one room to the other. It also meant providing a main set of control-room monitors, as well as a smaller set of speakers for the studio area. This arrangement would free up the Bose equipment to function as PA speakers for special events, which was what they were purchased for.

Next, a replacement console was selected. The final choice was a Yamaha RM2408, which provided the ABWE staff with all the input, output and signal processing functions they needed, at a price that made sense.

"We just love it thoroughly," Brandon says. "It hasn't given us one bit of trouble, and was operational the day it came in here." All 24 microphone inputs appear on a Whirlwind mic panel in the studio, allowing any studio source to be routed to any input channel.

The next area to come under scrutiny was the master recorder. Over the years, Brandon and his staff had done most of their initial tracking work on the Otari BQII. Its 4-track ¼-inch format had served them well, providing two tracks for a music bed, one for voice narration and one for a slide-show control track. After some discussion, only one new recorder was chosen for the initial upgrade, a ½-inch Otari MTR-10-4.

This decision allowed the ABWE to continue with the 4-track format that it was accustomed to. Also, because of the increased tape width, the finished product was greatly improved. In addition, the ½-inch tape format helped to reduce crosstalk; this is especially important when dealing with the very hot signal created by the slide show control pulse. An Otari CB-109 autolocator was also provided, which allows all tape machine functions to be remotely controlled.

During the planning stages, we talked quite a bit about expanding to full 2-inch, 24-track recording. The outcome of the conversations was that it would be unnecessary for the kind of project the ABWE was doing. The center would not have purchased a 24-track "even if the budget had been there," Brandon explains. "I think that the 4-track and the 8-track are more than adequate for our needs. I guess you would call us a voice-recording studio."

The combined cost of the RM2408 console and MTR10-4 4-track represented the largest dollar portion of the upgrade, as well as the most critical in terms of function. Once these items were chosen, our attention turned to the rest of the room's needs. The ABWE had never had the luxury of separate studio monitors; the Bose 802s served their dual purpose admirably, but were not considered true "studio" monitors. We now had the task of choosing two sets of speakers, one for the control room, the other for the studio recording area.

JBL model 4411s were selected for the control room, powered by a Yamaha model PC1002 amplifier. This combination, Brandon says, creates an excellent stereo image, as well as providing enough raw power to mix effectively at high monitor levels. For the studio, we chose JBL model 4301BEWXs, which are small and self-amplified. (We not only saved the cost of an amplifier, but also valuable rack space.)

Signal processors

It was decided that some special effects were needed to augment the single voice narration that serves as the main recorded source. Two items were chosen out of the literally dozens of available devices: a Lexicon PCM-41 digital delay and a Yamaha R1000 digital reverb. Again, the idea here was to provide effects that would add depth and interest to a production track, yet at a price that was realistic and without the long learning curve associated with more complex special-effects devices.

Also added to this portion of the project was an Orban model 422A processor. While not a special-effects device as

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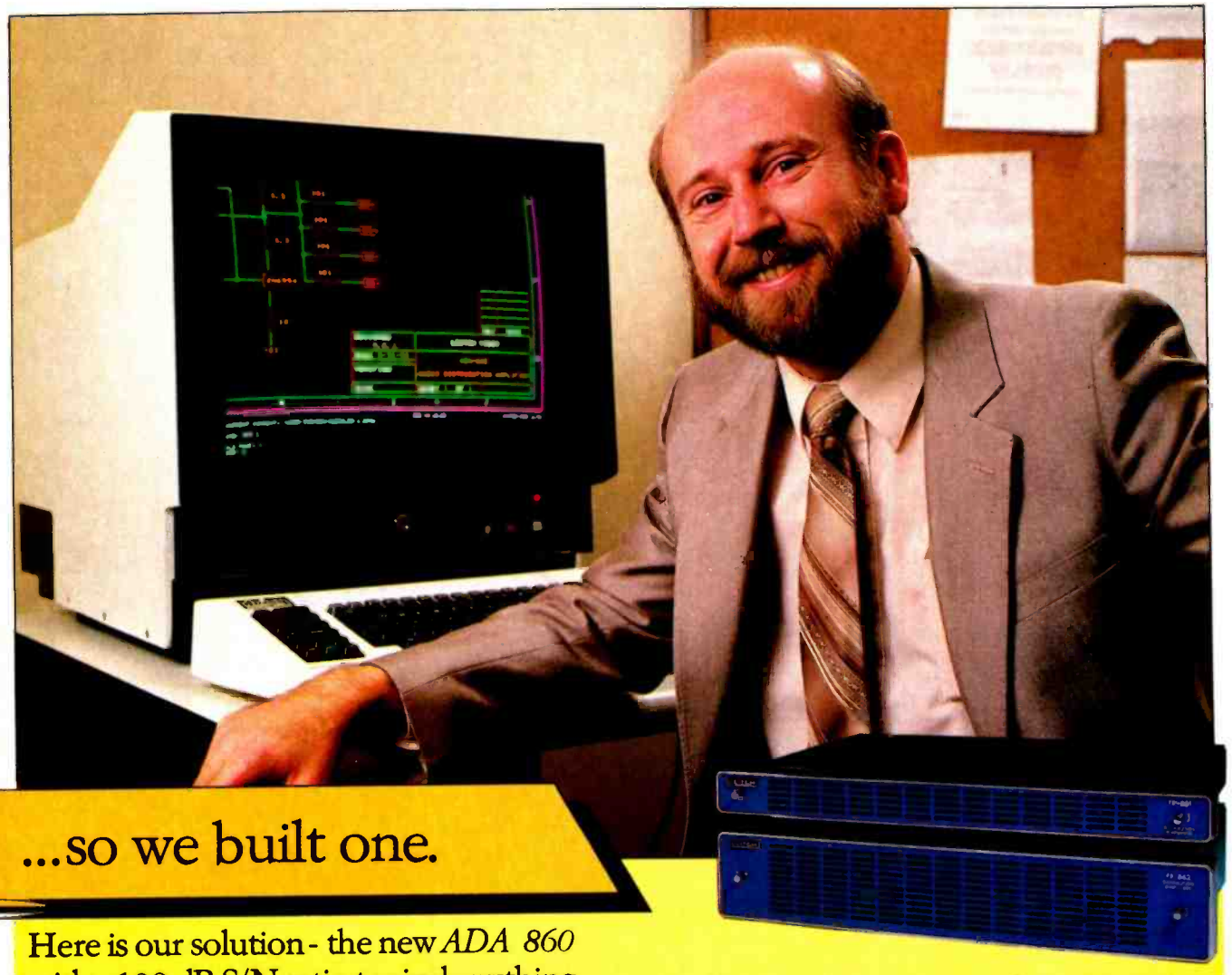

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Recording and Production Equipment Currently Available at the ABWE Media Center's Production Facility

Console: *Yamaha 24-input RM2408 with eight main bus outputs.*

Multitrack: *Otari MX-5050MkIII 8-track on ½-inch.*

Mastering transports: *Otari MX-5050B 2-track; Otari MX-5050BQII ¼-inch 4-track; Otari MTR-10 ½-inch 4-track; Nakamichi model 1000II cassette deck; Nagra IV-L portable reel-to-reel.*

Monitoring: *JBL model 4411 cabinets powered by a Yamaha model PC1002 amp (control room); JBL model 4301BEWX cabinets with integral power amps (studio area).*

Outboard effects: *Lexicon PCM-41 digital delay; Yamaha R1000 digital reverb; Orban model 422A compressor, voice-gate and de-esser; Biamp model EQ220 stereo 10-band equalizer; eight channels of dbx Type II noise reduction.*

Synchronizer: *Adams-Smith model 2600 modular time code synchronization system, with PSU, LTC generator, LTC reader, two transport control modules and a compact remote controller unit.*

Miscellaneous: *Two Teac PB-64 patchbays; AKG C414 condenser mic; Electro-Voice RE-20 dynamic mic; Technics SL1200MkII turntable with ATI P100S phono pre-amp and Stanton model 681SE cartridge; Sony CDP-502ES Compact Disc player; CD sound effects library; Wireworks mic termination panels; Bose model 802II speakers and model 1800 power amp (for sound reinforcement).*

such, the 422A's compressor, voice-gate and de-esser functions allow the ABWE to deal with difficult voice tracks gathered in the field. Such voice tracks are often associated with the 16mm film soundtrack produced each year, or voice recordings made by missionaries under less than ideal circumstances.

A Biamp model EQ220 dual-channel, 10-band equalizer was provided for equalizing the control-room monitors. Finally, eight channels of dbx Type II noise reduction were added.

The RM2408 console has 24 selectable mic- or line-level inputs, eight main bus outputs and a number of auxiliary send and receive buses. All tape machines and other source hardware could easily have been dedicated to individual inputs. It was decided, however, that having everything come up to a patch panel, including source recorders and all signal processing, would enhance the system's flexibility. Because the ABWE already owned a Teac PB-64 patchbay, it was a simple matter to integrate a second identical unit into the system. The PB-64's RCA plug arrangement, while possibly not the ideal way to patch mic- and line-level signals, proved to be an effective choice for the studio's application.

Again, cost was a big factor, as well as time necessary to put a patchbay into operation. For example, if the dbx noise reduction units are hard-wired to the inputs and outputs of the 8-track, they are not available for use with other recorders. By routing the system through the patchbay, noise reduction is available on a unit-by-unit basis to all recorders, including the cassette deck.

The issue of microphones was next to be addressed. Because of the nature of their productions, the ABWE really needed only one good microphone. Carl Brandon specified an AKG C414EB, making for an easy choice. Upon my recommendation, an Electro-Voice RE20 was also added to the equipment package, to act as both a second microphone for the rare 2-voice production and as a backup in case of any problems with the main mic. (In actuality, the RE20 gets used most of the time!)

Additional source hardware was also needed to augment the reel-to-reel and cassette decks. We provided a Technics SL1200MkII turntable, complete with an ATI P100S phono pre-amp and Stanton model 681SE cartridge. This hardware is the only part of the system that does not pass the patchbay, but is hard-wired to two console channels.

During a recent trip to Japan, Brandon purchased a Sony CDP-502ES Compact Disc player, and has since added a complete CD sound effects library. While the library represents a reasonable investment in software, the time and aggravation saved by having easy, direct access to thousands of different sound effects has made the investment well worthwhile.

Synchronization equipment

Perhaps the most intriguing addition to the studio is equipment that makes no sound, records no audio, does no processing and represents 20% of the money spent on the entire package. The facility's Adams-Smith model 2600 modular synchronization system consists of a power supply unit, longitudinal time code generator, longitudinal time code reader and two synchronizers, all mounted in a 19-inch rack frame. The system is completely software-controlled; in essence, by programming the appropriate parameters into each synchronizer module, any audio transport can be controlled by the system. (Assuming, of course, that the designated tape machine is equipped with external servo control of the capstan motor.)

We configured the synchronization system so that both 4-track machines, as well as the MkIII-8 8-track, can be designated master or slave, depending on the individual application at hand. Because the MTR-10 4-track is still designated as the primary recorder, two music tracks and one voice track can be created, leaving one track available for time code.

In addition, a model 2600CC compact controller was provided, which puts all synchronization functions in one hand-held, programmable control box. Multiple keystroke functions, as well as complex edit and repeat functions, can be stored using the controller's non-volatile memory. The ABWE now has the ability to build multiple music tracks for film production, as well as speed-up record, edit and mixdown functions for day-to-day production.

We worked closely with the ABWE to design, provide and install the new production facility. Brandon had the option to simply catalog-shop for all the equipment, and have his own people assemble and install it once it was delivered. Undoubtedly, this approach would have saved him some money on the initial equipment prices. He chose to select an equipment package because, as he puts it, "We have a limited staff and, if you're going to be successful in this business, you have to trust people out there; you cannot just buy a box here and a box there and expect professional quality."

The ABWE took the approach of working closely with a vendor that not only sells boxes, but is in the business of building and installing systems. This decision allowed Brandon the freedom to continue to do his job, without spending inordinate amounts of time trying to figure out system needs and configurations.

"We were looking to someone that can give us input; to look at what we're doing and make a professional concept to take the type of equipment we need and put

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Naturally, the project did not go without its share of problems; no project of this scope ever does. For example, we faced equipment model changes and obsolescence problems, particularly with the Adams-Smith synchronization system. By the time the system was ready to go on-line, the PROMS in the control modules have been updated from version H to version J; some of the modules were supplied with one version, some with the other. These differences made the software internally incompatible. We elected to sponsor two visits from a company representative to make sure the ABWE had the most recent software released as well as general product knowledge. By taking this approach, Brandon and his staff gained valuable insight into the workings of the synchronization system.

"Any time an organization goes through this [kind of project], there's always the unknown. There has to again be this trust between a dealer and the client to work through the problems. It was a team effort in putting this facility together."

Future plans

The ABWE production facility is now fully functional. After a short period of downtime, while Brandon and his engineering staff learned the new system, the studio is producing remarkably good product for the investment made. However, although this phase of the project has been deemed a success and is now officially finished, upgrading at the ABWE is a continuing process. As this article was being prepared, additional audio recording equipment was on order, and a LaserDisc recorder was being considered.

"We wanted to make sure that we were getting the optimum quality in the end product, which would often be a cassette tape."

Long range plans for the facility include the addition of video production as well as post-production capability. The primary reason for selecting the Adams-Smith 2600 synchronization system is its ability to adapt easily to any number of video or audio transports: the move to video will naturally entail synchronizing audio and video machines in a chase system. Budget restraints, however, will prevent any significant video purchases for some time, Brandon says.

"The hurdle is equipment cost. Once we overcome that, we will be producing more programs and we'll add more stuff. Again, we're just small potatoes compared to some of the large production companies out there, so we plan to establish a good video editing department and go on-location with one or two cameras to record an event. The studio is already on the drawing board; it's just a matter of moving into it."

The Media Center at the Association of Baptists for World Evangelism may indeed be "small potatoes" by some standards. But, it has created a small-format production facility that fulfills the most important requirement in any studio: it does exactly what they need it to do today, and will grow right along with their needs into tomorrow.

R-E/P

Studio Update

Northeast

Kennedy Music and Recording (Philadelphia) recently upgraded its facility to 16-track, and added an **Aphex Compellor, Valley People 415** Dynamic Sibilance Processor, **Lexicon PCM-70** and **Yamaha SPX-90** effects units, **E-mu Systems SP-12** sampling drum computer and **Emax** sampling keyboard. *5253 Montour St., Philadelphia, PA 19124; 215-533-2380.*

Record Plant (New York) has added a 60-input **Neve V Series** console with **NECAM 96** servo-controlled fader automation. *321 W. 44th St., New York, NY 10036; 212-581-6505.*

Regent Sound (New York) has added a **Sony MXP-3036** console and **Sony ADS-3000** time code-based hard disk automation system.

Also featured at the studio is a **Sony PCM-3324** DASH-format digital 24-track. *1619 Broadway, New York, NY 10019; 212-245-2630.*

Duplication Specialists (Long Beach, NY) is a new company formed by **David Schwartz**, former vice president of Burlington Audio Tapes, to serve the real time cassette duplication needs of artists and studios.

The company uses a **Nakamichi MR-1** cassette deck and a **Technics RS-1520** ½-track, ¼-inch open-reel as masters.

Outboard gear includes a **Dynafex DX-2** single-ended noise reduction system and an **Aphex Type C Aural Exciter**. Other gear includes **Fostex 350** mixer with meter bridge and **Primus Broadcast** distribution amps.

Copies are made on 32 remote controlled **Onkyo TA-2028** cassette machines, aligned and biased for **Ampex** and **Agfa** tape formulation. *P.O. Box 54, Long Beach, NY 11561; 516-432-2325.*

Southeast

Boutwell Studios (Birmingham, AL) has upgraded Studio C to include an **Otari MX-70** 1-inch 16-track. **Otari MTR-10** 2-track and **JVC CR85OU** VHS deck. All audio and video transports are time code synchronized via a **Cypher Digital Softouch** system.

Set-up provides for sound effects insertion to picture through Softouch event controller using an **Akai S900** digital sampler, **Technics SL-P1200** CD player and two 2-track transports as sound sources.

The studio also offers 16-track video sweetening services, in addition to 24-track music plus 8-track broadcast and A-V sessions. *720 23rd St., Birmingham, AL 35233; 205-251-8889.*

North Central

Studio A (Dearborn Heights, MI) has upgraded its New England Digital Synclavier with 16 voice polyphonic sampling and 16 FM stereo voices, 80Mbyte **Winchester hard disk**, 4 megabytes of RAM and a 250,000-note sequencer with time code/MIDI options.

Capabilities include direct sync to video and multitrack, 200 track software plus 24 analog tracks and timing accuracy to 1ms.

Other purchases for the recently opened 24-track Synclavier/MIDI room include a **Sequential Studio 440** drum machine/sampler/sequencer, a new **Yamaha DX7-2** synthesizer with floppy drive and a **Roland GM-70** guitar MIDI interface. *5619 N. Beech Daly, Dearborn Heights, MI 48127; 313-561-7489.*

Southern California

The Enterprise Studios (Burbank) [featured in the May issue of **RE/P** page 28] recently took delivery of three pairs of **Quested 412** monitors. *4620 Magnolia Blvd., Burbank, CA 91505; 818-505-6000.*

Red Zone Studios (Burbank) is the name of a new 24-track facility owned by **Dennis Degher** and **Frank Riesen.** Six months in construction, the new studio is located in the former site of Kendun Recorders Studio A.

The Tom Hidley-designed control room was updated by architect/designer Vincent A. van Haaff, who has also worked with redesigning A&M's new studios and control rooms, Conway Recorders and Village Recorders.

The large control room measures 20x24 feet and the main studio is 35'x39'x10'x50' and also features a 24'x10'x17'x32' live isolation booth.

The control room features a 36x24 **Amek Angela** console that provides 78 line inputs for multimachine mixing. Multitrack duties are handled by an **Otari MX-80** 24/32-track featuring **Dolby HX Pro.** Two tracks include **Qtari MTR-12s.**

Main control room monitoring comprises **Tannoy ESMs** with **Auratone T-6** and **Yamaha NS-10Ms** powered by **Crest** amps.

Red Zone Studios, Burbank, CA.

Photo by Elizabeth Annas/Photo Sensations.

Studio Update

Studio keyboards include a **Kawai** grand piano with MIDI, an **Oberheim Expander, Sequential Circuits Prophet T-8 E-mu Systems Emulator** and **Ensonic Mirage** samplers.

An **Apple IIe Mac Plus** and a **Commodore Amiga** computer systems are available for sequencing, score printing and sampling. A **New England Digital Synclavier** is also available for on-site rental. In addition, construction has begun on an 8-track pre-production room. *623 S. Glenwood Place, Burbank, CA 91506; 818-955-8030.*

White Field Studio (Santa Ana) has taken delivery of an **Otari DTR-900** PD-format digital 32-track.

Studio manager **Tom Roy** says, "Artists using the machine love the stunning clarity and the low-end, as well as the mid-band and upper mid-band smoothness." *2902 N. Garry Ave., Santa Ana, CA 92074; 714-546-9210.*

Mobius Music Studio, San Francisco.

KREN Studios (Hollywood) has installed a **Mitsubishi Westar** console.

The console features plug-in, 4-band equalizer modules on each of its 44 inputs and also on the two independent stereo mix modules. Console automation is provided by the **Compumix** PC system. *6553 Sunset Blvd., Hollywood, CA 90028; 213-461-5781.*

Amerycan Studios (North Hollywood) has added a 40/48 **Solid State Logic SL4000 E-Series** console. The studio is owned by Ray Parker, Jr. *5719 Lankershim Blvd., North Hollywood, CA 91601; 818-760-8733.*

Northern California

Mobius Music Studio (San Francisco) has re-opened its 24-track facility with expanded control room capabilities and

Studio Update

enlarged studio space in Noe Valley.

The control room features electronic keyboard interface and reverbs including **Lexicon 224, Yamaha REV-7** and **SPX-90** units. Mics include **Neumann U-47** tubes, **KM54** tubes, **U-87x, KM-84** and **KM-85**. Other mics include **Sennheiser MD-421s** and a **Beyer** ribbon.

Also included is a **Studer A-820** 2-track deck. *1583 Sanchez, San Francisco, CA 94131; 415-285-7888.*

Russian Hill Recording (San Francisco) has installed a **Solid State Logic SL4000 E-Series** console with **Studio Computer** and **Total Recall** in Studio A. The order is described as one of the first SSL systems to be delivered to the San Francisco area, and the first SL4000 to be specially modified for film work.

Jack Leahy, co-owner and chief engineer, says, "We are primarily a recording studio but, over the past few years, we've drifted into film work. Our requirement was a convertible console that would enable us to work with any known film format, as well as [satisfy] the demands of a full-blown recording studio."

The studio's film work involves left-center-right surround monitoring. Custom circuits converted the console's normal quad bus so the panpot functions in one of the modes.

Another console modification comprises a separate 24 x 6 monitor system in the center section, which allows for separate monitoring of a 24-track without returning through the normal tape-monitor sections. *1520 Pacific Ave., San Francisco, CA 04109; 415-474-4520.*

England

Terminal 24 (London) has added a 40-input **Amek Angela G2520** multitrack production console with **Audio-Kinetics Mastermix** fader automation. *52 Gloucester Place, London W1; 01-701-6644.*

The British Broadcasting Company (London) has taken delivery of two **Solid State Logic SL5000 M-Series** consoles for Broadcasting House. *London, England.*

RE/P is interested in hearing about your recent equipment upgrades and installations, studio personnel changes and diversification of production services. Send your "Studio Update" news to Sarah S. Coleman, **RE/P**, 9221 Quivira Road, Overland Park, KS 66215; 913-888-4664.

New Products

Roland DEP-3 digital effects processor

Offering programmable digital reverb, equalization and delay, the DEP-3 features a 16-bit DAC and a 28-bit signal processor for reverb simulation.

Quoted frequency response is 12kHz and dynamic range of 86dB. Three rooms, three halls and two plates are available with reverb time of up to 99s.

The unit can also provide non-linear reverb, with an RT_{60} up to 10s in normal or reverse mode. A digital 3-band EQ section is also featured. The delay mode offers delay up to 450ms at 12kHz.

The DEP-3 is MIDI compatible, and any of the 99 memories can be recalled from any external MIDI controller via a program change message.

Circle (77) on Rapid Facts Card

Studer A807 reel-to-reel recorder

The 19-inch rack-mount unit is designed for applications in remote recording, studio sessions and broadcast production.

The transport features include two ac spooling motors driven by 3-phase switched motor-drive amps, and a brushless dc capstan motor that incorporates new capstan bearings to ensure operation at temperature extremes, Studer says.

The electronics use phase-compensation circuits along with Dolby HX Pro. Front-panel VU meters are augmented by three LED peak indicators.

Standard features include phantom powered mic inputs, RS-232 and parallel remote control ports. The model A807 is available in cabinet, rack and console versions.

Circle (79) on Rapid Facts Card

Brooke Siren Systems 360 EQ Card

The 360 EQ Card is designed for removing room resonances, compensating for speaker cabinet and driver irregularities or attaining a desired response curve.

It is also suited for achieving the correct curve for constant directivity horns, the company says.

The plug-in circuit card features four sections consisting of a first-order, low-pass filter and full parametric section with design control over center frequency, Q and cut or boost levels.

Circle (83) on Rapid Facts Card

How to stop a 2235.

It's tough. Because Fender's new 2235 Professional Dual Channel Power Amplifier is designed for dependability. And engineered for performance.

Go ahead. Push the 2235 to 200 watts at 8 ohms. 350 watts at 4 ohms. Or 700 watts at 8 ohms in the bridged mode. It'll take it. And deliver at less than 0.1% THD. These specs are as conservative as the performance is unbelievable.

The 2235 uses a front-mounted, 15 ampere, magnetically-tripped, Heinemann circuit breaker for the power switch, instead of the typical, less expensive switch/fuse combination.

For thermal protection, the Fender 2235 utilizes artificial intelligence to constantly interrogate the output terminals.

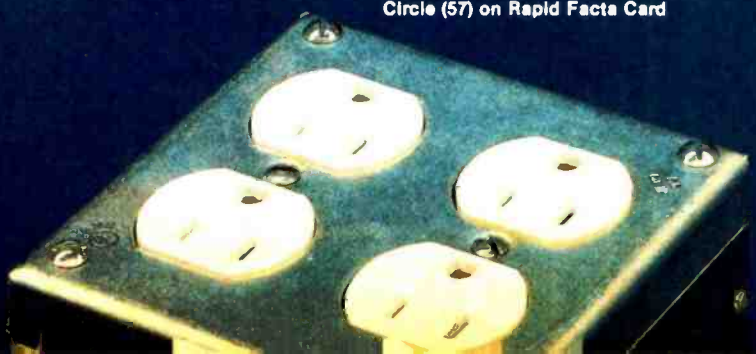
What's more, when you turn on the 2235, its logic controlled timing circuit waits for 2 to 3 seconds so your other equipment can stabilize.

Fender's new 2235 puts performance in your budget, too. State-of-the-checkbook performance that pays off now. And in the years to come.

About the only way to stop the 2235 is to unplug it. Or turn it off.

The best way to *start* your 2235 is to see your local Fender dealer. Or write to F.M.I.C. Pro Audio, 1130 Columbia Street, Brea, CA 92621.

Circle (57) on Rapid Facts Card



Fender®

We Make History

New Products

Denecke DCODE TS-6.5 time code slate

The new unit displays SMPTE/EBU and drop frame time code status on a 6½-inch LED readout.

Designed for multicamera productions during concert or large-scale shoots, the TS-6.5 features variable intensity LEDs that are readable in direct sunlight, the company says.

Circle (91) on Rapid Facts Card

Apogee Sound AE-12 subwoofer

The AE-12 comprises two, 18-inch high power handling cone drivers. Designed to compliment the 3x3 tri-amped concert series speaker system, the cabinets can be used as stand-alone units or as a part of a larger modular array.

The speaker is equipped with a standard 15A twist-lock inlet and loop-through outlet connectors.

Circle (96) on Rapid Facts Card

Panasonic Ramsa WR-8428 production console

Designed for video and broadcast post-production, the unit's 28 input channels allow simultaneous mixing and monitoring of two 24-tracks, plus microphone and stereo sound sources.

Input modules route to 10 mix lines, consisting of four group, two master, two send and two echo buses.

Group and master buses can be monitored in stereo, allowing the user to set up separate program and audition stereo monitoring modes.

Circle (85) on Rapid Facts Card

Agfa-Gevaert PE 649/949 cassette tape

The new bulk cassette tape is designed for "highly critical and demanding music duplication," the company says.

PE 649/949 is a high-output, low-noise, premium ferric oxide standard (IEC Bias I) tape, and offers extended headroom in low and high frequencies.

Tape length is 12,300 and 17,300 feet.

Circle (92) on Rapid Facts Card

Eventide PD860 audio delay

The 2-channel delay features user-selectable delay increments of 1ms to a maximum of 520ms.

The 1ms delay time resolution enables applications such as acoustic research, speaker array-time aligning and audio delay compensation for satellite path and video effects devices.

Circle (93) on Rapid Facts Card

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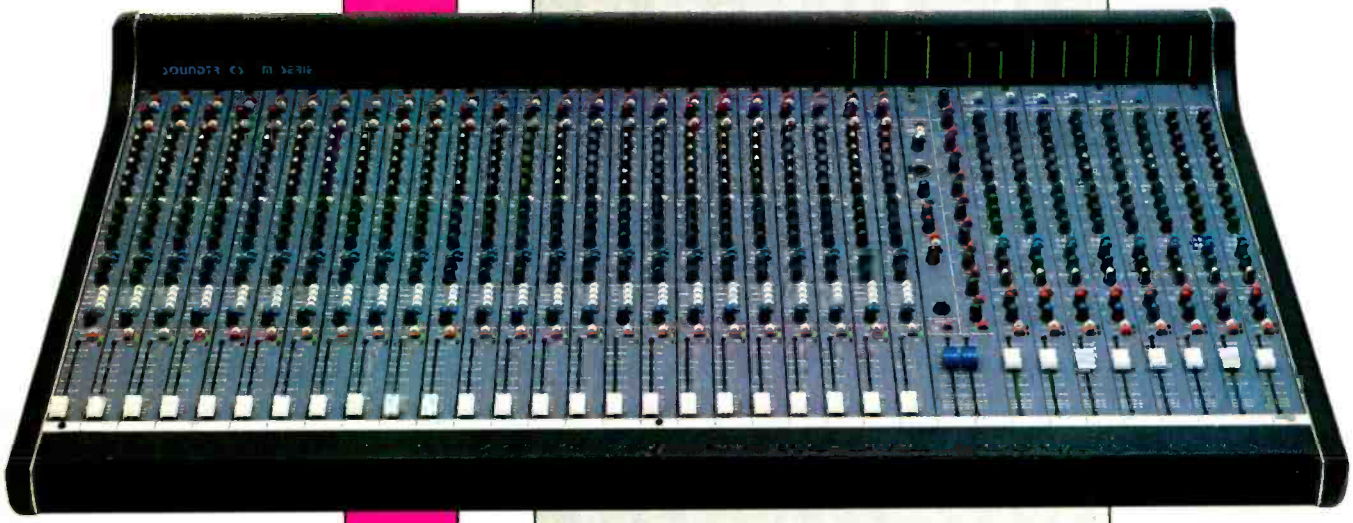

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Telephone: (203) 348-2121

Circle (59) on Rapid Facts Card

New Products

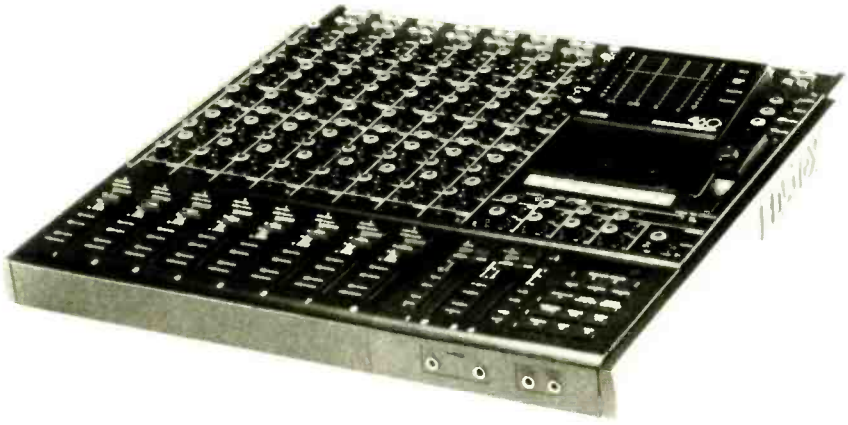
Fostex model 460 multitrack cassette/mixer

Capable of time code synchronization with video and other audio transports, the model 460's mixing section features eight inputs each with XLR-type mic connector, phantom powering, stereo send and parametric EQ.

Also featured are four bus outputs, a dedicated stereo mixer for the 4-channel bus, selectable monitoring, switchable LED bargraph metering and patch points.

The recorder features a 2-speed transport with Dolby B and C noise reduction, a 2-position autoclate, search-to-zero, auto repeat and SMPTE/EBU time code sync capability.

Circle (78) on Rapid Facts Card



Shure BC series phonograph cartridges

The BC70, BC80 and BC90 cartridges feature cue guard design, high-stiffness stylus shank and a wraparound stylus grip.

The 3-model series offers a choice of tracking forces, stylus geometries and mounting styles. The BC80 and BC90 both track in a range from 1g to 1.5g and have elliptical stylus tips; the BC80 is a P-mount and the BC90 is a ½-inch mount. The ½-inch mount BC70 tracks from 2.5g to 3.5g and has a spherical stylus tip.

Circle (98) on Rapid Facts Card

Bose AWC theater loudspeaker

The loudspeaker system features a single low-frequency drive located in a tuned waveguide. The tubular design allows efficient installation, Bose says.

Each unit weighs 70 pounds and is about 12 feet long. Up to eight speakers can be used for bass in any size theater.

The new system is part of the Cinema Sound System, a modular configuration of audio components computer-designed to match the acoustics of each theater's design.

Circle (101) on Rapid Facts Card

Studer A727 Compact Disc player

Using new LSI chips with full 16-bit resolution, the A727 features dual D/A converters and adaptive error correction. The revised front-panel layout features a 6- by 2-inch numerical keypad.

For specialized production applications, the A727 is equipped with digital outputs for audio and CD-I/CD-ROM data.

Other standard features include integral rackmount flange, modular circuit boards, and a die-cast disc transport on damped isolation mounts.

Circle (95) on Rapid Facts Card

Akai X-7000 sampler

The X-7000 is a 12-bit linear, 6-voice sampler with a variable sampling frequency of 4kHz to 40kHz, the company claims.

The unit can also be interfaced to the AX-73 or VX-90 synthesizers, thereby providing wavetable synthesis and an unlimited number of waveforms.

Circle (89) on Rapid Facts Card

New Products

Gefen Systems M&E Organizer software for CD libraries

The new M&E Organizer System is a series of software programs designed to catalog, search and play music and sound effects libraries on Compact Disc.

The program centralizes the storage, selection and replay of music and sound effects in one location. The program offers several methods of retrieving descriptions for each effect or cue that the user may need. It is designed to run on any IBM-PC or compatible with at least two disk drives, and interfaces with the Sony CDK-006 Auto Disk Loader.

Circle (76) on Rapid Facts Card

Studer Revox C279 production mixer

The 6-input mixer is switchable to accept either balanced microphone, balanced mono-line or unbalanced stereo-line inputs.

Each input features 48V phantom power, low-cut filter, input gain control, HF and LF shelving equalizers, pan or balance control, PFL button and mono direct output.

Other features include bargraph PPM metering of master output, phase metering, monitor speaker and talkback mic, headphone output and monitor level control.

Circle (80) on Rapid Facts Card

Apogee 944-S and 944-G digital low-pass filters

Both filters are designed to achieve accurate band limiting in digital audio systems. Multitrack DASH- and PD-format recorders and OEMs can now be upgraded to achieve improved linear phase response, optimized roll-off, low-pass band ripple and low distortion in the audioband.

The filters are said to be compatible with the specifications and dimension of filters currently used in digital multitracks.

Circle (82) on Rapid Facts Card

Altec Lansing 1715A mixer/power amp

The new unit consists of a protected 150W amp with six input/output ports. When configured with the model 1781 programmable input modules, the mainframe becomes a 6-channel mixing system.

Standard features include a compressor/limiter, low- and high-frequency shelving equalizer, input muting, remote level control capability, and a tone/slate generator.

Any configuration of input and output modules, connector style and control functions can be used from the unit's nine components. Multiple units can be stacked to provide additional inputs and power output capability.

Circle (75) on Rapid Facts Card

New Products

Sony MXP-2036 production console

Designed for stereo audio-for-video and broadcasting, the new console offers twice the inputs of the existing MXP-2016.

The frame accepts a maximum of 32 stereo or mono input modules, which can be assigned to any of four audio-groups and four VCA groups.

The system can be programmed for studio loudspeaker muting paths, power-up logic, choice of insertion points, choice of solo source and choice of sources for the optional dynamics processor module. The mixer also offers 10 independently selectable talkback destinations.

In video post-production, the console has facilities for an optional MXBK-EI21 video editor interface, allowing each VCA group or selected input channels to be remote-controlled by a range of video editors. The result is cross-fades and mutes accurate to within a single video frame, Sony claims.

Circle (84) on Rapid Facts Card

Altec Lansing 9872 series loudspeakers

The 9872-8A and 9872-8F series loudspeakers are 2-way, full-range loudspeakers featuring a threaded insert points for mounting in permanent installations.

The 9872-8A is housed in an unfinished birch plywood cabinet, while the 9872-8F enclosure is finished with a textured tan paint. Both models have front-mounted components.

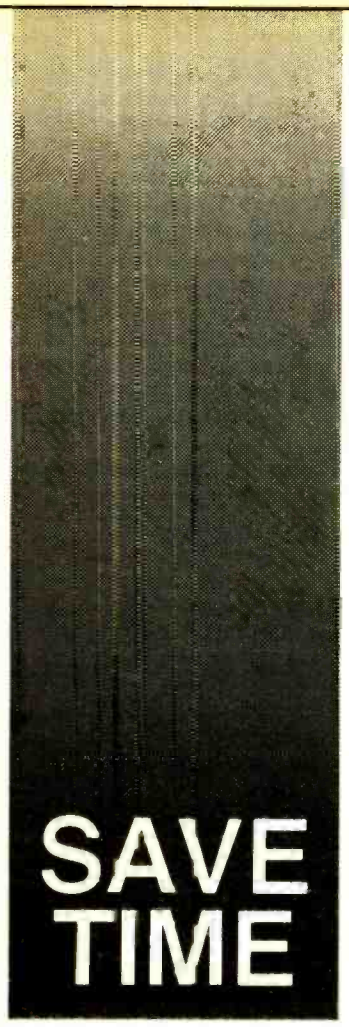
Circle (88) on Rapid Facts Card

Wireworks CS mic cable series

The new series features PVC jacketed, conductive plastic-shielded cables in standard lengths of 5, 10, 25, 50, 75 and 100 feet.

Five different XLR-compatible connector cable types are available in black, red, blue, yellow, green, gray, pink, violet, orange, white and brown to match any application.

Circle (85) on Rapid Facts Card



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Fluent Spanish and sales management experience will provide the background essential for this assignment. Working closely with representatives, dealers, sound contractors and end users, you'll work all channels to ensure our aggressive sales goals are met. Part of this effort will involve attending dealer/trade shows, preparing detailed call/travel reports, and keeping a close watch on competitive activities such as technical advancements, pricing and sales policies. You will compose marketing plans for the region. Although you will be based in the San Francisco Bay Area, travel will be extensive.

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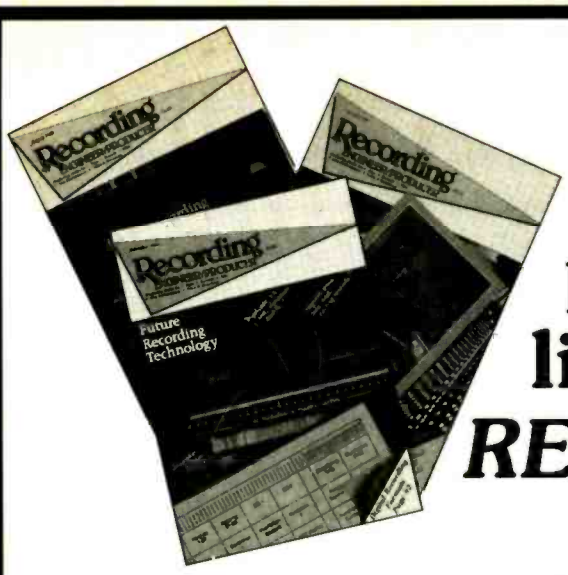

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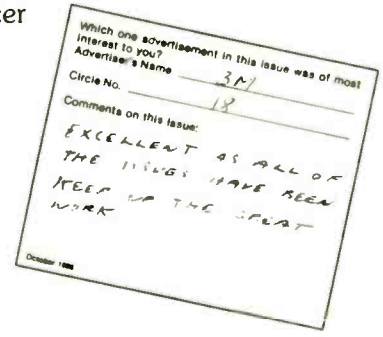
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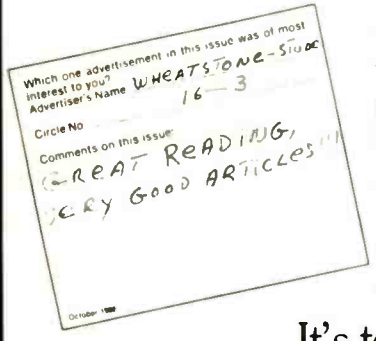
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