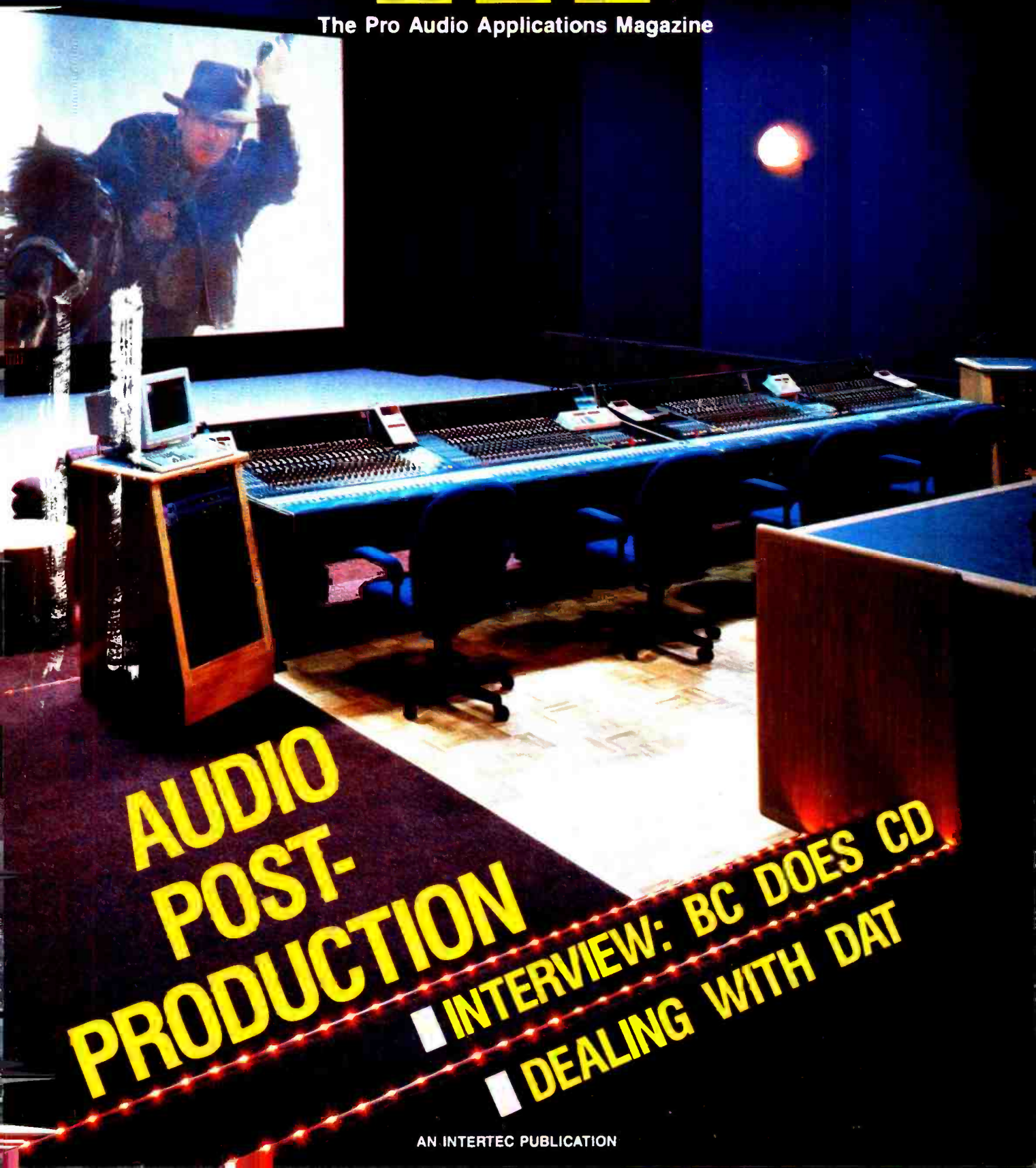
April 1991

Recording ■ Engineering ■ Production

REP

The Pro Audio Applications Magazine



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On the Cover: Skywalker Sound, Santa Monica, CA, featuring an Otari Premier console. Photo by Martin Lavadie.

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R•E•P is an applications-based publication targeted at professional individuals and companies active in the commercial business of studio and field recording, audio for video, live sound production and related fields. Editorial content includes descriptions and demonstrations of audio production techniques, new products, equipment application, maintenance and audio environment design.

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From the Top

What It Is ...

Hold on! Something funny's going on around here. We're in a recession. Business is down. But half of the facilities we talk to are booking more business than they can comfortably handle. Audio equipment sales are down. But more than a few companies are reporting their biggest business year ever. Is this some kind of weird temporal space/time continuum shift? Or, has our industry fragmented into so many different pieces that an all-pervasive reality no longer exists?

The answer? All of the above. Clearly and specifically, it has to do with bank lending rates, broken dreams and wild stretches, the communing EC, baby-booming, hermitic cultural encrustation, technological economies of scale, small company engulfment, the aging of front-line operators (owing to calcification of the aural arteries), visual media, baby-making, career development, informational sensory overload, escapism, science over intellect, "us" wearing multiple hats and worms.

Let me 'splain it on ya. Once upon a time there were baby boomers — us — post-war creations. The big war begat all this technology, created by new young companies. The tech had no place to go after we won, so it spilled into consumer product land — radio, TV, FM, stereo records, tape and 4-head VCR in digital stereo. All development was neatly tracked by the growing number of consumers — us — able to appreciate, afford and purchase these neat new techno-gadgets as our incomes grew.

Our mere presence and program appetite created what we call media — the record industry, video, modern broadcasting, mega film hits, and so on. This production industry, music and pictures, thrived on consumers — us — demanding goods.

Cut to the point: The production industry rode the wave of population and technology development from the late '50s through the late '80s.

Throughout all of this, the economy was positioned to properly support the growth and development of our program production and consumer product industries.

But Hark! Nothing lasts forever. At the risk of generalizing, the boomers — us — grew up, Got married. Got serious. The market shifted, Video siphoned off a slice of record sales and live sound revenue, A generation learned how to cook at home, watch the tube, rent videos or prepare sales meeting reports over the weekend for that Monday morning conference. We eschewed concerts, clubs, new Neil Young releases. VCR and TV sales exploded. OK, our kids, a mini-boom, kept some pieces of the industry active, but not to the consistent level of the '70s or '80s. Only the hottest, common-denominator records/tours went platinum/SRO.

The point again: This biz changed due to demographic, cultural and sociographic causes, into something that is now, truely, in mid-transition. What we know, do and think is half valid/half not in light of the world soon to confront us. Some elements will change radically; some won't change at all. Proof? How fast did it take for compact discs to wipe out vinyl record sales? Or for MTV to change forever the face of movies, burger commercials, car ads, young girl's clothing styles, big hair, or on-stage lead vocalist's posturing? Overnight!

How should we, as producers, profile vis a vis the future? The need for creative capabilities (program generation by producers, musicians, composers, arrangers, writers, production houses) is becoming more important than the actual facilities themselves, which are now affordable and fit on a desk. Facilities or people with foresight, luck, or a strong dose of fiscal conservatism will survive until tomorrow, able to take advantage of the following future major growth areas:

1) Audio-for-video/multimedia support: "do-it-at-home" desktop video production,
2) Minor (non-commercial) project support, including MIDI mixdown rooms.
3) Sample generation,
4) One-off or small-run CD creation.
5) Local commercial action.
6) In-house production companies.
7) Owning or sharing in so-called independent or home-grown labels.
8) Digital protocol interface (sample/rate conversion, file translation for competing computer workstation and MIDI file formats),
9) Industrial project support of corporate media departments.

Where do you fit in? ■

Mike Joseph
Editor

Letters

DAT Questions

From: Sear Sound, New York.

On a recent session for Justice Records, we tried an experiment and are interested in comparing notes with our engineering friends. Because it was a 3-day live jazz recording, we did not have the opportunity of doing technical testing. The conclusions were done solely by listening to the recorded product.

Here is a description of the sessions. The producer was Randall Jamail; Peter Denenberg engineered, with Fred Kevorkian assisting. We used the following microphones: Neumann U47, KM56, U67 and KM88; AKG414, C28 and C60; Sony C37A; Sennheiser MKH405 and an assortment of other dynamics. We have a Neve 8038 console, and limiters were Fairchilds and LA-2As.

The client requested that the sessions be recorded on our Studer A-80 with Dolby SR at 15ips and a DAT backup. We decided to add our Ampex 300 1/4-inch machine with 351 vacuum tube electronics running at 15ips. For part of the session, we also recorded on our Studer B67 at 30ips. Analog tape used was Ampex 456 and Sony DAT cassettes.

The sessions went well, and upon comparing the various recorded formats, it was unanimously agreed upon by producer, engineer and musicians that the best-sounding format was the Ampex 300 at 15ips. This has raised a serious question: Why does a 35-year-old machine seem to sound better than DAT and Dolby SR recordings? All the machines were fed from the same stereo bus and were played back from the same machines on which they were recorded.

Subjectively, the DAT machine sounded totally artificial. To the others present, it was not even in the running. The Dolby SR worked very well; in fact, too well. It not only eliminated the analog tape hiss, but it seemed to have eliminated all of the room tone, also. It sounded as though the instruments had been recorded in an anechoic chamber. They were disembodied from each other and the real world, which is full of room tone. The Studer B67 running at 30ips was a close second to the Ampex.

Has anyone out there had any experiences that might bear on this? Any ideas? Any thoughts? Please contact us at 353 W. 48th St., New York, NY 10036; 212-582-5280; fax 212-581-2731.

The New R•E•P

From: Jon L. Hilton, director, Hiltronex Sound Production Studios, Ithaca, NY.

I just wanted to comment on the new style of R•E•P. It seems to be much cleaner, more concise and overall more readable.

For many years, R•E•P, in its various formats, has been one of my primary information sources of current, *professional* trends and information. I remember that when I first read R•E•P in the mid-1970s, I used to guard those issues jealously — I still have many of the original articles in loose-leaf reference notebooks.

Back then, the content of many of those articles was way over my head. However, I familiarized myself and learned everything as best I could from reading R•E•P. With that knowledge, coupled with the experience brought over the years of working in audio engineering, I find myself understanding the audio field well enough to actually start submitting and writing ideas for articles.

There's a lot packed into R•E•P if you want to find it and learn. It's a good reference magazine, and a great starting place from which you can take what you learn, and go as far as you want in the field of audio production and engineering. Keep up the good work. ■

An Audio Tribute

From: Greg Youngman, Greg Youngman Music, Santa Ynez, CA.

I received my first copy of R•E•P when I was 13 years old. The man who gave me the magazine owned an immaculate, 3-track studio, and I believed him to be a brilliant engineer. His equipment consisted of an Ampex 300 3-track, two Ampex 351 2-tracks, RCA lathe, McIntosh amps, Altec monitors, Langevin console, numerous Neumann, RCA and Altec mics, and much more that I don't remember. All of it was in pristine condition. I wanted that stuff.

Today, I operate my own studio that utilizes some older, vintage-type equipment that I used to admire.

One of these days, someone might walk through my door and ask as many questions as I once did. He will seem familiar. I will answer his questions the best I can and pass on my latest issue of R•E•P. Maybe he will think of me as a brilliant engineer.

I would like to thank the man and the magazine, both of whom inspired me enough to make sound and music my business. Thank you, Dick Terzian, wherever you are. Thank you, R•E•P. ■

Hearing Loss

From: David C. Vaughn, Lightspeed Productions, Cambridge, MA.

Thanks to David Scheirman in his February Live & Direct column for reasserting the essential need for a proactive approach to hearing protection. My own experience has driven me to an acute awareness of the intractable hearing damage that now occurs regularly in rehearsal rooms and concert venues everywhere. It's sad that great performers like Kerry Livgren, Pete Townshend, Al DiMeola and others have spoken out about their own hearing damage and permanent tinnitus, yet practical approaches to the problem have yet to be invented, or are poorly disseminated.

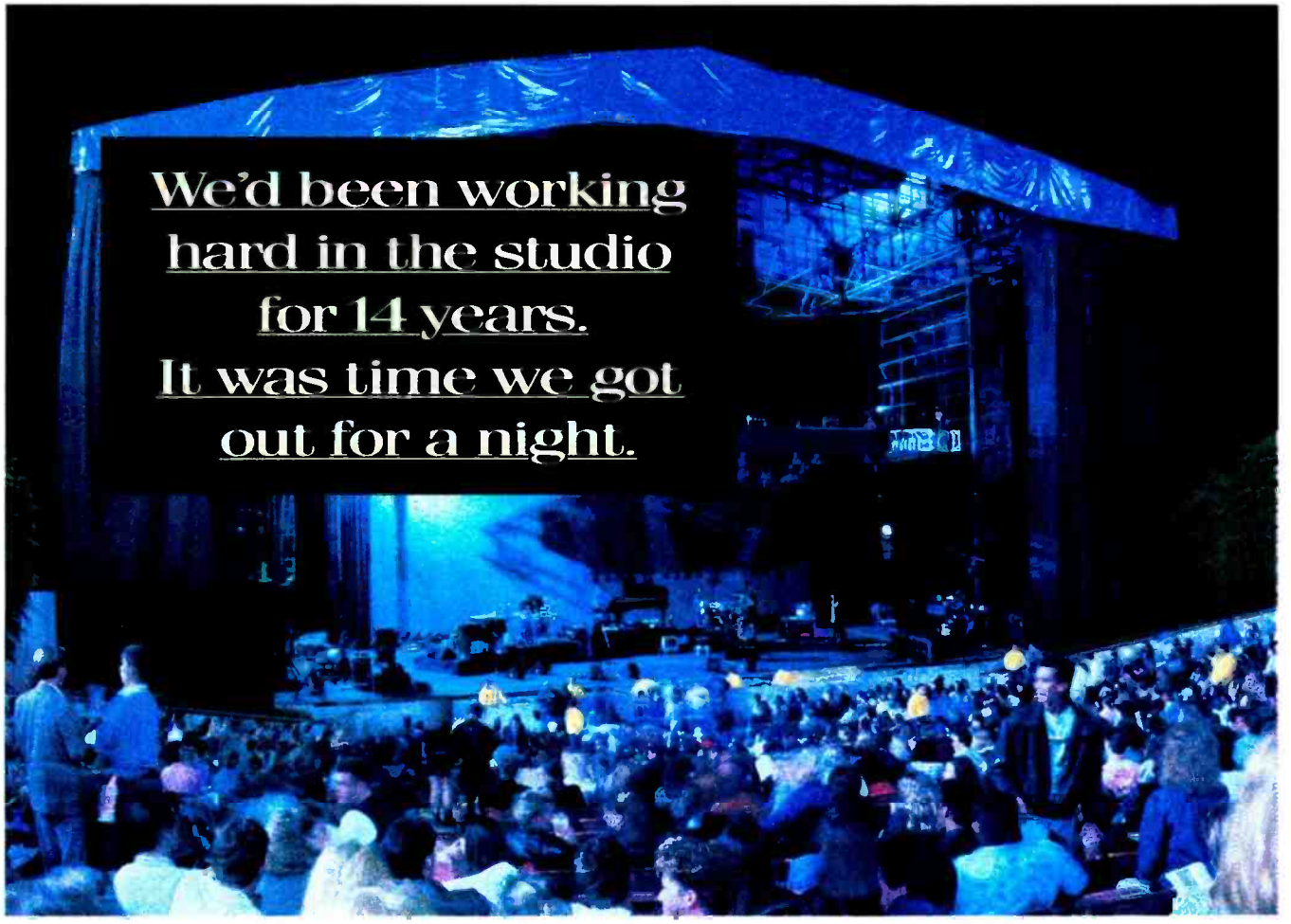
Kudos for covering some possible solutions available to production personnel. However, it seems to me that artists and performers log as many or more hours in high SPL environments than do production staff. I would like to see another column devoted to hearing protection in practice, with the focus given to solutions available to performers.

For example, some of my clients, after seeing footage of "The Wall" performances, want more information about what appeared to be ear-bud wireless monitors used by the performers. If this is for real, it sounds like a great development. What's this all about, and what else is out there?

David Scheirman replies:

For information on in-the-ear monitors, see March's Live & Direct column. Although these systems can act to reduce overall stage levels if the performers are willing to forego their traditional high-decibel floor wedges, they take some getting used to. For a variety of reasons, such systems are not a quick fix by any means. ■

Send letters to R•E•P, Box 12901, Overland Park, KS 66212. Letters must be signed and may be edited for length and clarity.



Spending years on end cooped up in small, dark rooms with a bunch of engineers takes certain special qualities. Durability, for one. We've always been known for that. Of course, clear, uncolored sound quality doesn't hurt, either. Or hand-assembled components, with gap precision to plus or minus one-millionth of an inch.

These features got TAD speakers into studios like Record Plant, NOMIS and Masterfonics. And the same features are now getting us out of them.

See, we had this funny idea that if TAD could make music sound terrific in a small room, we could make music sound terrific in a huge arena. And every outing we've had with Maryland Sound has proved us right.

Not that we won't still work our woofers off in studios from L.A. to London all day. But, at night, we'd like to get out and jam more often.

TAD Technical Audio Devices

Pioneer Professional Products Division

Grammy-Go-Round

As of this writing, the Grammy Awards are but a recent memory. We are pleased to cite four of our peers who were honored with engineering and producing Grammies:

- Best Engineered Recording (Non-Classical): Bruce Swedien, "Back on the Block" by Quincy Jones.
- Producer of the Year (Non-Classical): Quincy Jones.
- Best Engineered Recording (Classical): Jack Renner, for "Rachmaninoff: Vespers" by the Robert Shaw Festival Singers.
- Producer of the Year (Classical): Adam Stern.

Also, congratulations to the multitude of engineers, producers and studios who worked on projects nominated and awarded in the 75 additional categories.

In other Grammy news, the Chicago chapter of the National Academy of Recording Arts and Sciences is forging ahead with its goal of trying to add more engineering/production categories to the Grammy Awards. According to Timothy Powell, the editor of the chapter's newsletter, *The Eardrum*, a meeting to discuss the issue was held in late February. Plans are to complete a written proposal and submit it to the Grammy Awards committee in the next few months.

Powell, you may remember, was the author of a March letter outlining the reasoning for adding more categories. For more information on the issue or to give your input, contact *The Eardrum* at 2097 John's Court, Glenview, IL 60025; 708-998-6421. ■

Bob Davis: 1935-1991

Robert Trabue Davis, manager of promotions and advertising for Yamaha's pro audio group, died Jan. 23 after a brief illness. A long-time member of the pro audio industry, Davis worked as a sound contractor and systems designer, and held positions at Industrial Communication Company, Altec Lansing and Yamaha.

As an active member of the Audio Engineering Society, Davis chaired the 72nd Convention, was workshops co-chair for the 81st Convention and was exhibitor liaison for the 89th Convention. He received the AES Board of Governors Award in 1984. He was also a member of the Acoustical Society of America and the Society of Motion Picture and Television Engineers.

A Robert Trabue Davis Scholarship Fund has been established to benefit the Central Kentucky Youth Orchestras. Contributions may be sent to 161 N. Mill St., Lexington, KY 40507.

L.A. Record Plant: FAREWELL

When the picture at right was taken in December 1985, Stephen Stills, Joe Walsh and Al Kooper were closing out the Los Angeles Record Plant's Third Street facility. A little more than six years after moving to its Sycamore Street location, the third of Chris Stone and Gary Kellgren's studios closed its doors. The L.A. Plant was part of a triumvirate that included the New York Record Plant (now 321 Studios) and The Plant in Sausalito, CA, both of which have continued business with new ownership. Stone sold the L.A. studio to the Chrysalis Group a few years ago; in announcing its decision to close the facility, Chrysalis said that studio operations no longer represented an integral part of its U.S. operations. At press time, chief operating officer David Ellman said that although no offers were currently on the table, he was confident that a buyer would eventually be found.

Photo: Ed Freeman

PEOPLE

AMS and Neve have announced an integration of personnel, following Siemens' acquisition of AMS. **John Gluck** has been named president of AMS North America, and will relocate from the United Kingdom to Neve's Bethel, CT, offices. **Graham Murray,** technical services manager, and **Stuart Hirotus,** product support engineer, have relocated to Bethel. **Doug Ordon** has been named sales manager at the newly established Chicago office. In the U.K., **Frank Massam** has been named marketing manager ... **Steve Krampf** has been named vice president of marketing at Digidesign ... **Peter L. Marsac** has joined Rapco as chief executive officer ... Alesis has named **T.D. (Tim) Craig** as Canadian sales manager, based in Vancouver ... **James K. Grunke** has been named manager of Atari Computer's MIDI group ... NVision has named **Charles Meyer** director of engineering ... Studer's 1990 salesman of the year, **Joe Bean,** has been promoted to regional manager, mid-America ... Full Discount Wholesalers has named **Mark Nash** as general manager ... **Rick Caruso** has been named sales manager for Full Compass Systems ... **John Shepard,** Altec Lansing's design engineer manager, has accepted the position of chairman of the National Sound & Communications Association's product safety group for 1991.

TREND WATCH

Record Labeling: New York is the first state in 1991 to introduce a record labeling bill, which would prohibit the sale of unstickered recordings to people younger than 16. A similar bill introduced in April 1990 died in committee.

Lip Syncing: A Connecticut legislator has introduced a bill requiring concert and musical promoters to let customers know when vocals or music are pre-recorded. "I want to know if I can look forward to a night of live music, or if all or part of the show has been pre-recorded," the bill's sponsor was quoted as saying.

Broadcasting: Is cleaner, not louder, becoming the new benchmark at the nation's radio stations? According to an article in *Billboard*, many radio stations are moving away from heavy processing and more toward what was originally created in the studio. Said one broadcast engineer, "We cannot afford to run listeners off of the FM band like we did on the AM band 20 years ago. Listener fatigue is one of the bigger problems in larger markets."

DCC: Philips has released more details concerning its recently launched Digital Compact Cassette format. At the time of its scheduled rollout in April 1992, players will cost about $600 and will be equipped with the SCMS system to prevent digital copies. Cassettes will be priced between analog cassettes and CDs. Philips contends that DAT will never be a full-fledged consumer format, so no conflict exists between it and DCC. ■

> **"We're losing a little piece of history here. We're losing a good clubhouse, too. No one could go by the Record Plant without stopping in. They liked to hang out here."**
>
> — Record Plant studio manager Rose Mann, quoted by the Associated Press upon the studio's closing.

Random Access

STUDIO UPDATE

Facility/Location	Details
Roar Productions Recording & Musical Services/Columbia, MD	Tenth anniversary and opening of new 24-track studio with a Neotek Elan 40×24 console and an Ampex ATR-124 recorder.
SOUTHEAST	
New Rivers Studios/ Fort Lauderdale, FL	Taken delivery of a Mitsubishi X850 32-track digital recorder with Apogee filters and a pair of Pultec EQP1 equalizers. Studio A has undergone renovation.
MIDWEST	
WLD Recording Studio/ Mill Spring, MO	Opened new studio near Poplar Bluff in the Missouri Ozarks, featuring a Fostex 812 recording console, Fostex 8-track recorder, JBL 4406 studio monitors and a Yamaha SY55 keyboard.
NORTHERN CALIFORNIA	
Music Annex/Menlo Park	Engineer/producer Ted Brooks has joined the staff. The reconstruction of Studio C is complete; a 56-input Soundcraft 3200 console, Diskmix II Automation, a Studer 827 multitrack and A80 2-track, a Lexicon 480L digital processor, and an Eventide HD-3000 SE have been installed.
Alpha & Omega Studios/San Francisco	Relocated one studio to San Rafael, CA.
MANUFACTURERS	
Amek/TAC	Console sales: Clemson University (South Carolina), two TAC Bullets with ES-8 serial interface units; WSOC-TV (Charlotte, NC), KNBC-TV (Burbank, CA) and the National Video Center (NewYork), AMEK BCIIs; CBS-TV (New York), a short-frame TAC Bullet; Atlanta voice talents Marcus Graham and Brad Able, TAC Bullets; Miami Executive Recording, a TAC Bullet and TAC Scorpion II; Turner Network Television (Atlanta) and WLTV (Miami), TAC Bullets with ES-8 interfaces. S.A.S. Studios (San Antonio, TX) took delivery on a 40-input Mozart console featuring designs of Rupert Neve; Showplace Recording Studios (Dover, NJ) has purchased a second Mozart RN Series console; Martin Audio (New York), Harris Audio Systems (Miami) and Full Force Productions (New York) have purchased Medici equalizers, featuring designs by Rupert Neve.
API Audio Products	Pinebrook Studios (Alexandria, IN) has purchased a Discrete Series console for Control Room C.
Audio Kinetics	Videolondon Soundstudios has purchased an ES.Lock system for Studio 4.
Digital Audio Research	Sales of the SoundStation II System: Sound Developments Studios (London) and Hebei TV (China).
Gauss	Normandy Sound (Warren, RI) and Kajem Victory Recording Studios (Philadelphia) have upgraded their monitor systems by converting to Gauss 3588 coaxials and 4583A 15-inch woofers. Loudspeaker sales: Debbie Gibson Productions (New York), John Patitucci of Chick Corea's Elektric and Akoustic Bands, and Warner Bros. Records.
Genelec	Digisound (Omaha, NE) has installed the first 1033A Active Monitoring System.

NEWS NOTES

Update: **Fred Ampel**, editor of R•E•P's sister magazine Sound & Video Contractor (we like to call him the "ayatollah of audio"), was the photographer for Figures 1-4 in "Lean and Mean: Schubert Systems Group," which appeared in the January issue.

Sony has announced a series of pro audio training courses to be held at its facilities in Fort Lauderdale, FL, and San Jose, CA. For more information, contact the company at 305-491-0825, ext. 186.

Audio Services Corporation is now an authorized Neumann service center. Ron Meyer, ASC's engineering manager, recently completed a training course at Neumann's Berlin factory.

QSC Audio Products has named Washington Music Center, Wheaton, MD, as its 1990 dealer of the year. Michael Chafee Enteprises, Sarasota, FL, has been named 1990 representative of the year.

The Society of Motion Picture and Television Engineers is celebrating its 75th Anniversary this year, to be capped with special events at its October convention.

Studer Revox America has announced that its Studer professional dealer products are now being sold by a direct sales staff, which could mean a savings of up to 30% on these products. Dyaxis and Revox products will continue to be sold through dealers.

CTI Audio has announced two acquisitions: Techmat cable products, previously a division of TL Industries; and Megamix automation products, from Musically Intelligent Devices.

QMI, the North American distributor for Drawmer and Genelec, has appointed Alactronics, Wellesley, MA, as the exclusive authorized warranty repair center for those product lines.

JBL Professional has been granted trademark registration for two of its product lines, Bi-Radial horns and the Control series of studio monitors. ■

"I've been sold on Beta's superiority since I first tried them. I use them on vocals, drums, amps, and brass because their sensitivity and resistance to feedback make them the perfect fit for the groups I work with. And the Beta 58 Wireless is the first system I've found that gives my artists the freedom of a radio mic without sacrificing sound quality."

Paul Dalen, Sound Engineer for David Sanborn and Lisa Stansfield.

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Circle (8) on Rapid Facts Card

Fresh Tracks

Sting: "The Soul Cages"

Label: A&M
Produced by: Hugh Padgham and Sting
Engineered and mixed by: Hugh Padgham
Assistant Engineers: Simon Osbourne, Yves Jajaget, Bruce Keene, Al Stone, Brian Scheuble and Efren Herrera
Recorded & Mixed at: Guillaume Tell (Paris); Villa Salviati (Italy); Townhouse (London); A&M (Los Angeles)
Mastered by: Bob Ludwig, Masterdisk (New York)
SPARS Code: DDD

Comments: After marveling at the clarity and sonic presence of Sting's newest "life perspective," we can't remember a recent recording with greater intelligibility and accuracy. Padgham's "Sonic Report Card" would yield all A+'s, especially in the categories of frequency response (preservation), amplitude mixing (blend) and simulated environments (aided by digital FX or otherwise).

Of special interest: This album features QSound, which provides something — although we're not really sure how much is smoke and mirrors. From the very onset of the album, certain instruments *do* appear to be placed further back in the mix. The experience sounds different from amplitude levels; indeed, perhaps one could say (if we stretched our imagination) that certain instruments seemed to emanate *behind* other instruments. Then again, we're still recovering from that 1970s quadrophonic experience. ■

Queen: "Innuendo"

Label: Hollywood
Produced by: Queen and David Richards
Engineered by: David Richards
Recorded at: Metropolis (London); Mountain (Montreux)
Mastered by: Kevin Metcalf, Townhouse (London)

Comments: Queen is back with a vengeance. Freddie Mercury's voice is in fine form, and Brian May's trademark, unmistakable guitar tone is still the coolest. As to sonics, Queen, having ridden the crest of engineering development for nearly 20 years, produce enjoyable recordings that are something of engineering marvels. The new release pushes the envelope: parts of the mixes come right out of the speakers with extraordinary depth, and surpass the best QSound we've heard. With headphones, the effect is equally as dramatic, although different in scope.

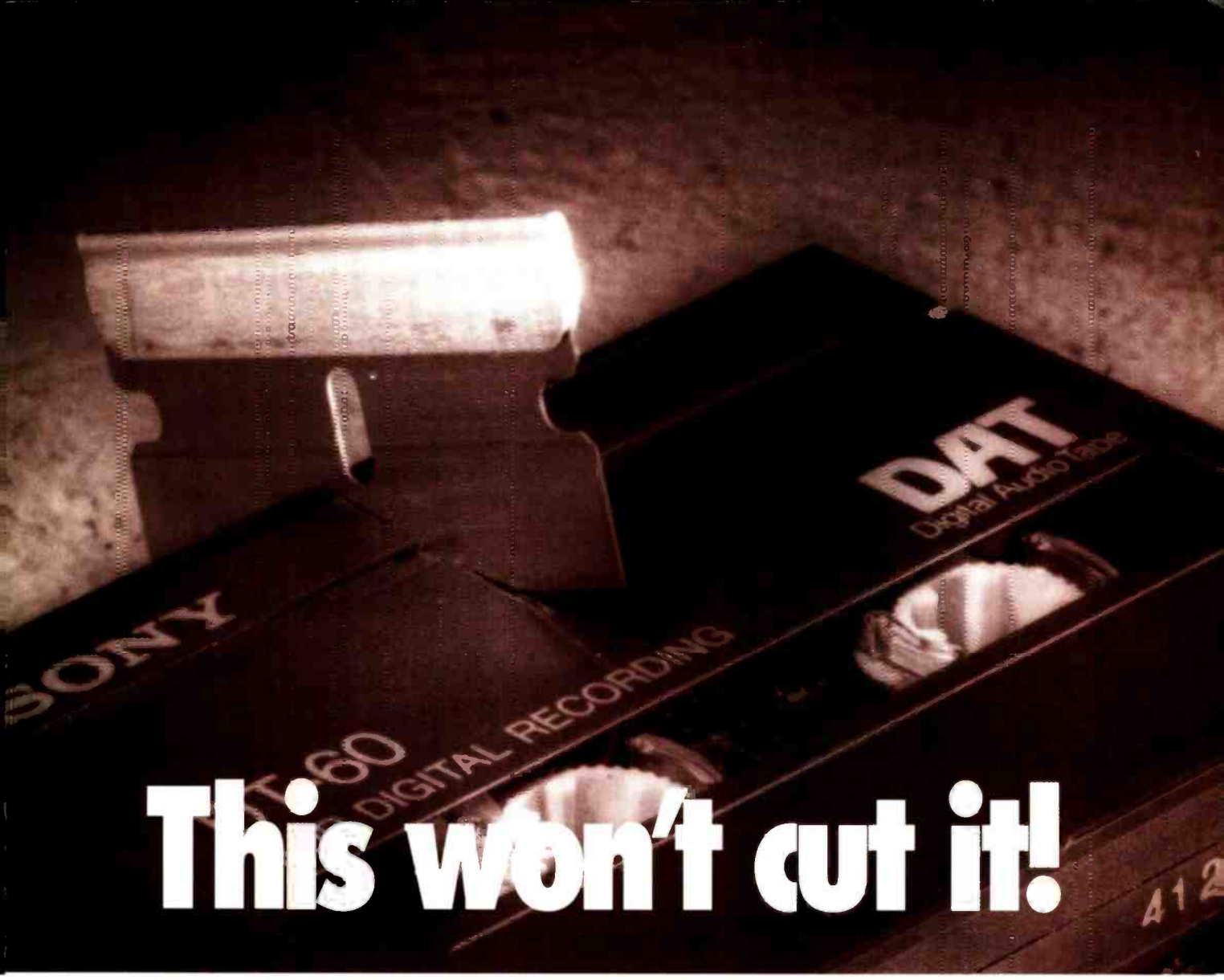
Of special interest: The wideness of the sound field in headphones seems to stretch way beyond the distance between the listener's two ears. We're baffled as to how Richards did this, but it is all great fun and a definite "must hear." (Maybe Brian May has developed his own private 3-D sound encoding system?) Kids: don't try this at home. These are professionals. ■

The Beautiful South: "Choke"

Label: Go!/Elektra
Produced by: Mike Hedges
Engineered by: Lance Phillips, Ben Kape, Rupert Coulson
SPARS Code: AAD

Comments: The Beautiful South are two-thirds of The Housemartins, one of the most widely acclaimed British pop bands of the 1980s. The South sound a lot like the Housemartins, but without the sometimes overdone political lyrics. On the group's sound, Heaton says, "It sounds as if I've spent my life listening to British pop music." Some of the same influences that led to the success of Simply Red and Squeeze are developed here to good effect. Producer Hedges has also worked with Siouxie & The Banshees and The Cure.

Of special interest: In production, it is often the little things that make a big difference. "Let Love Speak Up Itself" features a trumpet solo right out of late sixties Burt Bacharach — everything, down to the tone of the horn and choice of notes, sounds like it could have been inside of "This Guy's In Love With You" or "Raindrops Keep Fallin' on My Head." It fits beautifully and works for the song (the true test, of course), and each time we hear it we laugh out loud at how well they pulled it off. ■



How do *you* edit DAT recordings? Let's face it. Your choices are limited. You can (1) give up, (2) either buy or rent time on a costly dedicated digital editing system, or (3) look into a disk-based editor. The latter is certainly the most flexible and cost effective alternative. And among disk-based systems, none is more widely used and recognized than Digidesign's Sound Tools.™

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Circle (9) on Rapid Facts Card

Fresh Tracks

Spies:
"By Way of the World"

Label: Telarc
Produced by: Paul Freeman
Engineered by: Paul Freeman
Mixed by: Paul Freeman
Recorded at: Front Page (Costa Mesa, CA)
Digital Transfers: Doug Doyle, Digital Bros. (Newport Beach, CA)
SPARS Code: DDD

Comments: The second release by this popular jazz/fusion group is the first commercial recording to utilize the Shure HTS Stereosurround system. On a normal stereo system, the width and depth are very impressive, the imaging excellent. We listened on six different full surround sound systems with mixed results, because only one installation was properly set up. In this case, the music actually surrounded us, to suggest at times that the musicians were in a circle around the listener, at other times that the listener was in a very good sounding hall. With systems improperly set up (mismatched speakers, missing center channel), phasing problems were apparent.

Of special interest: The music is a fascinating array of sounds, rhythms and colors from Africa, Brazil, the Middle East and Native America. The melodies are rich with visual images, evocative and fun. The recording is excellent, particularly the percussion; the sheer range of recorded sounds is impressive, both in terms of their frequencies and textures. A musical achievement. ■

FOCUS:

PAUL FREEMAN, Producer/Engineer, "By Way of the World"

R•E•P: I listened to this on three different surround sound systems, and it sounded radically different in each.
PF: Right. I've had that experience, too.

R•E•P: When you go to mix something with surround sound, what do you do?
PF: Shure created the surround sound technology and they sent a representative, Bob Schulein, to supervise the setting up of the system for mixing. Basically, you have an encoder and a decoder, and you set up your surround speaker system, which should consist of five matched speakers. I used five Tannoy 6.5 speakers; one center, one left, one right, and then two rears. The rear channel is mono, that is, there's no difference between the signal in the two rear speakers.

The console we have is a Neve Quad console with GML automation. The encoder can be set up in zillions of different ways, but we sent the quad pan pot into the front-to-back input of the encoder. The more I wanted something shoved toward the rear of the room, the more I turned this pan pot toward what would be the rear in quad.

However, you can't confuse this technology with quad; it's completely different than that. For one thing, all of the information is encoded onto a stereo mixdown. Secondly, surround sound is designed to emulate the ambience of sitting in a live hall hearing an orchestra; to give you the sound of the room you would be in if there were no other people in it. The theory is that the center of your perspective is this center channel; the things you would find on the left or right of the stage are in the left or right channels. Then you take your effects and move them into the interior of the room. This is the area between the front and the rear speakers.

You don't usually send primary material all the way to the rear of the room — although I did in a few cases — because what you're really doing there is playing with the phasing of each individual channel. Now, if someone is listening in stereo, the more you've moved something to the rear of the room, the wider it sounds in stereo.

It was interesting to try and get things to move around in a circle; it's not like quad where you're moving things around 160°. You're just moving things from front to back. But the theory of surround, as Shure would have you deal with it, is that the effects are in the interior, creating the ambience that a concert hall would create. The music in the left, right and center is drier than you would do in regular stereo, and as you move back toward the rear of the room, the more effects — reverberation — you experience, plus you get the ambience of your own room.

When they get surround sound, most people turn up the rear speakers really loud, because they're not accustomed to hearing anything back there. But you shouldn't hear them, you should just perceive them; they should just provide a warmth and depth that wasn't there before. ■

— Interviewed by Dan Levitin

If Bob Clearmountain didn't have so many good things to say about our digital multitracks, we might've had room for his picture.

It's not that Bob Clearmountain is camera-shy. It's just that when you consider he's one of the most respected names in the recording industry, his reasons for buying a Sony PCM-3348 DASH 48-track look even better.

Sony's PCM-3348 makes digital editing so precise, you may never use one of these again.

He bought it for the transport. "The first time I ever used a 3348, the transport was so incredibly fast and responsive, I was addicted to it immediately."

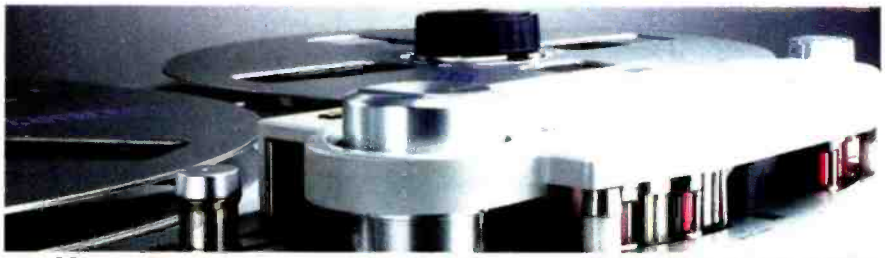
He bought it for its reliability. "I've never had any real downtime because of a Sony digital multitrack. Either the 24- or the 48-track. And believe me, there are other machines that have cost me weeks of my life."

He bought it for digital editing. "Editing on the 3348 is unbelievably quick and easy. I can edit and re-edit without destroying an original take. And that leaves me an infinite number of options."

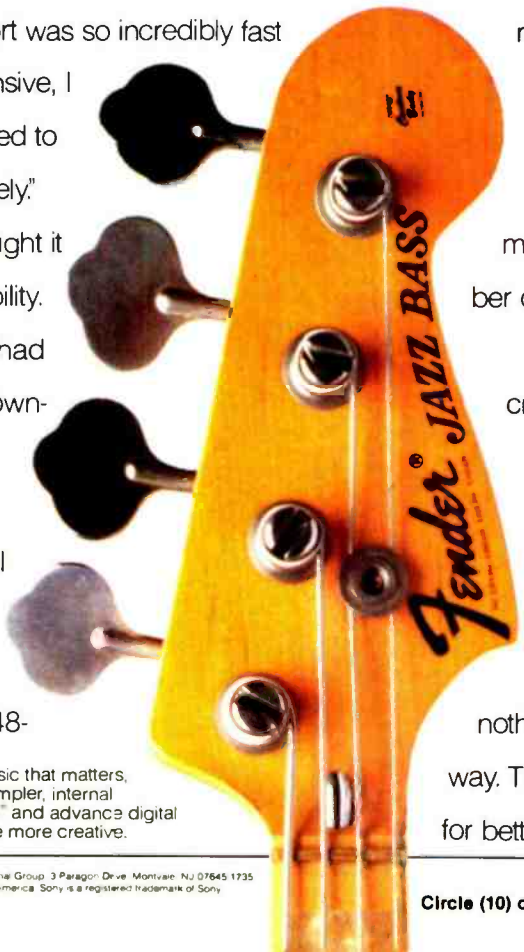
He bought it for creativity. "Sony's multitracks create an atmosphere where you can just let it all happen and have nothing get in the way. That really makes for better music and even better records."

He bought it for the sound. "The 3348 sounds fantastic. Everything I record sounds exactly the way it went in, no matter how long I work with the tape."

And he bought it because he wouldn't consider buying anything else. "I don't think there's another machine that even comes close to the 3348."



The PCM-3348 has a truly unique transport mechanism. Its predictable response, consistent reliability, and incredible speed actually make the 3348 a lot of fun to use.



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SONY

Circle (10) on Rapid Facts Card

BUSINESS AND PROFESSIONAL GROUP

On the Floor Again

By Steve Lawson

Trade shows are mesmerizing. It's hard to keep me away from the Auto Show or the Boat Show when they hit town. Even if I'm not looking to buy something, I find it fun to browse. Conventions are great places to shop, talk to representatives, kick the tires, visit the competitive exhibitors and attempt to analyze the pros and cons of each new model being presented.

But are trade shows a great place to make a purchase? It depends on what you're buying. I wouldn't put my cash down on a boat before testing it on the water to see how it really performed. The same goes for a car. I may admire the styling, and listen to the claims of horsepower and gas mileage, but I reserve judgment until I've taken a test drive.

Trade shows are the gathering of the tribes for our industry. They provide a magnet which draws us together. For audio folks, the AES is our Mecca. Next on the list would have to be NAB. And then there's SMPTE, NAMM, NSCA and others. We make the pilgrimages; we meet and talk; we shop around. But what should we buy?

It's a frightening prospect. The gear you buy today could be your undoing tomorrow. If it's expensive, how do you know someone else won't make the same thing a lot cheaper and better tomorrow? Should you wait? Maybe you should buy now and take advantage of the special show price. You could prove to be a visionary — maybe that little gem you're looking at will be the next Pultec or LA-2. You might even buy the next Telefunken. Or you could get stuck with that booby prize behind door No. 2.

The recording industry will always be in a state of change. But there will be those who get very comfortable with a certain technology and they'll stay with it — forever. In Seattle, I know of two individuals who have made a good living for years while operating modest 4- and 8-track studios. They have a loyal clientele who come for the expertise of the engineer rather than the flash of technology. Who can criticize someone who serves the client well and has found a profitable niche?

For the past few years, the latest upheaval in the audio industry has been the project studio. Who can blame a producer or musician who wants to work at home? The big commercial studio owners aren't thrilled with this trend, but I doubt that fast food restaurants are thrilled with supermarkets that operate in-store delis and salad bars. As they say in New York, "Whatchagonna do?"

Is a trade show a great place to make a purchase?

So, we have monumental changes in the infrastructure of the recording industry. We have technological changes that are both invigorating and bewildering. What's a person to do? For starters, you might get together with people who are in your same situation. Find the kindred spirits who are interested in swapping stories of failure and success. Some people started small and like it that way. Others started small and find themselves grappling with expansion. Some of the big players are taking a look at the smaller operational options.

Which brings me to SPARS. When you join, you enter a new world of professional camaraderie. You are a phone call away from advice, a friendly word and the feeling that you are not alone.

Which new reverb should you buy? Talk to all the sales people, and then make a few calls to your fellow SPARS members. Call 10 of them and you'll probably get 10 different opinions. But you'll also learn five things you never dreamed of about reverbs. Should you buy another analog 24-track machine or should you take the digital plunge? Call SPARS members and ask what works for them. Some are profitable with analog, others are in digitally driven markets. Some want one big multitrack, others like to lock up several for the big sessions and have the flexibility of multiple machines for separate studios.

Are the markets really that different? You better believe it. In Seattle, there are seven active audio-post facilities; all but one are using digital audio workstations. In this market, you can't give away 24-track time for radio production or video sweetening. If it's not on a workstation, our clients simply won't do the job.

Buy a new synchronizer? You've got to be kidding. Not now. But that's not the case in Los Angeles or New York, where it's open reel analog or digital with a synchronizer for TV work. Chicago seems to be split between open reel and workstation, but leaning toward the workstation. How do I pick up these interesting tidbits or market trends? I talk to SPARS members.

In May, SPARS will present its third Workstation Business Conference in Orlando, FL. All the big guns will be there. What separates this conference from a trade show is that each participating manufacturer makes a formal presentation to the audience about their device, and in that audience is their competition. There is no hoopla — all the manufacturers are on equal ground.

Balanced with the formal presentations are informal one-on-one discussions with the various manufacturers, with fellow SPARS members and manufacturer panels moderated by SPARS. It's a great way to see the latest gear, and to find out what is and isn't really working. You have the opportunity to talk to fellow studio owners and engineers to find out what works for them.

Even if you belong to local studio organizations, membership in SPARS offers a distinct advantage. Whereas facilities in your own region won't easily part with competitive information, you will find a refreshing willingness among SPARS members from other regions to be completely open with you about all aspects of the recording industry.

So now it's NAB time. The SPARS workstation conference is in May, and we're only six months away from AES. Make these shows work for you. Browse, kick tires, talk — and think seriously about joining SPARS. There is no guarantee that you won't buy the wrong equipment, but at least you'll have bought it for all the right reasons. ■

Steve Lawson is a member of the SPARS board of directors and president of Lawson Productions, Seattle.

The Society of Professional Audio Recording Services is the industry's best source of business information. For details on activities or membership, contact SPARS at 4300 10th Ave. N., Lake Worth, FL 33461; 407-641-6648; fax 407-642-8263.

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Circle 115 on Rapid Facts Card

Master of Code

By Rick Schwartz

Time code has changed the way we work in the studio. Without it, automation systems would have no way of accurately recreating a mix. Flying in vocals and sound effects would have to be done by hand, instead of by offsetting two machines. And, of course, video lockups would be almost impossible without SMPTE. Although time code may have made our lives better, it has created its share of problems as well. Here are some hints that should help.

SHAPING UP

Myth: Reshaping time code from a video master is the safest way to copy time code from a video master, because it will correct for problems caused by the audio generation loss.

Fact: Although reshaping will clean up rounded edges, it will also pass on any speed anomalies, jitter or dropouts from the master to your slave tapes. Many experts believe it's more reliable to stripe fresh time code from your generator, instead of reshaping when making audio slave tapes. This way there is no chance of passing on problems that the master may have. If you need to transfer production audio from a video master while you stripe a slave reel, it's best to jam-sync time code from the video master to the slave machine.

As long as you print contiguous code with nice sharp edges, the method you choose is not that critical in most applications. Even if the synchronizer has to "pull down" the speed on the slave to resolve it, as long as the tape was prestripped, there well be no change in the pitch of the audio tracks.

Myth: Always stripe time code with your slave machine resolved to house sync.

Fact: The slave shouldn't be resolved to anything during striping -- it *must* be free running. Make sure its capstan is not under external control. Remember that stripping time code is possibly the most important part of a lock up. If a tape is not striped properly, you are sure to have problems down the road.

READING & WRITING

Myth: If your synchronizer is having a hard time properly reading time code from tape, try recording it at a hotter level.

Fact: You will encounter more problems recording time code too hot because of distortion, than recording it at a level of -7VU to -10VU. Another problem with over-recording is SMPTE bleed onto adjacent tracks. Before a session, try printing time code at several levels to determine the lowest level your reader likes to see. If you need to boost under-recorded code, do it upon playback using a low cost reshaper like the Brainstorm SR-1.

SYNC & OTHER SAFEGUARDS

Myth: Always record a 60Hz sync tone to act as a safeguard against time code loss.

Fact: A sync tone can be a useful backup to SMPTE as long as your synchronizer is capable of switching over to it in the case of problems. Keep in mind that in order for a sync tone to be useful, it must have been recorded *at the same time* the SMPTE time code was, not post-striped (unless your transport was resolved to the same speed). In addition, the field rate should be twice the frame rate of the time code. This means 30-frame time code has a field rate of 60, while 29.97 has a field rate of 59.94.

Myth: I can't print a 60Hz sync tone because my time code generator doesn't have a sync output.

Fact: Au contraire, mon frére. You can build a poor man's sync generator for a couple of bucks with a transformer from Radio Shack. With a little help from the power company, this simple generator will allow you to print a 60Hz signal on tape, which will work fine for most 30-frame audio-only applications. It is always better to get your sync tone from a synchronizer resolved to house sync, because it will have exactly the same relationship with the time code.

FUN WITH FRAME RATES

Myth: 29.97 is the same as drop-frame 30.

Fact: Contrary to popular belief, there are six different types of time code: 24-frame, 25-frame, 29.97 drop, 29.97 non-drop, 30 drop and 30 non-drop. (A gold star should be given to the few manufacturers that support all six rates.) Frame rate is simply a count of how many frames go by in one second. Drop frame has nothing to do with the frame rate — it is simply a way of numbering frames.

Myth: 30-frame non-drop works great for most applications.

Fact: Although this is true for audio-only applications, most videotapes today are referenced to an NTSC signal, which has a true frame rate of 29.97. Carefully check the box on your video to see what frame rate was used.

THE AUDIO MASTER

Myth: For music applications, it's better to use an audio master rather than a video master, because you don't have to wait for the machine to be locked to punch-in, which saves time and also eliminates the irritating pitch change while the machine is locking.

Fact: Although the preceding is true, keep in mind there are some potentially serious problems that can occur with an audio master. Unless your synchronizer will resolve the tape transport of the audio master with house sync, it is not recommended for the following reasons: First, most video machines aren't good slaves, because they don't like to run off-speed. As a result, after the synchronizer resolves them to within a frame, it releases them so they are essentially free running. Second, it is impossible to spot time code numbers by jogging the video without first taking both machines off-line. Videotape machines make better masters because when required, they can reference their speed to house sync via a back panel connector.

THE LTC ALTERNATIVE

Myth: VITC should be used instead of LTC whenever possible, because it is more accurate.

Fact: VITC is more accurate, but only at very slow playback speeds. VITC can be used as an alternative to longitudinal time code (LTC), but they work best when used together. Striping LTC on an analog track for redundancy is always a good idea. Most synchronizers will automatically switch between LTC and VITC. Unfortunately, not all transfer houses are VITC capable, so it is not always easy to get.

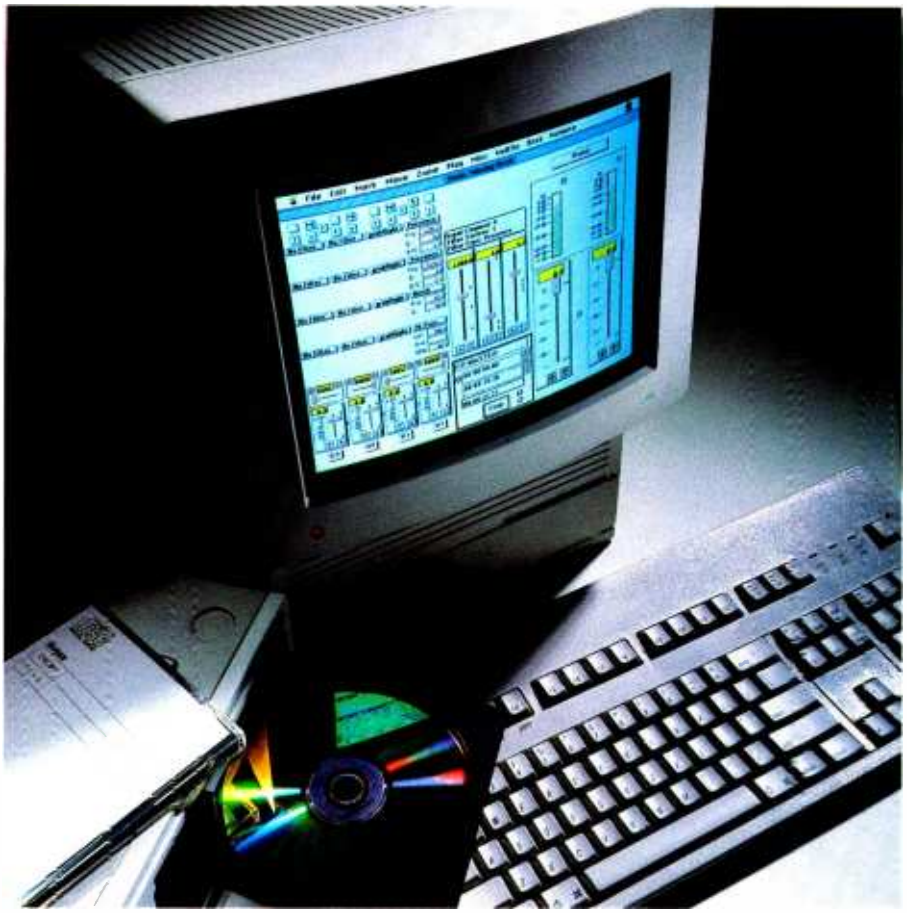
GETTING IT THERE

Myth: Time code should appear in the patch bay, so it can be easily multed and patched to any machine.

Fact: Although it is possible to mult SMPTE to a couple of machines, keep in mind that multing loads down the signal, which can cause reader problems. Time code from your master machine should be distributed to multiple destinations using

Continued on page 72

Rick Schwartz is a contributing editor to R•E•P and director of post-production at Music Animals, Los Angeles.



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NoNOISE - The ***NoNOISE*** system has restored thousands of recordings. Now you can add any ***NoNOISE*** "tool" for de-clicking and noise reduction to the Sonic System.

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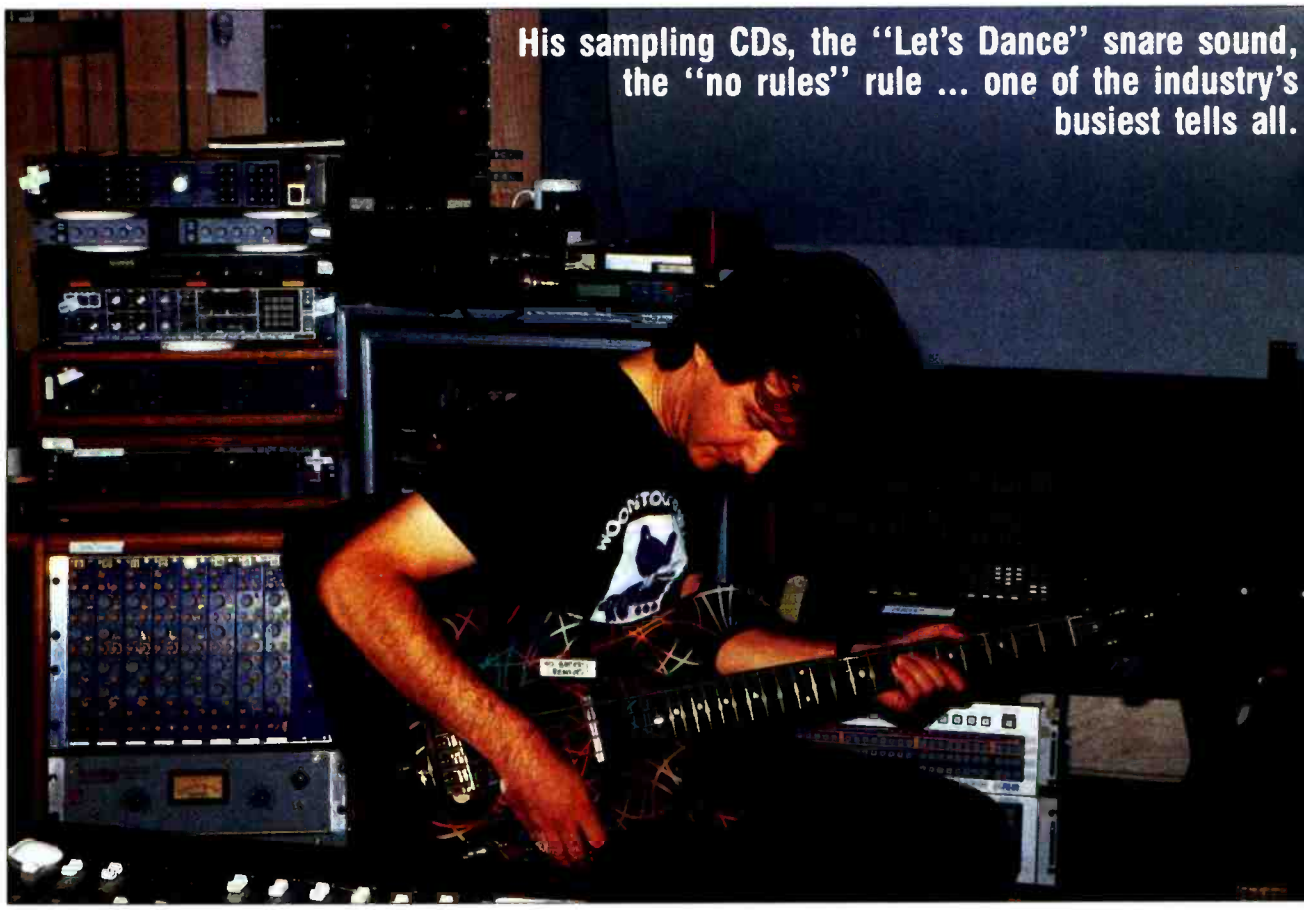
THE R-E-P INTERVIEW

By Ira Cord Rubnitz

Bob Clearmountain



His sampling CDs, the "Let's Dance" snare sound, the "no rules" rule ... one of the industry's busiest tells all.

Amidst all of the workstations, remote-controlled mic stands and equalizers named after classical composers at last year's AES show, my eyes opened widest when I saw a booth featuring Pro Samples drum sounds on compact disc by Bob Clearmountain. As one of the most sought after producer/engineers in current times, Clearmountain's career retains the quality and longevity reserved only for the top echelon of successful professionals.

Ira Cord Rubnitz is an independent recording engineer and free-lance writer based in Los Angeles.

But why should he put out a CD of drum samples? Are they, indeed, from the vast library of his "greatest hits" (pun intended) such as classic Bowie or Springsteen snares? Or are they new and improved digital sounds that we'd really get a kick out of? With all of the talented knob addicts searching for new gizmos like ants at a company picnic, wouldn't they already have a large collection of sounds of their own?

Clearmountain's drum sounds are all new and meticulously recorded at top studios (A&M in Los Angeles, Bearsville in New York) with a huge variety of kicks, snares, toms, hats and cymbals sampled in an assortment of combinations, including dry, with room ambience and/or subtle processing.

The prime reason for the CD from his perspective? He was, "Tired of hearing crap drum sounds on demos." Second, Doug Rogers of East-West Communications convinced him. Clearmountain was in Los Angeles to mix some things for Guns 'N' Roses, Janet Jackson, Bruce Springsteen, Toni Childs and Edie Brickell. The Pro Samples project fit in nicely. In this interview, Clearmountain discusses the East-West Drum Sample CD and his

newest sample project of percussion and bass sounds.

R•E•P: Can we have a little guided tour about the sampling sessions and any tips you have?
BC: We recorded direct to DAT (Panasonic 3500 and Sony 2500) and compiled it on a Sonic Solutions digital workstation, so it all stayed digital from start to finish. The percussion samples were recorded on a Sony 3348 digital multitrack so we could treat them later with QSound and pan them various ways, adding in effects, while mixing in separately recorded room ambience.

R•E•P: Do you notice sonic differences between the DAT and 3348?
BC: Not really. I use the 3348 and mix to three DAT machines for backup. DAT's less expensive than 3/4-inch, open-reel digital or 1/2-inch analog, for that matter. That's not always a factor, but it's a lot easier and quicker to find takes. They're more convenient and sound pretty much the same as 1630. There may be minor differences, but nothing that has ever bugged me. I've been assembling most album projects on the Sonic Solutions for the last year or so. It's fast and sounds really good, plus you can see what you're doing at all times.

R•E•P: Did you approach these sampling sessions differently than doing an album project?
BC: Very similar. There's a certain kind of sound I like to get. Although when sampling, I have the luxury of being able to put different mics at different distances. With a full set of drums, I can't put a mic four feet away from a snare because it would pick up spill; the rest of the kit would sound out of perspective. When sampling just one drum at a time, a 421 about four feet above the drummer adds a fullness and realness to the sound.

You can sort of get that through overhead mics, but you'd be EQ-ing and setting up those mics to pick up the cymbals and toms, so it can actually be a hindrance depending on phase relationships.

R•E•P: Any different methods or equipment between the drum and percussion CDs?
BC: The percussion CD was done in A&M Studio D with an SSL 4000G series console with E series EQ and recorded to the 3348. EQ was kept to a minimum. I like the SSL mic pre-amps. A combination of mics were used, including AKG 460s, Sennheiser 421s, Neumann U87s and B&Ks. Four close mics were used on everything for QSound and four room mics for ambience, so we had eight tracks for everything. The four room mics were in cardioid with two facing toward and two facing away from the instruments. The drum samples were all direct to DAT using one to three close mics and two to four ambience mics.

R•E•P: When did you first get into sampling and how has it affected your approach while recording?
BC: In Sydney, Australia, at Rhinoceros Studios. I used an AMS 15-80S and thought it was brilliant for drums and flying in vocals. As far as changing my recording approach, I don't use samples that much. I'll tune the drums — that's not a problem. I may try a sample once I get to the mix, having developed a different idea of how the drums should sound than when I started. With overdubs on the track, you think "Oh well, that sound isn't really appropriate now — maybe I can change it a little bit and get creative." I don't have much of a problem with drum sounds. Once in a while I'll have a problem with a bass drum. I don't know why; I think everybody does.

For example, on the new Edie Brickell record, the tracks sounded great; no way would I ever need a sample. Once in a while you get something that's on the moon. All engineers have come across that. Years ago, there was nothing you could do about it. I'd use lots of EQ, compression, gating and things until it sounded like something. Samplers changed all that. The challenge became how to make it sound real, to make a drum sample sound like it was part of the original kit. Early samplers had trigger delays, like the AMS, which made it harder.

I just think it's wrong to tell people they should do something a certain way. The only rule is there are no rules.

R•E•P: You'd get the audio from a sync head to a delay line, and then to the AMS?
BC: Always. On analog. With digital, if I have two DASH machines, I'll bounce a trigger from the snare and bass drums over to the other machine out of sync so it appears ahead. The 3348 has an "advance output" record feature (an inside switch) so you can bounce to another track and it'll play back up to 5ms ahead. You can delay it again to get the sampler in sync.

R•E•P: Do you ever miss recording as opposed to mostly mixing?
BC: I was an engineer for years and enjoyed it. I got to the point where I did lots of mixing; I enjoy it a lot more than recording. Why should I waste my time sitting with some producer whose methods I might not agree with and push buttons all day long? I'd rather be producing or mixing. When I produce, I usually engineer my own tracks. I still enjoy it as long as I can make most of the decisions.

R•E•P: Can you still retain all of the objectivity?
BC: Yeah. It's not an easy thing to do, but you do it enough and the engineering becomes second nature and really happens in the background. The main focus is on the performances. Hopefully, I'm working with an assistant who's together enough to know when I'm going on the wrong track or whatever. That's the hard part. Sounds aren't that big of a deal, but having too many technical things to think about is.

R•E•P: These days are there big differences between New York and Los Angeles studios?
BC: New York is a problem. Because of the higher rents and overhead, the studio rates are higher, and there's not enough money for good maintenance and such. It's ironic, but everything seems to be slower in New York for some reason.

R•E•P: Besides being tired of hearing "crappy" drum sounds on demos, are there any other reasons for making these CDs?
BC: I've always wanted to make my own record and I'm not a very good songwriter or singer! (Laughs) I don't know ... it seemed like a fun thing to do, really.

R•E•P: Did you think of using any of your prior "greatest hits" like from Bowie, Bryan Adams or Springsteen?
BC: No. That would actually be illegal unless I got releases from their labels and that would be far too complicated. Also, I wouldn't want my next mix client asking me if his snare was going to show up on my next CD! Personally, I don't think the "Let's Dance" snare was one of my best drum sounds anyway. Lot's of people seem to really like it. I think it's one of the worst drum sounds I've ever gotten!

R•E•P: You used Non-Lin and room mics on it?
BC: No. Natural ambience, highly compressed (SSL) at Studio C at the Power Station. I used my Ludwig Black Beauty and a lot of EQ. We did the tracks so quickly that I wasn't able to get a proper sound. All of a sudden they said "That's a take." In the mix, I overprocessed it.

R•E•P: Drum sounds, as well as other sounds, are so subjective that crappy to one person is brilliant to another.
BC: It's subjective and depends on the application, really, as to what's good or what's bad. A good drum sound isn't necessarily what most people think of as a good drum sound. A typically "good" sound may not be applicable for every situation. An interesting example is just the way people describe certain sounds. I'll use a particular sample that might be a thick-sounding snare drum. Where one producer or artist is going to say, "That's really a nice, fat sound," another will say, "That sounds really tubby!" It depends on your perspective. That's why the drum CD has lots of different kinds of sounds. Some are small, actually, and some are fat or bright.

I've come across tapes having samples that are simply inappropriate. Bowie's last solo album had these enormous drum samples on the whole thing, and for some songs they worked, but for others they were way out of proportion for the song. For example, in the title song "Never Let You Down," there was this huge, big fat gated reverb snare on the thing (the whole album was drum machine) and I replaced it with something very small, which worked a lot better.

The best drum sound is the one that works. I don't understand mixers who will solo the snare for an hour and get this monster sound. Well, what does it mean? Once you put it in the track, it may not be in character with the record. I tend to leave all the faders up a bit when I'm getting the drum sounds. I'll put a rough mix together to hear what everything's doing and then pull all the faders back, but not turn them off, always keeping in touch with the song.

R•E•P: Speaking of which, what's your opinion on recording "rules," such as the 3:1 miking rule (that mics should be three times as far away from each other as to the subject)?
BC: I've never heard of that, but as long as the mics are in phase and one's not closer than the other there shouldn't be a problem. But having said that, I'll put one mic close and one a few feet away from a guitar amp and actually take advantage of the phase difference between the two. You can get a certain kind of sound by altering how far away the mics are from each other. Sometimes you just offset them a little bit and it's almost as if you've run one of them through a short delay. If you flip the phase on one, it just opens up a whole new set of sounds before you go near an equalizer or anything. [See "Dealing With Drums," June 1990, and "Recording Instrument Amplifiers," November 1990.]

R•E•P: What kind of processing or sampling gear do you use?
BC: I don't use any really cheap or really expensive reverbs. A Lexicon 480L is the ritziest thing I use, and the Eventide 3000SE for sampling or pitch-shifting. I use Yamaha REV5 and REV7s, AMS rmx 16s and an Ursa Major Space Station, which is a cheap piece of junk, but I like it for certain things.

Engineering really is an art ... a creative art. I don't think it's a technical thing with specific guidelines.

R•E•P: I remember going into a well-known studio in Los Angeles where a staff guy told me how everyone there listened through big monitors at a precise, unbearably loud level and how certain tube mics had to be precisely "two fingers" away from the top tom head.
BC: What kind of sound do you get from that? All you're going to get is attack. That's the biggest load of s**t I've ever heard in my life! Thank God it isn't like that anymore. No wonder there were so many boring-sounding records. Although I'm not saying you should never mic toms that way just because I probably wouldn't. I just think it's wrong to tell people they should do something a certain way. The only rule is there are no rules. Engineering really is an art, a creative art. I don't think it's a technical thing with specific guidelines.

R•E•P: Will the Pro Samples CD make it too easy to get sounds?
BC: To me, it was designed for people with home studios who can't record at A&M or Bearsville and who want some interesting and different kinds of things, rather than what comes out of the drum machine. For demos, post-production or whatever, it's for people with no time or resources to record samples themselves.

R•E•P: Any particular juicy favorite sounds on the drum CD?
BC: The Yamaha piccolo snare at Bearsville I like a lot and Jamo's cocobola piccolo snare. There's a funny ring to it — a real pitch, so you may want to tune it to the track. My Black Beauty with my tuning-sort of a "ratty" sound to it. Not proper. I fooled around with it until it sounded cool to me.

The most explosive ones are from the iso booth at Bearsville and Studio B at A&M. I keep finding new ones. I didn't realize I'd use it so much. To have stereo samples is wonderful. You can put two stereo samples in the H3000. I'll take two similar samples [there's four of each on the CD] and put them in the H3000. I have a box built by Jonathan Little at A&M [available soon for purchase] that alternates the two triggers, so every time a trigger comes off tape, it's playing one or the other. So on a roll, it doesn't sound like a machine — it sounds very natural.

R•E•P: Room mics are such a big part of your sound. What's the deal?
BC: Depending on the room, I use a couple of 87s facing the walls or ceiling, equidistant from the drums and in cardioid. Sometimes I use four mics and at Bearsville I'll usually use six, because it's such a huge room. With the drums at one end of the room, I'll have two that are halfway back facing the walls in midroom, two facing the back wall, and two about 20 feet up in the loft above the control room. I'll see which combination works best.

Sometimes the close room mics face the drums ... it all depends. I'll tune the drums if the drummer doesn't. At Power Station, I bought drum kits for the studio, tuned and re-headed them and all. I'll have a drummer play and walk around the room and find a good spot for the ambience mics and I've done the same for the sample CD.

R•E•P: Your usual mic setup?
BC: A 421 or D12 on the kick, a 57 and 451 on the snare top, and 421s on toms. Usually 460s as overheads and U87s for room. I don't trust tube mics cause they always sound different! I love them, but not for drums. I like a U47 or U49 on vocals, if I can find one that's working properly.

Doing the King Swamp record, I started with an M49 that blew out after about a third of the vocals, so then I tried a U47 and it blew out too! I ended up with an old tube B&K that the maintenance guy owned that sounded a lot like the 47 — it worked great.

R•E•P: Did you find any unusual circumstances in doing the CDs?
BC: It was interesting when recording the samples how noise becomes a really big factor. With drums or percussion in a track, you put a mic up and it sounds good and you don't really notice console and RF noise. When you really examine a sample on its own, noise really becomes an issue.

R•E•P: Do you end up using relatively similar EQ on most things?

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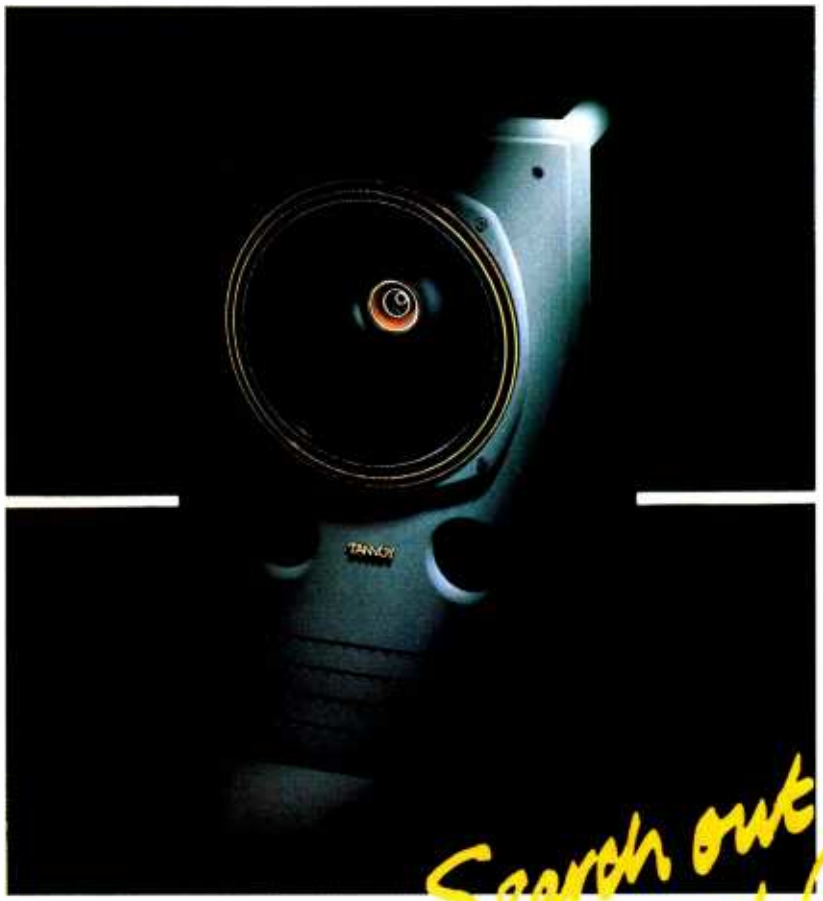

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BC: I tend to do some things, you know, generally dip 400Hz on a kick; depending on the track, I'll add 8k or so to the snare. I guess I'll do what sounds good at the time. I really try hard to treat each situation differently. Sometimes I use Pultecs on snare drums. I just play around until it sounds right. It was more difficult recording samples because there wasn't much of a point of reference; there wasn't a band. Usually, I'll get a basic drum sound and bring the band in, have everybody play and then tweak it up a bit. It usually takes me about an hour to get drum sounds, two if I'm having problems. I'm not one of those guys who takes a week for drums. "Let's Dance" was 20 minutes. We cut three tracks in an 8-hour session. It can get really boring for the musicians to take a long time on sounds. I have certain things I'll start with. I'll brighten the snare and toms right away, then I'll tune in and tweak. It's sort of like cooking — you have a certain recipe you know is going to work and you put in all those ingredients in certain amounts, and then you taste it and you go, "Oh, it needs a little more pepper" or something. Same sort of thing, really.

R•E•P: How do you feel about the role of the engineer becoming a sort of "octopus-man," where you have to be a professional manual reader 24 hours a day to keep up with new toys and be a recordist/mixer/producer/MIDI-it/sound designer/sample editor/psychologist/acoustician/computer hacker/video guy?

It's sort of like cooking — you have a certain recipe you know is going to work and you put in all these ingredients in certain amounts, and then you taste it and you go, "Oh, it needs a little more pepper" or something.

BC: I don't really think of myself as an engineer and haven't really done it in years. Nowadays, assistants do all that stuff. On the King Swamp record, the assistant — an 18-year-old named Andy Bradfield at Virgin Studios in England — had it all down. He was running an S1000, S950, SRC, sequencing software and more! I didn't really have to worry about any that stuff.

For me, it's always seemed quicker and more efficient to simply audio trigger samples off tape or a drum machine using the SSL's computer and dynamics section to get the samples to mimic the drum kit's original dynamics. Sequencing software has come a long way in the last few years, so this may not be true anymore. Actually, if I can possibly finagle a day off from my current projects, I'm planning to purchase a sequencer for my Mac SE and a decent MIDI sampler and teach myself how to use them. A few months from now they'll probably be calling me "Midimountain." ■

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MODERN DIGITAL BROADCAST PRODUCTION

How ABC Watermark uses NED's Direct-to-Disk for high-pressure, high-volume radio production.

By Tim Sadler

With the proliferation of countdown shows, you'd think they were easy to produce. They're not. In fact, the granddaddy of them all, "American Top 40," requires an eclectic mix of talents and technologies to deliver the 4-hour syndicated radio program to more than 400 worldwide affiliates 52 weeks a year. AT40 is produced by ABC Watermark, the syndication production unit of the ABC Radio Networks, in Hollywood.

The weekly obstacles range from fax failures to digital data demolition, and are exacerbated by the 4-hour program format and a 10-hour production window. To ensure timely postal delivery service to affiliates around the world, the show must ship from its distribution point near Columbus, OH, every Saturday. Because the chart positions are not available until late Wednesday afternoon, that leaves only Thursday for production and Friday for mastering and duplication — a rigorous regimen that the Watermark team performs 52 weeks a year.

Pre-production, including actualities, musical montages, flashback pieces and the like, goes on during the early part of each week. But the real countdown begins Wednesday afternoon at 3 p.m., when the *Billboard* chart arrives by fax.

Tim Sadler is the director of technical operations for ABC Watermark, Hollywood.

On one side of the hall writers and producers begin blocking the show based on the week's chart positions. This includes writing additional material to introduce songs making their AT40 debut.

On the other side of the hall, in Studio B, engineers begin pre-production tasks necessary to include these same debuts in the voice tracking session. A CD of each new title is placed in a Studer A730 CD player; the start point of the cut is programmed into the A730's memory. Then, a start point about 30 seconds from the end of the tune is programmed.

Next, the same disk is placed in the alternate A730 and the programming process is repeated. Storing the program data in both A730s makes it possible to play the cut using the pre-programmed start points regardless of its chart position in the coming weeks. These intros and outros are played during voice tracking to give Shadoe Stevens the feel of each song as he intros and back-announces it. Because of our special association with Discovery Systems, all of the "number" jingles and theme music for the show are on compact disc. A third Studer A730 CD player keeps all of these production elements immediately accessible.

DIRECT-TO-DISK

In Studio C, Watermark's digital suite, an engineer begins to assemble the countdown on the New England Digital Direct-to-Disk system. At eight tracks of four hours each, Watermark's system is one of the largest configurations NED has done to date. Watermark is the only NED user doing a 4-hour product, and we do it every week! Even feature films are less than four hours and rarely done all as one sequence. The show brings with it problems unique to its format, not the least of which is the sheer length of time it takes to perform each step in the process. Just copying the show must be done in real time in the digital domain.

The debut songs are uploaded to the Direct-to-Disk, replacing ones that have dropped off the chart, and then added to the sequence. Commercials for the show arrive by satellite, including a data transmission describing their placements in the show. These placements will remain volatile until they are actually sequenced into the show on Thursday.

As these pre-production activities are taking place, Studio A is being readied for the 7 a.m. Thursday tracking session with Shadoe Stevens. Our current resources dictate that the voice tracks are mastered on analog tape using Dolby SR. Shadoe performs with all of the themes, jingles and songs that you hear in the countdown, giving the show its live feel. However, only his voice is recorded.

The voice tracking team consists of a recording engineer (alternately Ken Halford, Michael Sullivan or Stu Jacobs); the director, Matt Wilson; the producer, Bruce Goldberg; the head writer, Darryl Morden and the statistician. Yes, statistician!

When Shadoe tosses off a comment about how this is the first time in 30 years that there have been three songs with the word "ambidextrous" in the title, in the same week, in a month starting with J, you can bet that he is being historically accurate down to the last consonant. Accuracy is a religion at Watermark, and Dr. Robert Durkee is our cardinal of credibility.

WHY ANALOG?

As each hour of voice tracking is finished, the reel is whisked away to an edit suite where false starts and pickups are cleaned up before "uploading" these edited tracks to the NED. At this point, you may say, with $250,000 worth of digital, non-linear editing horsepower in the NED, we're still editing on analog tape?

Well ... yes. The time factor rears its ugly head again. Direct-to-Disk engineers Brandon D'Amore and Ken Halford are occupied sequencing the first hour of the show by the time hours 2, 3 and 4 of the voice tracks are ready for editing. Lack-

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ing additional disk editing facilities, we are compelled to edit analog. The linear nature of these recordings makes it especially amenable to conventional, linear editing techniques. Arguably, much of the advantage of disk-based, non-linear editing would be wasted in this process. At this point all three studios are in action: tracking in Studio A, editing in Studio B and assembly or sequencing in Studio C.

As each hour of Shadoe's tracks are uploaded to the NED, each block of copy is placed in its proper location and the segment is timed. Because each half-hour must have 26 minutes of program material, some songs must be shortened. Alternately, some song intros are extended or looped to accommodate long voice-over intros. Here is an area where the disk-based editing really shines. Looping intros and cutting "shorts" on analog tape is laborious and time-consuming. Some of our past shorts would have curled the hair of many a record executive. Now, our song edits are so good we've even been asked to repeat them for producers looking for ways to pare down overly long hit records.

When the tracking is completed, at about 11:30 a.m., producer Goldberg moves over to Studio C to catch up with the assembly process. As the sequencing takes place the mix levels are adjusted and recorded for later "downloading." Concurrent with the assembly process, the distribution department is feverishly completing the show logs or cue sheets that must accompany each show.

Engineer Ken Halford at ABC Watermark's NED System. (Photo by Alan Trugman.)

These logs tell the local radio announcers where holes have been left for station IDs and local commercials. The logs must include exact timing information and commercial "out cues," so much of the work must wait until each hour of the show is assembled and timed, and commercial placements are locked. When the log is completed, it is laser-printed and photocopied.

As each hour of the show is sequenced and mixed, this final assembly is downloaded to PCM 1630 in preparation for digital mastering. This download is monitored using the "confidence" or read-after-write head of the DMR-4000 by the engineer and a member of the production staff to ensure its technical quality and performance integrity. There's little or no time to reassemble an hour of the show. It takes four hours just to download to 1630! As an added precaution, a Sony DTA 2000

KEEPING UP WITH TECHNOLOGY

The biggest challenge in supervising a production facility in today's high-tech, high-pressure marketplace is keeping up with emerging technologies and how each might affect your own particular brand of production work. One of the mandates of an effective manager is to continually assess emerging technologies. A small change or improvement in a particular system might alter its status from "emerging" to "viable."

A case in point is transportable hard disks. As I write this sidebar I have just returned from MacWorld Expo in San Francisco, where I found a vendor with a transportable hard disk system that fits all of my particular qualifications.

I need a 3.5-inch hard drive of at least 200Mbytes that I can quickly and easily remove from the SCSI bus of one Mac and add to the SCSI bus of another located in another studio.

Until now, there have been several vendors offering transportable hard disk configurations, but none that would "unbundle" the actual drive mechanism. We have a number of 3.5-inch drives already in service; frankly, the pricing of bundled configurations (power supply, disk drive, chassis, etc.) are well above the megabytes per dollar many of us have come to accept as the current rate.

We are evaluating an external power supply with removable 3.5-inch hard drive carrier from Mac's Place, a Macintosh mail order vendor. At less than $200 for power supply, with locking power switch, push-button SCSI selector and drive carriage, all housed in a zero footprint case, this system may well mark a turning point in our approach to disk-based editing.

With one or more of these "fly-away" drives on each digital workstation, we'll be free to continue recording voice tracks for hour 2 while hour 1 tracks are carried down the hall and edited on another system.

Low tech? Maybe, but moving sound files over networks is still slower than walking from room to room, and magneto-optical disks are not yet fast enough to edit on. Risky business? How about using a DAT recorder for A/D conversion, providing the extra benefit of a digital linear tape backup?

In quite a different area, Watermark currently produces program logs or cue sheets on a Macintosh, prints masters on a laser printer and then, using very expensive, trouble-prone copier equipment, "publishes" more than 4,000 pages weekly. These logs are then shipped, at overnight rates, to Discovery Systems, where they are packaged with the CDs for distribution to stations.

Wouldn't it be nice to upload finished page layouts to an offset printer near Discovery Systems and put an end to the weekly visits from the copier repairman and get out from under those thrice-weekly shipping deadlines, not to mention the cost of overnight shipping of almost 100 pounds of paper?

Of course it would. And now the technology is easily accessible. But how about the digital audio? Why not just upload to Discovery Systems directly from the Direct-to-Disk? Unfortunately, the current level of throughput afforded by even the much touted fiber-optic circuits is below that needed for CD-quality audio. But don't think that ABC Watermark and the full resources of the ABC Radio Networks are not working to change that. Stay tuned... ■

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digital tape analyzer provides a real time histogram of error correction rates.

This pre-mastering or downloading process is complicated by the fact that we must create three versions of the show simultaneously: a commercial version for domestic consumption, a non-commercial version for international markets and an Armed Forces Radio version for broadcast at military installations around the world and at sea. (Remember, creating mixes separately would take 12 hours.)

Both the domestic version, which is distributed on CD, and the international version, which is distributed on vinyl, are mastered digitally and therefore downloaded to PCM 1630. The Armed Forces version gets additional editing and is distributed on vinyl, and is downloaded to analog tape. Each downloaded hour involves two PCM 1630 masters and an analog tape master. Additionally, we run a DAT copy from which truncated versions of the show can be created.

Almost as an afterthought, late on Thursday, the pre-production elements of the show are transmitted by satellite to Mexico City, where a local version of the countdown is created. When all of these processes come off without a hitch, the 1630 masters and their cue sheets are delivered by overnight courier to Discovery Systems, Dublin, OH.

When you talk to most CD facilities about short turnaround time, they usually talk about two weeks, or maybe one week, if you catch them at a slow time. Discovery Systems ships "American Top 40" within 24 hours of receiving the masters. I hasten to add that this includes mastering, duplication and packaging of more than 400 4-disk sets, or 1,600 pieces! (What I hesitate to add, out of fear that others might ask them to repeat this unnatural act, is that they do this three times a week, 52 weeks a year for Watermark product: "American Top 40," "American Country Countdown" and "Hot Mix.")

BEST-LAID PLANS ...

In the past, everything that can go wrong has gone wrong. Before we switched our pre-mastering to 1630 format, we used to download to DAT and ship them to Ohio. On more than one occasion, my phone would ring at 6:15 a.m. Friday and Discovery mastering engineers Ed Thompson or Rob Peebles would gently wake me with the news that one or more of the DAT hours would not reproduce without significant error rates. I would have to re-DAT the offending hour or hours and overnight it to them.

Of course, this would push the ship date off until Monday and require second-day express shipping, a distribution cost increase of 800%. The first time we were faced with this dilemma, it so rattled us that in a misguided attempt to keep to our shipping schedule, we took the unprecedented step of asking our Technical Operations Center (TOC) in New York to open a 60-minute window on the satellite, and using our fiber-optic T1 link to TOC, we uplinked an hour of the show to a local affiliate in Columbus that faithfully recorded the hour and drove it, by car, to Discovery Systems in Dublin.

The result was predictable. We felt there was an audible difference between the satellited hour and the those that were not. The lack of a professional standard for DAT convinced us that pre-mastering to 1630 was the only reliable way to deliver our product.

I guess the great thing about producing a weekly countdown show is that you get to start over every week. As technology evolves, we can try something new one week, and if it doesn't work, we drop the idea and try something else the next week.

What will we try next? The Shadoe knows. ■

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By Mary C. Gruszka

NBC GOES SSL

Letterman's audio production facility gets a facelift.

During the past decade, NBC has gained the reputation for quality TV audio production. Even before a standard for stereo television transmission was finalized in the early 1980s, some of NBC's programming, such as "The Tonight Show with Johnny Carson," were being recorded in stereo. With stereo sound firmly entrenched in just about every entertainment program, NBC's audio engineers have lately been adding the aural dimension of surround sound to some of their shows, such as "Saturday Night Live" and "Late Night with David Letterman."

To support all of these increased audio requirements, NBC has upgraded and expanded its audio facilities. At the headquarters at 30 Rockefeller Plaza in New York, several audio rooms have been renovated in the past six years, and new rooms to handle special audio needs, such as sound effects and music, have been constructed.

For "Late Night with David Letterman," the most recent audio improvement project was the upgrading of the music room, used solely for mixing the musical segments of the show – the guest artists as well as the house band, Paul Shaffer and

Mary C. Gruszka is the owner of MCG Audio Consulting, a New York-area company specializing in TEF analysis, systems design and acoustical consulting.

NBC photos by Al Levine.

the World's Most Dangerous Band.

Located off of Studio 6A, which is the stage used by "Late Night," the music room is one room of an isolated three-room audio complex that includes a new sound effects room and an air-lock, which is also used for power distribution and a couple of equipment racks.

This sound effects room was added as part of the Studio 6A upgrade.

EQUIPMENT

The music room features an SSL 4056G console outfitted with 48 mono inputs, an empty bucket for 8 more input modules, mechanical VU meters, G Series equalizers and mic pre-amps, eight VCA groups, four patchable stereo VCAs, and an in-board patchbay.

"This is considered a stock recording studio console," says Jim Starzynski, project engineer, NBC Technical Engineering and Maintenance (TEAM). "We don't have the computer, although the board is computer-ready." The board has the keyboard and necessary connections for the computer.

One of the requirements for the audio console was that it have expansion capabilities to meet the show's needs five years down the road. The previous board, an old 40-input Harrison, was too small and inflexible, according to Michael Delugg, audio consultant to "Late Night" and music mixer.

"The acts aren't getting any smaller," Delugg says. "You are more apt to see a second kit of drums, and that can involve 15 inputs right off the bat. To accomplish this, we installed a console with a 56-input frame, but only filled up 48. We can pop in extra modules. The room is ready for multitrack."

For the day-to-day mixing of the show's music, Delugg does not use multitracking. "This is the final mix," Delugg says. Normally, the music mix is a stereo feed that goes through the main 6A audio room and onto tape. Multitrack work may be needed when "Late Night" produces its anniversary shows, according to Delugg.

"The console is flexible. It has a good clean monitoring section and the terminology is clear," he says. "The console lets me do what I want with the small faders."

Delugg also likes the dynamics (limiter, compressor and gating) and equalizer sections on each input of the console. "I hardly ever have to go to the outboards," Delugg says. When he does, it is usually for gating on the drums.

Before the SSL was installed, Delugg needed and used much more outboard gear. Two full-sized floor to ceiling racks housed compressors, limiters and gates, plus the other outboard equipment. Often the gear installed in the room wasn't enough and had to be tracked down from other areas in NBC or rented. "You couldn't be sure of what you'd get," Delugg says. After the renovation, the outboard rack requirements were cut almost in half, contributing to a reduction in rental costs and an efficient payback for the project.

When Delugg originally specified the outboard gear, he did so with the anticipation that although the Harrison board would eventually be replaced, some gear would still be necessary. "You don't want to say to an artist that we don't have something," Delugg said.

Because the board was a stock unit, it was not outfitted with the NBC mods that have been installed in the other SSL consoles at NBC, New York. For example, there is no backstop pre-fade listen (PFL). Although it would have been a desirable feature, "that would have been a costly and time consuming mod, an addition that would have put the project in jeopardy," says Starzynski.

The project was completed under tight time and cost constraints and yet, "we wanted to get the most reliable and cost-effective console that we wouldn't outgrow in a few years," Starzynski says. "We put in what was smart for us at this point while setting in place low-cost hooks for the future."

One of the 4000's features particularly suited for the music room is the quad monitoring and panning section. The three audio rooms used for "Late Night," the music room, as well as the 6A audio room and the sound effects room, are all equipped with Dolby surround encoders and decoders.

For the music room, "we didn't need a 6000 for this application," Starzynski says. "The 4000 quad bus monitor section lends itself to surround sound." As part of the standard architecture of the console, controls for left, center, and right pan, as well as front to back pan are provided. (The music mix is currently not surround encoded, according to Delugg, but Steve Singer, the 6A audio mixer, uses surround a little for the audience, and Bruce Leonard occasionally uses it for sound effects.)

"The facilities now are the best they have ever been."

Another feature of the 4000 that Delugg finds useful is the stereo echo return. "You can make it mono or more or less stereo," Delugg says. "The benefit [of having this control] is that if the echo effect is too broad in stereo, it tends to get lost in mono."

MONITORS

Monitor loudspeakers that are used in the music room include Yamaha NS-10s for close fields, UREI 809s and an Auratone for mono. The rear surround loudspeakers are JBL 4406s.

"The Yamaha NS-10s are the primary set of speakers," Starzynski said. Delugg says,

"They are one of the standards in the recording business."

"A set of 809s were available from the Seoul Olympics, and we installed them as well, to get a wider range," Starzynski says. "These are mounted on platforms that were designed to minimize vibration." The design for the platforms was provided by Russ Berger, president of the Russ Berger Design Group, Dallas, with the fabrication done by NBC.

At first, Delugg saw no reason for using the larger speakers. "I'm mixing for TV. I thought the 809s would be a lot of fun, but that they wouldn't be used a lot," Delugg says.

Starzynski convinced Delugg that they should get the 809s, to use at least for the times when the musicians would listen to the playback of their performance. "It turns out that I am using them a lot more than I thought I would," Delugg says.

"When the band and the guest artists come in the control room to hear the mix, they need to understand what they are listening to. They can't adjust quickly to the smaller speakers," Delugg says. "Since the band plays loud in the studio, their ears are still in a state of compression when they come out of the studio and into the music room." Delugg will then first monitor the mix on the 809s and step it down to the NS-10s and finally to the Auratone mono mix.

"The room is dry enough but it doesn't feel sterile," Delugg says. "The people are real happy with what they hear on the speakers."

The music room measures about 20′ ×11′ with a 7-foot ceiling. Starzynski worked out the architectural and acoustic details of the room and used Russ Berger on a limited basis to answer questions on acoustics and mechanical considerations.

WHY A MUSIC ROOM?

A separate music control room is a bit of a rarity in TV audio production. Although "Saturday Night Live" and "Late Night with David Letterman" each have one, the norm for television is that all of the audio mixing originates from one audio control room. In fact, this is how "Late Night" operated until January 1989. (Sometimes, a separate sound effects room, such as that used by both shows, is built to allow for the production and playback of the various sound effects that are needed for a show.)

"'Late Night' places a lot of emphasis on audio, and has extensive audio facility requirements," Starzynski says. "They have competitive demands and book top-notch talent."

"The 6A audio console is almost filled up now without the music mix," Singer says. The SSL 6048 in the 6A audio control room was too small to handle all of the audio requirements for the show, the talent and guest mics, audience mics, boom mic, tape playbacks and the feed

Mike Delugg, "Late Night" audio consultant and mixer (foreground) and Jim Starzynski, project engineer, NBC Technical Engineering and Maintenance, at the SSL console in Studio 6A's music room.

Equipment:

NBC 6A Music Room

- 1 SSL 4056G console
- 2 Yamaha NS-10 monitor loudspeakers
- 2 UREI 809 monitor loudspeakers
- 1 Auratone monitor loudspeaker
- 2 JBL 4406 monitor loudspeakers (for surround)
- 4 UREI LA-4 limiter/compressors
- 1 Drawmer D5201 dual gate
- 1 RTS 802 master station (for communications to 6A and other NBC locations)
- 1 Orban 642B parametric equalizer
- 1 dbx 166 compressor
- 6 dbx 160X compressor/limiters
- 2 Yamaha REV 5 digital reverbs
- 1 Lexicon PCM 70 digital effects processor
- 1 Yamaha SPX900 multi-effects processor
- 1 Yamaha SPX90II
- 1 Eventide Model H3000 Harmonizer
- 1 Lexicon 480L effects unit
- 1 Technics SL-P300 CD player
- 1 Panasonic SV3500 DAT recorder/player
- 1 Tascam 122 cassette player
- 1 Dolby SE04 surround encode unit
- 1 Dolby SD04 surround decode unit
- 1 Hafler Pro 500, 200W/channel power amp for the NS-10s
- 2 Hafler Pro 2400 operated in bridged mono, one for each UREI 809
- 1 Hafler Pro 1200 for the Auratones
- 1 Harrison V200 for the JBL 4406s
- 1 Benchmark SPM-2 volume indicator panel
- 1 Tektronix 760 stereo phase scope
- 1 Anchor AN1400 powered loudspeaker
- 3 Sony 1271 color video monitors (for program, preset and fixed-band camera)
- 1 Sony quad black and white video monitor for camera feeds ■

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from the sound effects room plus the music mix. To complete a show, Singer would have to repatch feeds during the show.

In addition to these concerns, "we couldn't give an acceptable level of attention to the musical needs of the artist," Singer says. Until a music room was built, Singer mixed all of the elements of the show, except sound effects.

MUSIC ROOM, V.1

An old Harrison console previously used by "Saturday Night Live" was available after SNL's audio upgrade in 1988, and was installed in what was office space just off of the 6A studio.

"This was a cost-effective, stop-gap measure at that point," Starzynski says. "This had to happen quickly and it left the opportunity for us to upgrade when we had more time." This music room went online January 1989.

The upgrade was helped by another project that was installed in the first quarter of 1990, which was the new sound effects room for Studio 6A. With that installation, "we put in place all of the hooks needed for the upgrade of the music room," Starzynski says.

When the music room first went in, it had no real noise isolation. "So we installed a combination air lock and equipment room and built the sound effects room adjacent to it," Starzynski says. "We designed the sound effects room and air lock with the consideration that the music room would operate [next to it]. We did three things to make that happen — improved the air-conditioning system, built the equipment room for the power amps and power supplies, and installed a complete tech power distribution system. All of this happened during the sound effects room project."

This use of the air lock as an equipment room and power distribution center served a number of critical functions. It provided suitable noise isolation from the rest of the studio, space to locate equipment, such as the power supplies and amps that had noisy fans, and a central audio ground reference point for all three of the rooms, which in turn, virtually eliminated hum and noise from the audio lines.

MUSIC ROOM UPGRADE

The hooks were in place; the need for an upgraded music room was apparent at least to the audio people involved with "Late Night." Now all that was needed was to convince management that the upgrade would have tangible, long-term benefits.

Even as the sound effects room was being installed, Starzynski had been talking to Delugg about what he needed in an improved room. Starzynski drew up a budget estimate and equipment list and he and Delugg passed this information on to management.

"The show was seeing the difficulty [we were having] in getting the music out in the way that Shaffer and I wanted it to leave," Delugg says. The old board was too small and had been developing technical problems. "The band wanted me mixing and not fixing things," Delugg says.

The "Late Night" Audio Team

The World's Most Dangerous Audio Crew? From left to right: Barbara Byrd, Charles Moore, Bruce Leonard, Steve Singer, Tom Hyre, Glenn Arbor and Mike Delugg.

Integrating all of the audio elements of "Late Night with David Letterman" involves the cooperative and creative efforts of an entire team of audio engineers.

Steve Singer, the production audio engineer working in Studio 6A's audio control room, handles the on-air mix, which includes the talent and audience mics, and tape playbacks. Sound effects and the music mix also go through Singer's board, but he leaves these faders open because Bruce Leonard, the sound effects engineer, and Mike Delugg, the music mixing engineer, take care of their own mixes in their own rooms. Yet they don't work in a vacuum. They have developed the uncanny ability to anticipate what the other engineer may need so that the mix is properly balanced.

"Late Night" is a show with a live audience. This means that sound reinforcement is needed in the studio. Glenn Arbor handles the PA mix, while Charles Moore takes care of the talent monitors.

Tom Hyre and Bob Rooney serve as audio assists (A2s) and Barbara Byrd operates the boom mic. Jerry Foley is the technical director; Mike Mathews is the technical manager. ■

The music room upgrade project was approved in July 1990 and the installation took place during the two last weeks of August 1990, when the show was dark.

A number of preparations were made during the approval process that allowed the project to be completed within this tight time frame. Starzynski had already figured out what was needed, based on his communications with Delugg. He already had the list of circuits and equipment that would be required. When the approval was received, he converted the list to engineering documentation on the NBC Engineering CAD system.

On the Friday after the last show before the break, Delugg, Singer and the other audio engineers carefully dismantled the room, because they were reusing much of the equipment. The next day, the engineering implementation group came in to complete the demolition.

"We had 14 days to do the installation, but we were able to finish it in 10," Starzynski says. This included the full installation of the board, reinstallation of the outboard gear, and complete systems testing. Says Starzynski, "The system we put in was cost-effective and time-efficient.

"A factor that contributed to the success of the project was that SSL was helpful in facilitating the time requirements, and consulted to a limited extent on the design philosophy. They had a good handle on the show requirements and knew the people. They were able to help out with the integration of the new facility in a cost-effective manner." SSL provided some standard items, such as cables and connector panels, that enabled the installation to proceed quickly.

But probably most importantly, "SSL also helped to put a hold on a console before we had everything in place," Starzynski says. SSL worked with NBC to have the console available within the installation window, and without knocking anyone else off of its production schedule.

SSL is no stranger to NBC, as there are several other SSLs at NBC's New York and Burbank, CA, facilities.

Once up and running, the room was christened with a bottle of champagne and "it went right into service," Delugg says. The show gave Delugg and crew a break by not booking any guest musical acts during the first few days that the new room was in operation, but they still used the new facilities to mix the house band.

But before long, acts such as Bruce Hornsby, Diane Shuur and David Sanborn, were among the first to be mixed from the new music room.

Delugg summed up the feelings of the audio people involved with "Late Night." "The facilities now are the best they have ever been." ■

Because compromise is out of the question

Whoever said, "compromise is the oil that lubricates the business process" apparently wasn't in the studio business. To the contrary, in this unique world where art and business meet, and clients expect the best, compromise may be the fastest way *not* to stay in business.

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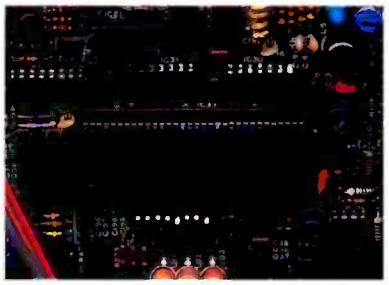

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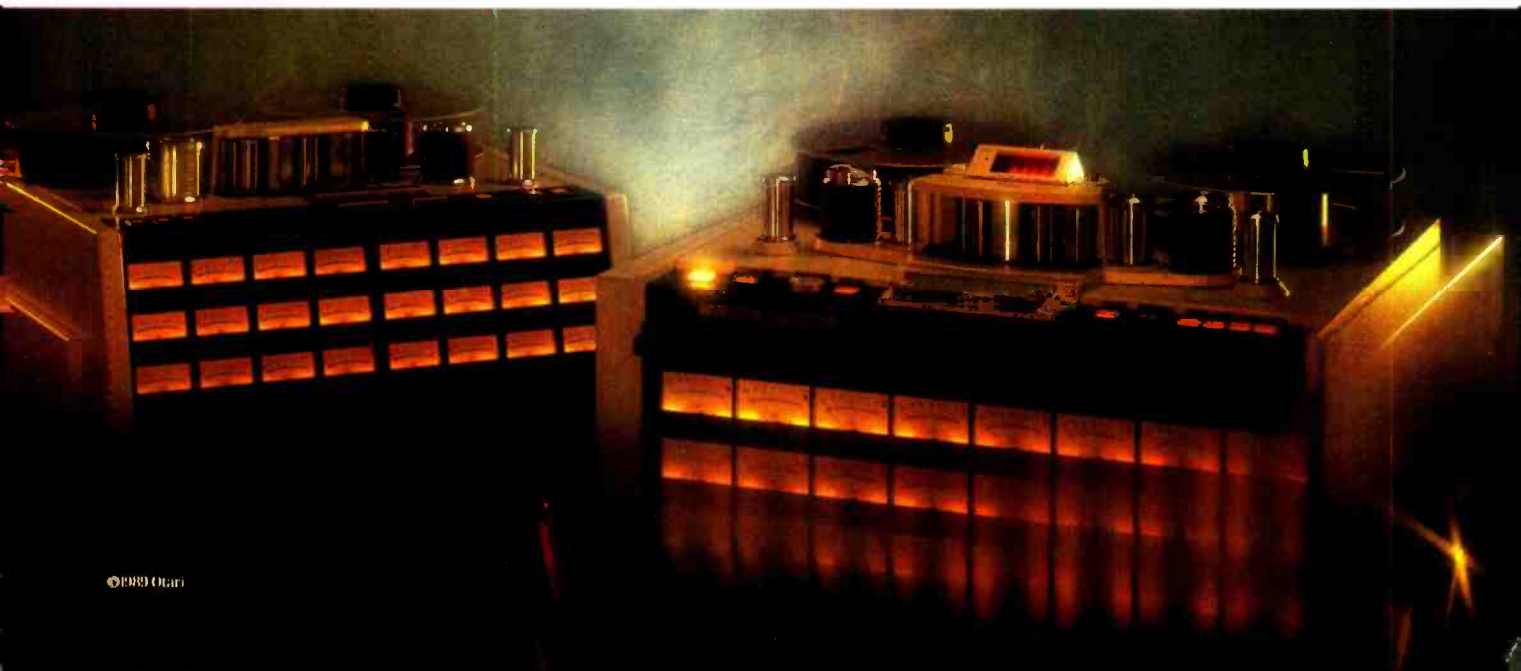

PART ONE

DAT IN THE REAL WORLD

Wonder why your DAT recordings won't copy?
Heard about SCMS?
Think it's not a professional's problem?
Guess again...

By Ron Streicher

Once upon a time, God created digital audio, and that was good. Then God invented DAT, and that, too, was good. Then came the RIAA, and the whole thing went to hell!

Like the EIAJ (PCM-F1) format before it, DAT began as a medium intended to provide consumers with the ability to make high quality digital recordings for their personal use. [To quote Sony, it was a medium designed to "wrap a car around" — Ed.] Before long, however, the professional audio community noticed the quality and cost-effectiveness of these formats, and adopted them as its own. Today, DAT has become the de facto standard for 2-channel digital recordings, particularly for mix-down and reference recordings before transferring to the Sony 1630 format required for compact disc mastering.

Suddenly, this little cassette began to attract enormous attention from some members of the record industry, who began to view this format as a threat to their livelihoods. Most vocal was the Recording Industry Association of America (RIAA), which claimed that virtually anyone using DAT was doing so solely for the purpose of violating copyright laws by making "illegal" or "unauthorized" CD copies.

In the late 1980s, the RIAA combined with the now-extinct CBS Technology Center to propose the imposition of a "copy guard notch" on all commercial recordings. When this proposal was defeated — owing to the sonic

BYTE 0	
bit 0	PRO = 1
0	Consumer use of channel status block
1	Professional use of channel status block
bit 1	Audio
0	Normal Audio
1	Non-Audio
bits 2 3 4	Encoded audio signal emphasis
0 0 0	Emphasis not indicated. Receiver defaults to no emphasis with manual override enabled
1 0 0	None. Rec. manual override disabled
1 1 0	50/15 μS. Rec. manual override disabled
1 1 1	CCITT J.17. Rec. man. override disabled
X X X	All other states of bits 2-4 are reserved
bit 5	Lock: Source Sample Frequency
0	Locked - default
1	Unlocked
bits 6 7	Fs: Sample Frequency
0 0	Not indicated. Receiver default to 48kHz and manual override or auto set enabled
0 1	48kHz Man. override or auto disabled
1 0	44.1kHz Man. override or auto disabled
1 1	32kHz Man. override or auto disabled

Figure 1. Professional channel status, byte 0.

Ron Streicher is the owner of Pacific Audio-Visual Enterprises, Monrovia, CA.

degradation it would have caused — the RIAA, together with other "interested parties," threatened to file lawsuits against any manufacturer importing into the United States DAT recorders for consumer use. (DAT recorders intended for "professional" use were never opposed by the RIAA.) This threat was fulfilled when a class action suit was filed against Sony Corporation after it began selling DAT recorders here in early 1990.

In June 1990, the manufacturers and the RIAA struck a compromise that would allow importation of DAT recorders, provided they incorporated technical limitations on their ability to copy recordings. However, this compromise between the manufacturers of consumer audio equipment and the music industry has now come to haunt users of professional audio equipment — the producers of the very product the music industry seems to be trying to protect. That compromise is known as the Serial Copy Management System.

THE SCMS SCHEME

This is the official line on SCMS:

"The Serial Copy Management System (SCMS) is designed to control digital-to-digital copying that a consumer can perform on various digital audio material, including compact discs, prerecorded DAT tapes, and other material via IEC-958 'consumer use' digital audio interfaces (also commonly referred to as S/PDIF and EIAJ CP-340). SCMS does not affect the ability to make copies using a DAT recorder's analog inputs and outputs, nor does it apply to digital-to-digital copies made via the AES/EBU professional digital audio interface.

"Serial Copy Management System labels are generated onto tape each time an SCMS-equipped consumer DAT machine records an audio signal to tape, no matter whether the source is from the analog or digital inputs ...

"Technically, the SCMS labels for DAT are encoded into the SubCode sections of the main digital data area, specifically ID6 ... For legal reasons, the ID6 bits are only modified if the source input is the AES/EBU Digital I/O; during digital copying via the IEC 'consumer use' input, the SV-3700 simply copies across the current status of SCMS codes ..." contained on the original source tape.

Just what does this mean to producers of DAT recordings? SCMS dictates that a tape be encoded — at the time of production — with one of three copy protection status codes: "Copy free" (status 00), "No further digital copies allowed" (status 10), or "One more digital copy allowed" (status 11). This encoding is buried deep within the digital information recorded on the tape — specifically subcode ID6 (byte 0, bits 6 and 7) of the Channel Status Block — and affects direct digital copying between recorders using the IEC (or S/PDIF) digital interface. Once encoded, these codes cannot be removed from a recording (using "consumer" equipment, that is).

Through implementation of the SCMS codes, producers may determine whether their recordings may be copied

BYTE 1	
bits 0 1 2 3	Channel Mode
0 0 0 0	Mode not indicated. Receiver default to 2-channel mode. Manual override enabled
0 0 0 1	Two-channels. Man. override disabled
0 0 1 0	Single channel. Man. override disabled
0 0 1 1	Primary/Secondary (Ch. A is primary). Manual override disabled
0 1 0 0	Stereophonic. (Ch. A is left) Manual override disabled
0 1 0 1	Reserved for user defined applications
0 1 1 0	Reserved for user defined applications
1 1 1 1	Vector to byte 3. Reserved
X X X X	All other states of bits 0-3 are reserved.
bits 4 5 6 7	Encoded user bits management
X X X X	Reserved

BYTE 2		
bits 0 1 2	AUX: Use of auxiliary sample bits	
0 0 0	Not defined. Maximum audio word length is 20 bits	
0 0 1	Used for main audio. Maximum audio word length is 20 bits	
0 1 0	Used for voice channel. Max. audio word length is 20 bits	
X X X	All other states of bits 0-2 are reserved	
bits 3 4 5	Source word length Max. audio based on bits 0-2 above	
	Max audio 24 bits	Max audio 20 bits
0 0 0	24 bits	20 bits (default)
0 0 1	23 bits	19 bits
0 1 0	22 bits	18 bits
0 1 1	21 bits	17 bits
1 0 0	20 bits	16 bits
X X X	All other states of bits 3-5 are reserved	
bits 6 7		
X X	Reserved	

Figure 1, continued. Professional channel status, bytes 1-2.

by consumers via the digital interface on their CD players and DAT recorders. This is the essence of the SCMS scheme: 1) to permit no subsequent digital copying at all; 2) only a first-generation digital copy (but no subsequent copies from that); or 3) unlimited copying and subsequent dubbing.

CONSUMER VS. PROFESSIONAL

Again, the SCMS scheme is intended to protect record-

BYTE 0	
bit 0	PRO = 0 (consumer)
0	Consumer use of channel status block
1	Professional use of channel status block
bit 1	Audio
0	Digital Audio
1	Non-audio
bit 2	Copy/Copyright
0	Copy inhibited/copyright asserted
1	Copy permitted/copyright not asserted
bits 3 4 5	Pre-emphasis - if bit 1 is 0 (dig. audio)
0 0 0	None - 2 channel audio
1 0 0	50/15 μs - 2 channel audio
0 1 0	Reserved - 2 channel audio
1 1 0	Reserved - 2 channel audio
X X 1	Reserved - 4 channel audio
bits 3 4 5	if bit 1 is 1 (non-audio)
0 0 0	Digital data
X X X	All other states of bits 3-5 are reserved
bits 6 7	Mode
0 0	Mode 0 (defines bytes 1-3)
X X	All other states of bits 6-7 are reserved

BYTE 1		
bits 0 1 2 3	4 5 6	Category Code
0 0 0 0	0 0 0	General
	0 0 1	Experimental
	X X X	Reserved
0 0 0 1	X X X	Solid state memory
0 0 1 X	X X X	Broadcast recep. of digital audio
0 1 0 X	X X X	Digital/digital converters
0 1 1 0	0 X X	A/D converters w/o copyright
	1 X X	A/D converters w/ copyright (using Copy and L bits)
0 1 1 1	X X X	Broadcast recep. of digital audio
1 0 0 X	X X X	Laser-optical
1 0 1 X	X X X	Musical Instruments, mics, etc.
1 1 0 X	X X X	Magnetic tape or disk
1 1 1 X	X X X	Reserved
bit 7		L: Generation Status
		Only category codes: 001XXXX, 0111XXX, 100XXXX
0		Original/Commercially pre-recorded data
1		No indication or 1st generation or higher
		All other category codes
0		No indication or 1st generation or higher
1		Original/Commercially pre-recorded data
The subgroups under the category code groups listed above are described in tables below. Those not listed are reserved.		
The Copy and L bits form a copy protection scheme for original works. Further explanations can be found in the proposed amendment (TC84) to IEC-958.		

Figure 2. Consumer channel status, bytes 0-1.

ings from being illegally copied on consumer equipment. Nothing in the system is intended to affect how professional users — i.e., the producers of the original recordings — can make their recordings. For professional users, SCMS codes are not carried across the AES/EBU digital interface; AES/EBU transmission simply ignores these status bits in the data stream.

However, this does not mean that professional equipment is immune from the effects of SCMS because the differentiation is not quite so clear-cut, at least not for the current crop of professional DAT recorders on the market. And that is the purpose of this article.

Most pro DAT machines are capable of working via either the AES/EBU or the IEC interface. Note that the operative word here is "either" rather than "both," because almost all current pro DAT recorders have a selector switch that allows use of one or the other, but not both interfaces at any one time. Thus, the recorder may be considered a professional machine at one time, and a consumer unit at another. Here is where SCMS gets involved.

BITS, BYTES ... AND BUTS

SCMS applies to DAT recorders if bit 0 and bit 1 of channel status bits are 00. However, recording is inhibited if bit 0 and bit 1 are 10 ... or 11. Here, the Category Code (byte 1, bits 0 and 1) within the Channel Status Block determines how the DAT recording is recognized: The leading bit determines the difference between professional (AES/EBU, bit 0=1) and consumer (IEC-958, bit 0=0). Bit 1 determines the type of signal present, and is set to 0 for audio applications. (See Tables 1 and 2 for detailed information as to the various bytes and bits of the professional and consumer formats.)

These Category Codes may be the cause of misinterpretation of the SCMS codes experienced by the various DAT recorders discussed in Part 2 of this article, scheduled for the May issue. This is because the AES/EBU and IEC formats both employ a similar, although significantly different, assignment of bits in the Channel Status Block. Some, such as those that bear the SCMS status codes in the IEC format, were "unassigned" or "reserved" when the AES format was adopted, and are now being read by DAT recorders as indicating copy prohibition, even though this was not their original intent.

Things get even more confusing when you look further into the IEC standard document: "For digital input signals originating from an analog-digital converter ... ID6 shall be recorded with '11' on the tape independent of status of the copyright status bit ..." (In the IEC format, bit 2 is the copyright bit — a carryover from earlier digital sub-

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BYTE 1 - Category Code 001	
bits 3 4 5 6	Broadcast reception of digital audio
0 0 0 0	Japan
0 0 1 1	United States
1 0 0 0	Europe
0 0 0 1	Electronic software delivery
X X X X	All other states are reserved

BYTE 1 - Category Code 010	
bits 3 4 5 6	Digital/digital conv. & signal processing
0 0 0 0	PCM encoder/decoder
0 0 1 0	Digital sound sampler
0 1 0 0	Digital signal mixer
1 1 0 0	Sample-rate converter
X X X X	All other states are reserved

BYTE 1 - Category Code 100	
bits 3 4 5 6	Laser Optical
0 0 0 0	CD - compatible with IEC-908
1 0 0 0	CD - not comp. with IEC-908 (magneto-optical)
X X X X	All other states are reserved

Figure 2, continued. Byte 1 category codes, consumer channel status.

coding as used by compact discs, PCM-F1, etc. This may also be set for copy prohibition "0" or permission "1.")

Several other clauses and sub-clauses of the SCMS standard go on to define specific cases and bit status conditions. One of particular interest: "Recording shall be possible for digital input signals with a copyright status set for 'copyright protected' ('0') when a category code of the signal is listed [such as a laser-optical product] ... ID6 shall be recorded with a '10' on the tape in this case."

Indeed, this is "a most ingenious paradox." The SCMS allows consumer DAT recorders to make a direct digital-to-digital copy from a compact disc, even if it is copyright protected. (Just what the RIAA was trying to prevent!) This, by the way, was impossible before SCMS.

Then there is the L bit (byte 1, bit 7) in the IEC Channel Status Block; this is called the "Generation Status" bit:

"The L bit determines whether the source is an original (or prerecorded) work, or is a copy of an original work (first generation or higher). The actual meaning of the L bit can only be determined by looking at the category code since certain category codes reverse the meaning."

For additional reference, the AES/EBU format, defined by AES3-1985, specifies "... a format and line protocol for serial transmission of two channels of digitized audio from one device to another over conventional shielded, twisted-pair cable ... 3-pin XLR-type plugs and sockets ... and carrying balanced, RS422-compatible signals."

This is in contrast to the IEC-958 "consumer use" format, which specifies "... unbalanced, phono-style connectors, running at lower voltage levels than those specified in AES3-1985."

In addition to these dissimilarities in transmission standard, the basic channel status information is also configured differently between the two formats. The AES3 format implements channel status as "blocks of 192 bits, in 24 8-bit bytes" while the IEC-958 format divides the 192 channel status bits "into 12 16-bit words." Furthermore, as stated above, the AES/EBU interface does not transmit the SCMS status bits, while the IEC-958 interface does.

In case you were wondering where the "catch" was with the AES/EBU interface, I should point out that there is another major difference between the AES and IEC-958 interfaces. While the consumer interface is subject to the rules imposed by SCMS, it does allow copying of the Start ID and Program Numbers recorded on the source tape. Copies made via the AES/EBU interface do not receive this sub-code data, and therefore do not retain these useful identification markings. (This is because the AES/EBU interface rules were written prior to the implementation of these subcodes by DAT recorders.) Thus, Start IDs and Program Numbers must be added manually later, after the program material has been copied. (This explains why none of the DAT recorders reported on in next month's article were able to copy these markers.)

A BRIGHT HOPE ON THE HORIZON

In the hope of making reason out of this confusion, Panasonic's professional audio products division recently introduced the model SV-3700, an excellent new DAT machine with an improved 1-bit 64× oversampling A/D converter, and an 8× oversampling D/A output converter. The sound quality and functional facilities of this unit boast a significant improvement over the model 3500. The analog inputs and outputs are the professional XLR-type (+4dBu, with the outputs also switchable to −10dBu) and the 3700 also provides for both AES/EBU and IEC-958 consumer digital interfaces. Clearly, this recorder is intended to work equally well in a wide variety of studio applications — interfacing with both professional as well as semi-professional equipment.

As an added benefit to the professional user, the Panasonic SV-3700 is conveniently provided with a series of rear-panel DIP switches that allow the user to determine which digital format and SCMS copy protection status is to be placed on a recording. According to the operations manual, the switches affect only the SCMS status of recordings made via the AES/EBU interface. Here, however, is where the trouble begins.

What the owner's manual doesn't tell you is that the switch intended for selection of AES/EBU or IEC-958 digital interface (SW-1, a mini-DIP switch located on the rear of the machine) selects not only the format but also the input/output connectors (XLR-type or phono-type respec-

DIP switches on the Panasonic SV-3700 allow users to determine digital format and SCMS status to be inserted in a recording.

tively) to which the machine will respond.

Thus, if you wish to use the SV-3700 in the IEC-958 (S/PDIF or consumer) format — for example, to connect to a unit with similar inputs or outputs — you must use the phono connectors, and set the digital interface switch for that mode of operation — both for the proper format to be implemented, and for the signal to be input to or output from the recorder.

The SCMS compromise has come to haunt the producers of the very product the music industry wants to protect.

So far, this presents no real problem. This is merely a minor, although frustrating, omission from the manual and, unless you need to use both digital interfaces interchangeably does not pose a significant difficulty. As stated earlier, the two interfaces cannot be used simultaneously.

However, another omission is much more significant. This same SW-1 status switch also affects the SCMS status on recordings made via the analog inputs. The SCMS status switches (SW-2 and SW-3) operate only when SW-1 is set in the AES/EBU position! Thus, even if SW-2 and SW-3 are set for "copy free" operation "00," if SW-1 is set for IEC-958 digital format mode, the recorder reverts to a default status. Any recording made via the analog inputs will be made with a "One copy allowed" "11" status — whether you want it that way or not!

To repeat: SW-1 must be set in the AES/EBU position if switches SW-2 and SW-3 are to have any effect on the SCMS coding written to the recording, even when using analog inputs. This seems to be in full agreement with the aforementioned sub-clause of the IEC document. So, why doesn't Panasonic tell us about it in the owner's manual?

In Part 2, we'll take a close-up look at the professional machines offered by the other manufacturers, how they interpret the SCMS codes, and where the loopholes can be found. Additionally, we'll present a simple little mod to the 3700 that will allow input and code status determination not offered in the stock machine. ■

FIVE QUESTIONS:

DATA DIGITAL

By Mack Clark

Q: How do magneto-optical drives work, and are they more desirable than magnetic hard disks?

A: Magneto-optical disks are a magnetic media, recorded and read with the assistance of a laser beam. The recording itself is made up of magnetic particles placed perpendicular to the surface of the disk. This vertical orientation permits a much higher recording density, ergo information, than is possible with magnetic hard drives.

To record data onto these specially formulated magnetic particles, a laser is focused onto a tiny spot of the magnetic material, allowing its orientation to be altered in the presence of a second head, this one magnetic. As the laser is removed, the magnetic orientation is locked onto the disk such that it is not as susceptible to ambient magnetic fields as conventional magnetic media. Thus, data are more durable, as well as more dense. Erasure is accomplished by uniformly overwriting the data similar to recording process. There is no head wear to contend with like in conventional drives.

They have high enough density to accommodate digital audio's voracious appetite for storage space, and the physical durability is greater, providing extended longevity. The drawbacks are that the laser/magnetizing process takes longer than a normal magnetic drive; a read-after-write verification process is built in; and the disks must be formatted up front, to program the orientation of the particles before you begin writing data.

Mack Clark operates McTech Associates, an audio systems engineering company in Oakland, CA.

Q: How can 18-bit D/A converters improve the reproduction of a 16-bit digital recording?

A: A 16-bit recording can be perfectly reproduced by 16-bit reproduction circuitry in theory only. Errors in the process of reading and reproducing a digital recording are inevitable. In addition, a limitation of 16-bit PCM recording is lower resolution at lower dynamic levels. An 18-bit D/A has more than a quarter-million levels, or four times the 65K levels represented in a 16-bit recording.

Although it is not possible to add real data to 16-bit recording, we can process it for superior results with 18-bit D/A conversion and oversampling. With four times the resolution available to restore data to audio signal, the anomalies left by the 16-bit process are reduced. Oversampling provides amplitude information that an 18-bit D/A will use to reduce both noise and distortion. The difference in performance is measurable and approaches the theoretical improvement in S/N of 12dB (6dB/bit).

Q: What are the differences between digital audio interfacing formats?

A: The most prevalent interface formats in the professional context have been SDIF-2 (Sony Digital Interface Format), PD and the AES/EBU format, which has been codified as the ANSI S4.40-1985 standard. From an operations standpoint, the SDIF-2 format, which is an industry standard because of the omnipresence of the PCM-1630s and other digital processors manufactured by Sony, provides separate inputs and outputs for each channel. This makes it a simple matter to dub digitally between devices or from one track to another on a multichannel machine. A connection labeled "Word Sync" must also be connected between devices to ensure proper clocking of digital audio data.

The AES/EBU format is a serial format that transmits two channels of data, audio and otherwise, down one transmission line (single twisted pair). Each format uses a 32-bit word (or subframe in AES/EBU terminology) to represent a channel of audio. They differ in the arrangement of data within those words. The basic breakdown of one is nearly a reverse of the other. The SDIF-2 word begins with the audio data, followed by flags and auxiliary information, with sync bits at the end. The AES/EBU word begins with the sync data, followed by aux data, 20 bits of audio data and finally, status and correction bits.

The two channels in the AES/EBU for-

mat are multiplexed and transmitted as subframes within the sampling period. They are also self-clocking and self-syncing. The IEC consumer format (also known as S/PDIF: Sony/Philips Digital Interface Format) is modeled after the AES/EBU specification. PD (ProDigi) is a discrete multitrack format developed for the Mitsubishi and Otari digital multitracks.

Obviously, these formats cannot talk directly to one another, though there are devices available that will convert one format to another, as well as convert sampling frequency.

Q: What is the difference between a digital audio workstation that uses its own CPU and a system based on a Mac or PC CPU?

A: The difference is primarily in how many processor chips are involved in a given job, the way the processors are collaborating and the means by which data are exchanged. An all-in-one proprietary workstation (such as an AMS, NED, DAR, SSL or Lexicon Opus) is an integrated system that has separate microprocessors controlling the various digital signal processing events, separate number crunching chips or video cards, via a control bus. The Mac- or PC-based system is similar in concept, although its CPU is the device that is doing these things directly, often including screen support (determining redraw time), disk drive control, etc.

All of this consumes time and processing power that is handled more efficiently in an integrated, one-chip-per-job system. Usually, but not always, (see March "Reality Check" digital editing system review) the integrated, multichip stand-alone wins the speed war. The exceptions in the Mac or PC world use the main CPUs to control external processors through onboard card interfaces.

Q: Will digital workstations ever think?

A: Not for a while yet. Some can talk, or rather, all Mac owners presumably have software that will occasionally make a point audibly, and in English, but we do not have HAL in the studio just yet. (What if SSLs could say those insults?) There may come a time when computer technology makes more extensive use of artificial intelligence. That will take much more speed (parallel processing power) and a vastly superior amount of memory than is currently available or affordable.

In the mainframe computer music field, there are those who have computers "learn" styles of composition and then create (program?) music in the context of that style. Modifications can be made to the finished composition or to the extent to which the computer is programmed to compose in that style. Why not do the same with our studio? What if we were able to train the system to accommodate our modes of operation with selectable setup functions and programmed responses? Not just setup recall, but why not program our studios to recognize spectral content or dynamic characteristics of specific types of program material and make adjustments per our "style"? Perhaps this would just add another level of flexibility to an environment already dripping with underutilized technology. What would we think then? Would that be a good thing? ■

Live & Direct

International Touring: The Global Challenge

By David Scheirman

As the Global Village continues to evolve, and the music and entertainment industry moves toward becoming a unified, planetary pop culture, the appetite of people around the world is whetted for localized live concert presentations by major artists. The truly massive worldwide concert tours by Pink Floyd, Paul McCartney, the Rolling Stones, Bruce Springsteen, Madonna, Michael Jackson and such offer production teams an interesting dilemma. These tours require the most complex and sophisticated sound reinforcement systems ever assembled for portable use, yet the shows are spread out over the largest geographical area imaginable: the globe.

Although sound reinforcement systems and crews of some sort are available on every continent, the type and quality varies considerably. English, European and Japanese companies can often maintain parity with much of what is available in the United States (which, being the largest market for concert touring because of geographic area and population distribution, still conceives and supports the greatest amount of the most technically advanced large scale concert systems in the world). It's getting easier to source useable large-scale rigs in Asia, still tough in South America and nearly impossible in the Middle East and Africa.

Most touring entourages would prefer to have a consistently reliable supplier of the same sound system, night after night, whether in Paris, Osaka, Chicago or Brisbane. Those artists able to afford it search for a worldwide sound system supplier to handle an entire world tour.

The full-service companies able to operate successfully in this realm are few. Such factors as language barriers, freight costs and shifting international economics make it difficult for a nationally successful sound company in one country to actually achieve true global reach, and establish firm operational bases with compatible inventories on more than one continent. Yet, the market for such efforts continues to present itself, as the expanding number of MTV viewers around the world help to make Madonna, Michael J. or McCartney must-see attractions, even in the Third World.

David Scheirman is R•E•P's live performance consulting editor and president of Concert Sound Consultants, Julian, CA.

OVERSEAS VENTURES

Major veteran sound firms like Clair Bros. Audio, Maryland Sound Industries and Showco have established operational bases outside of the United States. Audio Analysts, See Factor and dB Sound are three other American companies that have established offices or working relationships with firms in England, either on a temporary or permanent basis, in order to facilitate European operations.

Tasco and Electrotec (formerly Electrosound) have worked in reverse, being two of the few English sound companies to establish a long-term operational base in North America. Without these far-flung resources, it is difficult for an aggressive sound reinforcement company to provide the highest level of quality service to the concert industry's major artists.

Showco struck up a business relationship with Hibino Sound in Tokyo last year that placed the equivalent of two full arena-sized Prism systems in the Asian market. Showco gear is also warehoused in the United Kingdom or the European continent when major clients are doing large-scale concert work there. MSI formed a strategic alliance with a Hong Kong firm in the mid-1980s, positioning compatible inventory there for use with the company's clients touring in that region. MSI also has had a solid base of operations for nearly a decade in the United Kingdom through a joint venture with Brittania Row; Japanese activity for MSI is strong.

Clair Bros. has recently re-formulated its worldwide service strategies, and now offer Clair Bros. Japan, along with a new European operation in Basil, Switzerland, close to the French and German borders.

"The Swiss company Audio Rent seems to be the type of firm that we can work with well," says Clair Bros. business manager Greg Hall. "They've worked on projects with us for a while now. We've closed down the operation in England, and intend to concentrate our efforts on the continent. We also have recently reached an agreement for 1991 with the new management of Jands Concert Production Services in Australia, which is the first company there to gain access to the S-4 Series II cabinets."

Of course, not all touring artists can afford to ship an entire full-sized sound system, complete with rigging gear, power distribution, massive speaker arrays and electronic racks to 10 or 20 countries during a world tour. In fact, most international tours rely on a (hopefully) well-coordinated patchwork of different suppliers in different countries, often relying on the regional concert promoters to suggest and provide acceptable local sound companies.

HARDWARE CONCERNS

When seeking a level of sound system consistency around the world, the two primary aspects of hardware that concern most soundmixers are consoles and loudspeaker systems. Various international regional sound companies may be chosen in different countries during a world tour based on the fact that they have the "right" consoles for a particular tour that is not carrying sound equipment, or the "right" speaker system for a tour that is carrying only consoles and signal processing gear.

For example, knowing that the same Gamble, Harrison, Midas, Ramsa, Soundcraft, TAC or Yamaha console that a mixer is familiar with is available for a certain tour may help make the decision as to what local companies will be used. However, this puts sound companies in places like Hawaii, Singapore, Argentina, or Italy in a quandry: What large-format professional mixing consoles do they purchase to get the most business from American and English rock acts that are coming through their nations?

While the venerable Yamaha PM-3000 is often the considered choice for sound reinforcement firms trying to lasso the international touring business that comes through their nation's borders, other firms opt for higher-ticket items like the Gamble EX.

"We are seeing a great increase in our export business in the past year or two," says Craig Hannabury, in charge of marketing the Gamble EX consoles manufactured by Crest Audio in New Jersey. "We've seen several go to Germany. There's a recent purchase for Spain. We've just shipped a new 56-input board to a customer in Sao Paolo, Brazil. Another is headed to Onken Sound in Japan. Each one of these should be good news for touring soundmixers who work with this console."

Continued on page 72

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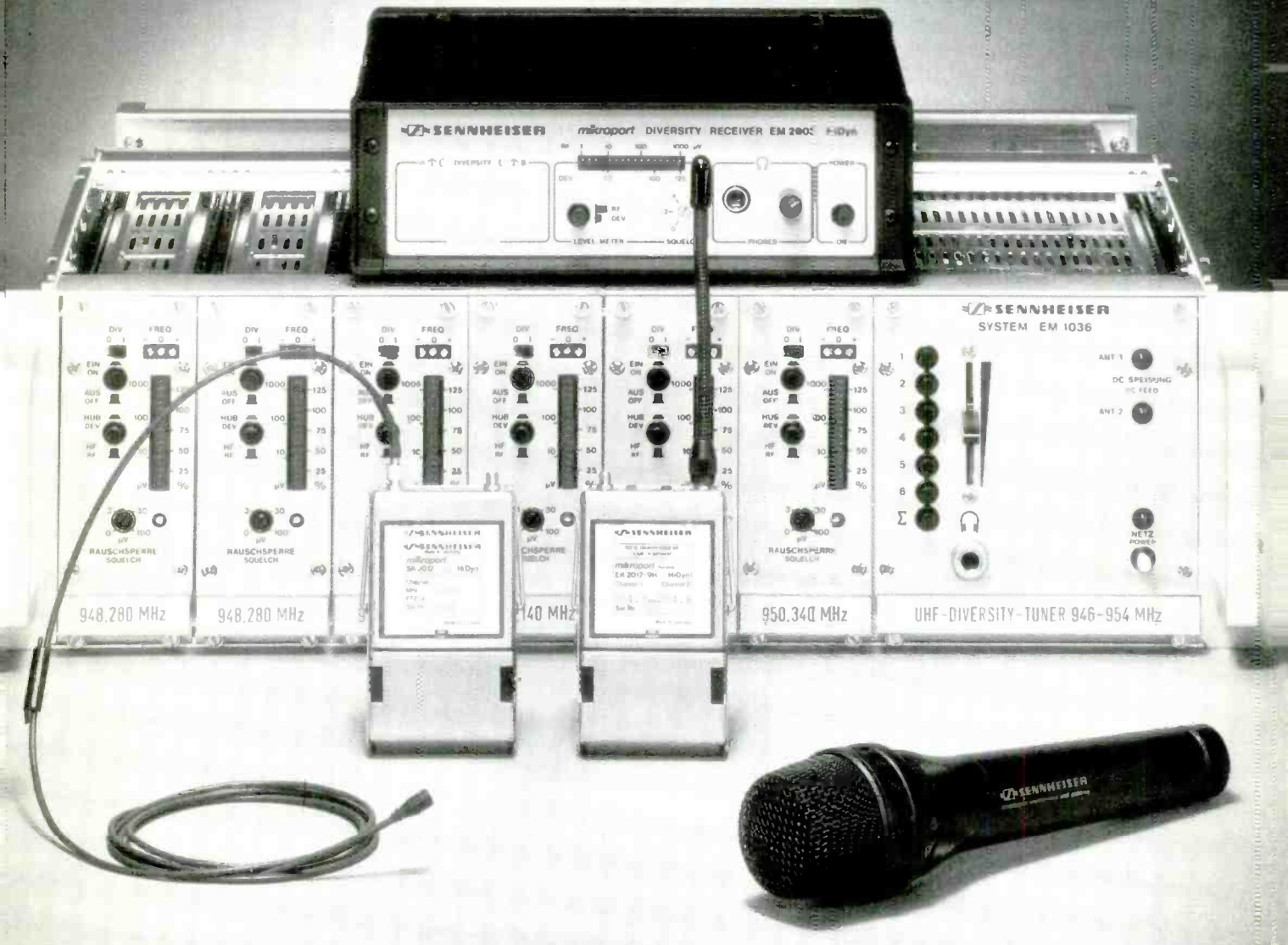

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QUALITY THEATER SOUND

A detailed look at A-1 Audio's sound production for "The Music of Andrew Lloyd Webber," one of the year's most popular touring stage shows.

By David Scheirman

The Music of Andrew Lloyd Webber" was conceived as a showcase for the British composer's most popular songs and theater music. Lloyd Webber, a 39-year-old wunderkind, has received four Tony Awards, four Drama Desk Awards, three Grammys and three Larrys, the British equivalent of the Tony Award.

One of the most heralded popular composers of his generation, Lloyd Webber is the first to have three shows playing simultaneously in New York and London. Much of his music ranks high in the pop music world, including "I Don't Know How To Love Him," which originated in the score for "Jesus Christ Superstar" and became a million-seller for both Helen Reddy and Yvonne Elliman. Webber's "Memory" from "Cats" has already been interpreted by hundreds of singers.

Featuring selections from musicals like "Cats," "Phantom of the Opera," "Evita," "Jesus Christ Superstar" and "Starlight Express," this current show was first staged in England during 1988. Revised and expanded, a Canadian production premiered in Vancouver in May 1989. Throughout 1990, the American tour played to sell-out audiences in more than 30 cities. I observed the show at the National Theatre in Washington, DC, during the 1990 holiday season.

David Scheirman is R•E•P's live performance consulting editor and president of Concert Sound Consultants, Julian, CA.

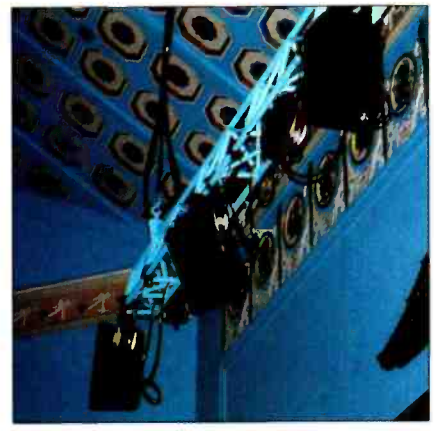

Figure 1. The center bridge truss, hung from the ceiling in front of the stage, holds three Meyer UPAs and three Tannoy 3859-R coaxial speaker units.

Figure 2. Compact Meyer UPM speaker units are used for both front-row fill speakers and for on-stage vocal ensemble foldback systems.

Although the show features a full symphony orchestra and an ensemble of 12 Broadway singers, it is difficult to categorize. Not a typical off-Broadway musical, a symphony event or a pop concert, the production requires the best in consistent, high-quality sound production. The show features a sound design by Martin Levan of England, who with his company (Martin Levan Sound Design) has been responsible since 1984 for designing the sound for almost all of the worldwide productions of Andrew Lloyd Webber's musicals (including "Cats," "Phantom of the Opera," "Aspects of Love," "Starlight Express," "Song & Dance" and "Requiem"). Assistant sound designer Graham Carmichael worked under Levan's supervision as project coordinator to implement this innovative system.

Soundmixer Lucas Corrubia Jr. was contracted to operate the specified sound system provided by A-1 Audio (Hollywood and Las Vegas). He has been working with the show since it opened in Canada last year.

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weekends in Toronto," says Corrubia. "Now, there are 26 weeks of work in the U.S., from the fall of 1990 through April 1991. I've had great fun working with Martin Levan and Graham Carmichael on this project. The show sound design is Martin's, and it is up to me to interpret his design and follow specific guidelines to guarantee a certain quality level and consistency from venue to venue.

"We're using A-1 Audio as the sound shop — the hardware supplier where we put everything together. Their fabrication shop is tops. They are able to fulfill a variety of custom needs. For example, they made us a phantom power on/off interrupt switch for use on the acoustic guitar, so you don't hear the pop during soft passages each time the guitarist needs to pick it up, turn it on and play. A-1 also gives us excellent support while we are out on the road."

Corrubia, based in Atlantic City, got his start in live soundmixing in 1980 after moving out of the video production field. For several years, he worked as soundman at the Golden Nugget casino showroom.

"The Atlantic City scene was an excellent foundation to start from," says Corrubia. "It gave me a good start on basic skills, with live music and production shows, as I moved toward working with sophisticated international projects."

Assisted by technician Jim Good, Corrubia examines each particular venue and

Figure 3. The conductor's position is equipped with a private mini-monitor system using Anchor-powered speakers and an intercom control station.

decides how to best use the portable loudspeaker system components at his disposal.

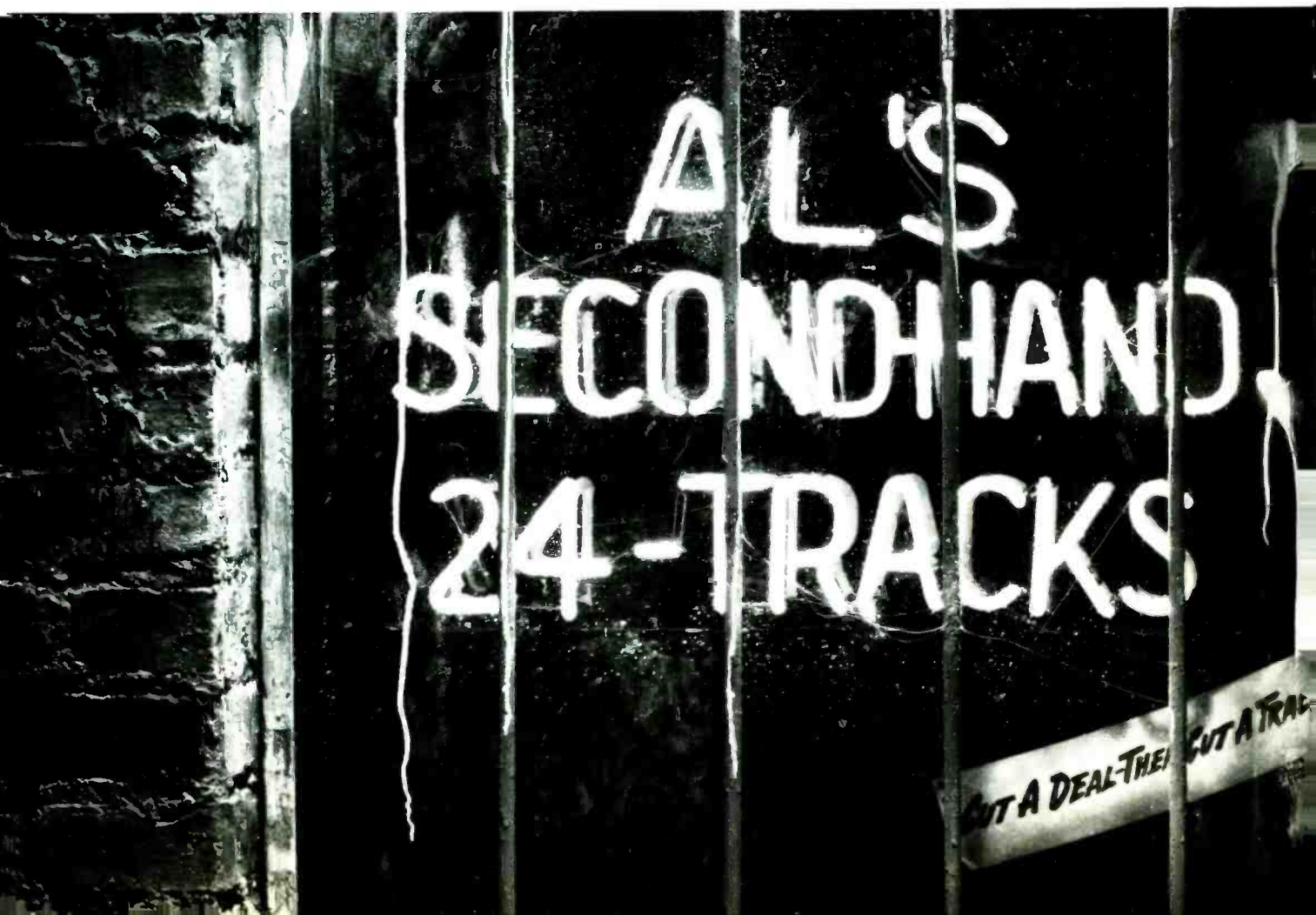
"Martin's design gives a very good center image for the sound of the show in a theater," he says. "That is pretty consistent, no matter what building we are in. Here at the National Theatre, we have a fairly typical deep balcony situation, with side loge boxes. My primary system structure includes left and right speaker placement with subwoofers at the bottom, an overhead center truss in the middle and an apron frontfill system for the forward rows."

SPEAKER SYSTEM LAYOUT

In the National Theatre, the sound team set up two Meyer UPAs and a Meyer 650-RS subwoofer on the lower level, with a single compact Meyer UPM on a higher shelf to cover the side balconies.

Although not visually overpowering, this compact system did a more than adequate job of tastefully filling the richly decorated historic theater with full-bandwidth program sound reinforcement. First constructed in 1835, the National Theatre is the third-oldest in America, and has hosted every U.S. President since its construction.

The center loudspeaker complement includes three widely spaced Meyer UPAs and three Tannoy 3859-R coaxial drivers.



"We typically will make use of an overhead bridge truss to hang these center speaker components," says Corrubia. "They can be adjusted with pipe brackets so that I can get the ideal coverage angle for different balconies in various rooms" (see Figure 1).

The Tannoys used in Martin Levan's sound design represent an unusual application of a loudspeaker component. A 15-inch diameter coaxial speaker, normally found in large-format studio reference monitors, the units are free-mounted without any boxed enclosure. Custom-configured Brooke-Siren Systems electronic crossovers, located at the power amp racks, are used to drive them.

The Tannoy speakers provide an open, breathy sound to the musical material, according to Corrubia.

"It's as if the theater room space is being used as the virtual enclosure. I think it gives a whole new dimension to the sound for this type of show, and it is particularly effective when you hear things like the pipe organ notes in the theme from "Phantom of the Opera."

The compact frontfill system includes up to eight Meyer UPM speaker enclosures, placed along the front edge of the stage. The number used varies, depending on the width of the stage area. The same type of unit, fitted with tilt brackets and fed with separate signals from an auxiliary mixing console bus, is used for the foldback system to serve the vocalists who work the front stage area (see Figure 2).

"In a show like this, having a supply of small, efficient, quality speaker units is a lot more important than having just a big pile of boxes," says Corrubia. "The levels that we work with are very tasteful, and very subtle things like speaker placement and EQ settings will make a big difference in what the listener perceives in the different seating areas. I'll use the Meyer UPMs whenever we need a small house fill-speaker for side balconies and that sort of thing. It's a close-field device, compared to larger things, but when integrated into the whole system it's a real problem-solver."

In larger venues, Corrubia sets up custom-built sound towers designed by Martin Levan. Each of these vertically oriented support structures holds one Meyer subwoofer, a Meyer MSL-3, a Bose 302, two Meyer UPAs and two Tannoy coaxials. Comprising a 16-foot post made of square steel tubing stock, the sound tower has a sturdy plywood base that will typically be secured to the floor with lag bolts. One is set on each side of the proscenium stage opening (see Figure 4).

Amplification for the loudspeaker systems is installed in custom-built electronics racks made by A-1 Audio. Dual-channel units from Crest Audio power the Meyer components, and Crown amps are available for various purposes. The Meyer control electronics units are also located in these amp racks.

MIXING EQUIPMENT

The show is set up to be run on a Yamaha PM-3000-40 mixing console. To accommodate the large number of instrument mic inputs for the 37-piece symphonic ensemble, a group of space-saving rack-mountable submixers is employed.

Four Yamaha MV802 8-input mixers, along with four Yamaha MLA-7 mic-line amplifiers, give a total of 32 additional phantom-powered mic inputs, convertible to line level signals. These are used for string, woodwind, brass and percussion subgrouping. Located in a rack beneath the main console, the submixers allow the assembly of a reasonably compact house mixing position. This is an important consideration in theater houses with fixed-row seating.

"We run the stage monitors from the

house mixing position," says Corrubia. "There is really very little change from show to show on the monitor settings; the musicians are quite consistent, and the program is the same from night to night."

The speaker systems are set up to be controlled from the output matrix section of the PM-3000 console. Each output program mix is provided with one side of a Yamaha Q-2031 1/3-octave graphic equalizer; a total of 14 are available for both house and stage monitor mixes. Output mix capabilities include the house left and right towers, the center UPAs and Tannoys, the frontfill UPM group, the vocal ensemble foldback, the conductor's feed and the rhythm/brass foldback "hot spot" monitors. A click-track signal is fed to on-stage headphone amps for the percussionist and the conductor's mini-monitor system (Rane HC-6 and a Shure M-267 with AN-1000 Anchor-powered monitors), to ensure time-synchronization with special effects playback (see Figure 3).

Portions of the program (including crowd noises from the "Evita Suite," for example) are run from an Otari reel-to-reel tape deck. Two identical MR-5050 units are linked to run simultaneously; one is a spare that can be instantly online when a console-mounted A/B switch box is engaged.

White Model 4700 programmable equalizers are given pre-set and desired EQ curves for the Tannoy speaker system feeds. Yamaha DDL-3 digital delay units are employed for the left and right main orchestra mix feeds (enabling the signal delay of the left and right speakers in relation to the center array), and a pair of SPX-1000s are used for vocal and orchestral reverb units. Two dbx 166 compressor-limiters are group-inserted for the vocal ensemble.

"It's really an elegant system design," says Corrubia. "The tools are here to achieve a certain consistent sound, regardless of what size venue we take the show into; yet, everything is compact and neatly arranged so as to save as much space as we can. I have everything at my fingertips."

MICROPHONE PROVISIONS

Perhaps the most specialized part of the sound system rental equipment for this show is the microphone kit. It includes models from Neumann, Sennheiser, Beyer, AKG and Electro-Voice. Countryman Isomax mini-condensers are also used.

"The key to having a great reinforced symphony sound is being able to match your microphone type to the various instruments and sections," says Corrubia. "You need condenser mics for a lot of applications. You need units with built-in bass rolloff switches and pickup pattern selection. Martin Levan has put a lot of thought into the microphone needs of this production, and it shows. It gives me the ability to really reach for the different instruments as needed, to have them sparkle, and to get a really good blend."

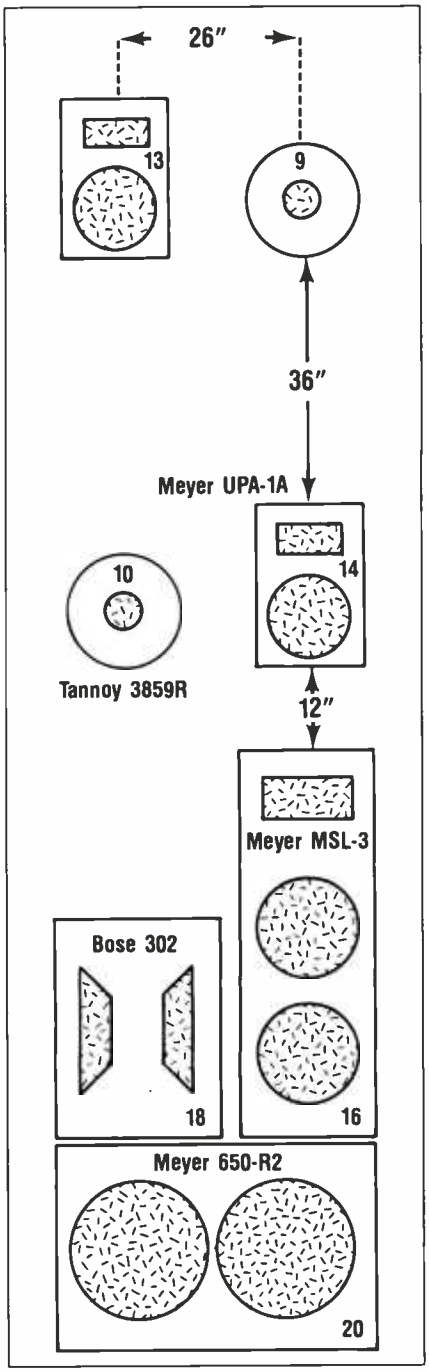


Figure 4. The tour's sound system resources include the sound tower, a 16-foot-high support used to raise spaker components on stage left and stage right.

For the high string sections (violin and viola), Countryman Isomax miniature clip-on condenser mics are fixed to the bridge post. Sennheiser MKH 40s are supplied for the celli and bass viol. The MKH 40s are also used for each flute, oboe, clarinet and bassoon player.

French horns are picked up with Sennheiser MD 409s, and Neumann U 89s are used for the trumpets. E-V RE-20s pick up the trombones. Each seated musician has a unique music stand that combines mic clip, lamp and sheet music holder in one sturdy, space-saving package.

The percussion set (including timpani, woodblocks, bells, etc.) is given five AKG C414s, while the trap kit uses an AKG D12 for kick, C451 for snare, and C414 for overhead. The piano is picked up with a Crown PZM, and the electric guitar amp is miked with a Sennheiser 409.

The male and female vocal solo mics are Beyer M88s, and Sennheiser hand-held wireless systems with 4031 condenser mic capsules are used by the vocal ensemble (15 R.F. systems are available).

"A-1 Audio used its computerized radio-frequency assignment system to set this rig up for us," says technician Jim Good. "We had to make sure that all of the RF systems were completely non-interactive. The Sennheiser system works really well for us, and we've had good results as we move from city to city. No problems at all, actually."

QUALITY AUDIO: A THEATER TREND?

One interesting note about this production is that the sound carries the evening; there are no lavish stage sets, no rich costumes, not even any dramatic story-weaving. It is musicians and singers presenting popular musical compositions. How well (or not) the theater patrons can hear influences how the show will be perceived by the critics and audience alike.

This show seems to be pleasing both. To quote one music reviewer: "From where I sat, the concert sounded great. It sounded just as good — not too loud, not too soft — from the extreme back of the house, where I sat after intermission. The orchestra has a rich, thoroughly professional sound."

"It's really more like a concert than anything else," says Corrubia. "These are theater patrons, people who are used to going to plays and to symphonic concerts; what they come to this show for is to enjoy some good music. So, we are fortunate that the producers have been aware of how important it is to get the sound of the show across."

"We are really enjoying the move toward greater audio sophistication for this type of musical show," says A-1 Audio owner Al Siniscal. "This production is a really good example of a project that lets everybody shine. We are very proud of it. The composer, the sound designer, the singers and musicians, the production staff and our sound system ... it all comes together quite nicely when things are done right like they are on this one." ■

AKG Acoustics, Inc.
Allen & Heath
Altec Lansing
Ampex
Analog Devices
Aphex Systems
Apogee Sound, Inc.
ART
Ashly Audio, Inc.
Atlas/Soundolier
Audio Control Industrial
Audio Precision
Audio Research & Technology, Pty.
Barron, Kennedy, Lyzun, & Assoc.
Bertagni Electronic Sound
Transducers
Beyerdynamic
Bose Corporation
Brüel & Kjær Instruments
BSS
Carver Corp.
Clear-Com Intercom Systems
Community Professional Sound
J.L. Cooper Electronics
Crest Audio
Crown International
dbx
DRV Public Address Consultants
Dukane Corporation
Eastern Acoustic Works
Electro-Voice
Gauss
Gentner Electronics
Innovative Electronic Design
Industrial Research Products
Ivie Technologies, Inc.
JBL Professional Products
The Joiner-Rose Group, Inc.
Klark-Teknik Electronics, Inc.
Klipsch and Associates, Inc.
Lester Audio Laboratories
Lexicon
Marshal Long Associates
Martin Audio
McCurdy Intercom
Meyer Sound Laboratories
MicroAudio
Neutrik USA, Inc.
Orban
Oxmoor Corporation
Panasonic Communications
Paoletti & Associates
Peirce-Phelps, Inc.
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RTS Systems
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Soundcraft USA
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Roadwork

By Mark Herman

Herman's Trivia Quiz:

Answers appear on page 71.

1. How many aux sends are on a Yamaha PM3000 input channel?

2. Madonna used this sound company on her last tour.

3. In what year did Meyer Sound first introduce the MSL-3 full-range concert cabinet?

4. Who was Pink Floyd's FOH mixer on their last tour?

5. Which Canadian loudspeaker manufacturer features an acoustic waveguide-type horn loaded with a 10-inch compression driver?

6. What brand of amplifiers does Showco use?

7. When and where is the next AES convention?

8. When and where is the next NSCA convention?

9. Db Sound's main PA for Aerosmith's 1990 "Pump" world tour featured this 2-box loudspeaker system.

10. Where is Maryland Sound Industries' main office located?

11. How much does a 40-channel Yamaha PM3000 mixing console weigh?

12. What loudspeaker manufacturer — differing from all others in the industry — uses the opposite polarity convention on its transducers?

Electrotec Productions (Canoga Park, CA) — which usually concentrates on the touring market — recently completed the installation of a $600,000 sound system for the Aloha Showroom in Honolulu. Working in conjunction with local sound contractor Rhema Systems, Electrotec placed more than 60 JBL-loaded enclosures in the multi-stage tropical environment, 1,000 seat room that opened mid-March with the musical "Aloha." Other equipment included BSS and TDM crossovers, T.C. Electronic 1128 EQs, one Soundcraft 8000 console, an IED UDAPS computer system for time alignment and 40 Crown ComTech amplifiers.

Electrotec has managed to keep several of its systems out early this spring. Randy Travis went out in mid-February with 56 Lab Q cabinets. Bob Butler is mixing

Mark Herman is the president of Hi-Tech Audio Systems, a sound reinforcement equipment rental company based in South San Francisco.

FOH with Paul Danese engineering the stage ... In mid-February Ricky Van Shelton's Redman-sponsored tour hit the road with 56 Lab Q cabinets. FOH engineer is Dave Hainey; monitors mixed by Jon Ducrest ... The venerable Rod Stewart's 5-month European tour of stadiums and arenas was set to begin after completing several weeks of rehearsals. A new 72-cabinet Q2 main PA system will be employed. Engineering are FOH mixer Lars Brogaard and monitor man Mark Tooch ... Metal monsters Megadeath are now touring Europe with a 40-box theater/small arena system ... Great White left in mid-March for a U.S. tour ... Guns 'N' Roses is scheduled to begin rehearsals early this month with the following tour planned to begin soon. This tour has all the makings of becoming one of the "super tours" of 1991. Axel and Co. will be using another of Electrotec's new Q2 main PA systems with engineers Fred Miscera out front and Rick Semerjian onstage ... Queensryche is scheduled to begin a U.S. tour this month.

Third Encore (North Hollywood) just opened a 19,000-square-foot addition at its well-equipped, modern rehearsal facility located just two minutes from the Burbank airport and 10 minutes from Hollywood. The rehearsal hall now includes seven acoustically sound practice rooms: a 4,100 square foot room, two 2,000-square-foot rooms, 1,700-square-foot room, 800-square-foot room, and two 600 square foot rooms. Third Encore also provides production and programming rooms, easy parking and loading, lockers, technical and logistical support, security, all the amenities, cartage and storage. Bob Ludwig, Bob Thompson and Robert Lemons are the three main principals in the company.

Sound Image (San Marcos, CA) reported having several tours out and a steady diet of national one-offs. The Indigo Girls' tour of 2,000-3,000-seat venues started in late January and continues through the spring with Rob Mailman mixing FOH and Les Banks handling both monitor and crew chief duties. Main PA equipment includes Ramsa WR-S 852 and 840 consoles, 12 PhaseLoc Series IV cabinets, PhaseLoc 2×12 wedges and QSC power ... Barbara Mandrell left in February for a year-long tour with an 18-box PhaseLoc Series V FOH system, with additional Ramsa 500 speakers for front fill. Consoles are a Yamaha PM3000 for independent FOH engineer Michael "Ski" Wisbiewski, a Ramsa WR-S840 and a Yamaha 2408 mixed onstage by independent Tony Distefano. Other crew members are Rick Stanley and Greg Alexander ... SI co-owner Dave Shadoan continued mixing Robert Cray's Japanese January and February tour leg. Cray was out on sporadic dates in March with a Sound Image system in the U.S. ... Jack

Continued on page 71

All Access

By Mark Herman

ULTRA SOUND, SAN RAFAEL, CA

Headline Act:
The Grateful Dead

Dates: Spring 1991
Region: North America

PERSONNEL
House Mixer: Dan Healy (independent)
Monitor Mixer: Harry Popick (independent)
Head System Engineer: Don Pearson
Technicians: Mike Brady, Chub Carrier, Howard Danchik, Uwe Willenbacher
Rigger: Marty Cohen (Stage Rigging)

CONSOLES
House: Crest Gamble Series EX-56
Monitor: Crest Gamble Series EX-48

AMPLIFIERS
Main FOH: Crest 8001, 7001, 4001, 5000
Lows/Subs: Crest 8001, 5000
Monitors: Crest 3500

MAIN LOUDSPEAKER CABINET
Manufacturer/Model: (88) Meyer MSL-3
Manufacturer/Model: (4) Meyer MSL-10
Flying System: Ultra Sound

SUBWOOFER
Manufacturer/Model: (16) Meyer 650-R2 Subwoofer

ONSTAGE MONITOR WEDGES
Manufacturer/Model: (9) bi-amped Meyer UM-1
Crossover: Meyer M-1A

HOUSE RACK
Equalizers: (6) Meyer CP-10 (Ultra Sound modified), T.C. Electronic 2240 HS

Mark Herman is the president of Hi-Tech Audio Systems, a sound reinforcement equipment rental company based in South San Francisco.

Crossovers, Main FOH: Meyer M-3T
Crossovers, Subwoofers: Meyer B-2A
Effects: (3) Lexicon PCM70, PCM42, (2) Lexicon LXP-5, (2) Lexicon LXP-1, T.C. Electronic 2290,1280, (2) Klark-Teknik DN716, Eventide H3000 Ultra-Harmonizer, Roland SDE 3000, DeltaLab Echotron, dbx 500 Subharmonic Synthesizer, Sony DAP PCM 401
Gates: (6) Aphex Expander/Gates
Compressor/Limiters: (5) Aphex Expressors, (8) Aphex CX1
Intercom: Clear-Com RM-120A Remote

DAT Machine: (2) Panasonic SV-3700
Time Code Generator: Cipher Digital 716A
Analyzer: Bruel & Kjaer 2032
Power Conditioner & Light: Furman PL-8
Headphones: Sony V7

ONSTAGE SIGNAL PROCESSING
Output Equalizers: 5-band parametric on Gamble EX-48 console
Effects: Roland DEP, Lexicon PCM70
Gates: dbx 904, Aphex Expander/Gate
Intercom: Clear-Com MS-400A main station
Power Conditioner/Light: Furman PL-8
Headphones: Sony V6

MICROPHONES:
Vocals: Milab LC-25
Kick: Sennheiser 421
Toms: Sennheiser 421
Overheads: AKG 460
Snare Top: Neumann KMS 841
Snare Bottom: Shure SM-56
High Hat: AKG 460
Kick No. 2: Sennheiser 421
Toms No. 2: Sennheiser 421
Overheads No. 2: AKG 460
Snare Top No. 2: Neumann KMS 841
Snare Bottom No. 2: Shure SM-56
High Hat No. 2: AKG 460
Timbales High: Shure SM78
Timbales Low: Shure SM78
Percussion: Shure SM78
Wood Blocks: Shure SM57
Beam: Custom pickup
Beast Drum: (2) AKG 414
Guitar No. 1 (Garcia): DI, Sennheiser 421
Guitar No. 2 (Weir): DI
Keyboards: DI
Bass: DI
Direct Boxes (DI): Countryman 85

CABLING
House snake(s): (2) Mogami 15-pair return, (1) Belden 52-pair, (1) Belden 48-pair, (2) ac power
Multi-pair Connectors: AMP QL, AMP G2
Stageboxes: Whirlwind, Ultra Sound
Splitter: Ultra Sound 3-way, no transformers ■

SUN SOUND AUDIO, NORTHAMPTON, MA

Headline Act:
Slayer

Support Act: Testament
Dates: Jan. 9 - March 10
Region: North America

PERSONNEL
House Mixer: Greg Bess
Monitor Mixer: Rick Diesing
Support House Mixer: David Pigg (independent)
Support Monitor Mixer: Rick Diesing
Head System Engineer: Kevin Marshall
Technicians: Geronimo States

CONSOLES
House: ATI Paragon 40×16×2
Monitor: TAC Scorpion 40×12
Support House: Yamaha PM3000 40×8×2
Support Monitor: TAC Scorpion 40×12

AMPLIFIERS
Main FOH: Crest 8001
Lows/Subs: Crest 8001
Monitors: Carver 1.5
Sidefills: AB 1200, QSC MX1500

MAIN LOUDSPEAKER CABINET
Manufacturer: EAW
Model: (40) KF 850

FLYING SYSTEMS:
Manufacturer/Model: (6) Sun Sound Audio Sun Beams

LOW END CABINET/SUBWOOFER
Manufacturer: EAW
Model: (20) SB 850

ONSTAGE MONITOR WEDGES
Manufacturer: Sun Sound
Model: (4) 2115
Crossover: BSS 310
Manufacturer: Sun Sound
Model: (10) 1115
Crossover: BSS 310
Manufacturer: Turbosound
Model: (4) TMS-4
Crossover: BSS 310

ONSTAGE SIDEFILLS
Manufacturer: EAW
Model: (2) KF 850, (1) SB 850
Crossover: EAW MX 800 (Sun modified)

HOUSE RACK (HEADLINER ONLY)
Equalizers: T.C. Electronic 1128
Crossover: EAW MX 800 (Sun modified)
Effects: Lexicon 200/PCM70, Yamaha REV-5/SPX 900, dbx 120 XDS, Eventide H3000
Gates: BSS 405, (40) ATI Paragon
Compressor/Limiters: (40) ATI Paragon
Intercom: Clear-Com
Cassette Machine: Tascam 112

ONSTAGE SIGNAL PROCESSING (HEADLINER ONLY)
Equalizers: Klark-Teknik DN300
Crossovers: BSS 310
Effects: (3) Yamaha SPX 90-II/ REV-5/REV-7
Gates: Drawmer 201

MICROPHONES: (HEADLINER ONLY)
Main Vocals: Shure Beta 58
Background Vocals: Shure Beta 58
Wireless: Samson Broadcast
Kick: Electro-Voice RE-20
Floor Toms: Ramsa S-5
Rack Toms: Ramsa S-5
Snare Top: Shure 57
Snare Bottom: Beyer 201
High Hat: Shure SM 81
Overheads: Shure SM 81
Guitar No. 1: Electro-Voice 408
Guitar No. 2: Electro-Voice 408
Keyboards: DI
Bass: Electro-Voice RE-20
Direct Boxes: Countryman 85

CABLING
House snake: 50 Pair
Multi-pair Connectors: AMP G-4 latch
Stageboxes: Wireworks
Splitter: Passive 3-way with transformers ■

By Paul D. Lehrman

HANDS ON:

Mark of the Unicorn Video Time Piece

For the large or small audio studio that wants to get involved with video, getting the right equipment is a serious problem. While the line between semi-pro and professional audio gear has become grayer in recent years, making quality audio products available at many price levels, professional video gear is still very expensive. And usually it is overkill: A studio that wants to produce music and sound for video is often forced to purchase a 3/4-inch video deck, even though all of the actual layback is going to occur elsewhere, simply because the synchronization capabilities of cheaper formats are not good enough for professional work.

The situation is changing, however, especially with the introduction of new lower-priced high-end formats, such as S-VHS and Hi-8mm, gaining acceptance at both the consumer and professional levels. At the same time, a new generation of inexpensive synchronization equipment is emerging, led by companies such as JL Cooper Electronics, Midiman, Horita and Fast Forward Video.

Mark of the Unicorn has now introduced its entry into the video sweepstakes: the Video Time Piece. Its Performer sequencing software for the Macintosh has gained wide popularity, and its multiple-cable MIDI interface, the MIDI Time Piece (MTP), created quite a stir when it was released more than a year ago.

Of the new low-cost audio/video interfacing devices, the Video Time Piece, which lists for $1,195, is the most ambitious. It is a kind of "video Swiss army knife" for audio studios. Although it will never replace a professional time-base corrector or character generator in video production, it does an amazing job of manipulating video for audio purposes. It deals with a host of synchronization tasks and problems, and accomplishes jobs that previously would have required gear costing at least five times as much. It is equally at home with any grade of equipment.

The time code chores that the Video Time Piece handles include reading and writing longitudinal (LTC) and vertical-

Paul D. Lehrman is a frequent contributor to R•E•P and a Boston-based producer, electronic musician and free-lance writer.

interval (VITC) code (based on internal or external clocks including house sync), converting from LTC and VITC to MIDI Time Code (MTC) and its own Enhanced Direct Time Lock (DTLe). It also does regenerating and jam-syncing code and generates MIDI messages from a click track. The visual functions it can do include generating window burn, imposing bit-mapped graphics onto a video signal, and with Performer, displays streamers, punches, marker names and a visual tempo crawl.

HARDWARE AND SOFTWARE

The device takes up a single rack space and is surprisingly lightweight — less than three pounds — thanks largely to its external dc power supply. On the rear panel are three 1/4-inch audio jacks for LTC input, output and Click input. Also included are three BNC jacks for video input and output and house sync input, four MIDI jacks for connection to a computer/MIDI interface and an external MIDI device, and the input for the power supply. The front panel consists of a power switch and 14 LEDs that indicate the status of the various operations, and the incoming and outgoing signals.

There are no other knobs or switches because the Video Time Piece is controlled entirely from software over a MIDI line, using System Exclusive commands. The software comes in the form of a Macintosh desk accessory program. Theoretically, the hardware could be used with any computerized MIDI system, and the System Exclusive commands are documented in the back of the manual. Perhaps Mark of the Unicorn or some independent programmer will develop similar software for other platforms.

The Mac Desk Accessory opens up seven different windows, corresponding to the various functions of the device. The Convert SMPTE window is for reading LTC or VITC and converting it to MTC or DTLe — in other words, for running a sequencer from a time code source. One option it offers is to find the first available time code signal, so if for some reason the VITC signal is missing or not readable, it will automatically pick up the first LTC number it reads, or vice versa. It will also convert MTC to DTLe and vice versa.

The conversion routines include a freewheel function for dealing with time code dropouts: the device will continue to generate MTC or DTLe messages for a period of time after the SMPTE stops, adjustable from 1 to 126 frames. If this function is set to "i," it will continue to generate time code indefinitely after an initial starting point.

The Stripe SMPTE window controls the type and levels of the time code being generated, as well as the sync source for

the code. The stripe can be started manually or when the device reads a specific frame number from LTC, VITC or MTC, which is how you get it to jam-sync. The LTC output level can be adjusted from −22dBm to +7dBm. Frame rates of 24, 25, 30 drop, and 30 non-drop are available, and there is a switch for the time base; you can use an internal 30Hz or 29.97Hz clock, or you can gen-lock the code to incoming video or house sync. The 30Hz setting yields a signal of 29.983Hz, while the 29.97Hz setting yields a signal at 29.955Hz — not perfect, but pretty good. (The designer claims this will improve in future versions.) In gen-lock mode the ouput signal is precisely the same as the input.

WORKING WITH VITC

The advantage of VITC over LTC is that it can be read at almost any speed, running forward, or backward or even standing still. This makes capturing frame numbers for hit points a much faster process than with LTC. The Video Time Piece makes VITC, formerly the exclusive domain of high-end video studios, accessible to any studio.

The Stripe window determines which lines in the video picture the VITC will be inserted into. The SMPTE specification says that the VITC signal should appear on two non-adjacent lines of the video signal between lines 10 and 20. (The redundancy is important to minimize errors.) The VTP limits this choice to even-numbered lines and always places them two lines apart. You specify the lower number: For example, if you set the line number to 18, the signal will appear on lines 18 and 20.

There's a popular myth that says you can't use VITC with VHS tape, but it is not true. Many inexpensive VHS decks, however, chop off the top and bottom of the picture when they are paused, and if the VITC signal is located in that missing portion, it will not be readable. The Video Time Piece overcomes this by letting you set the VITC line numbers as high as 38 and 40. Although it is not strictly kosher, and some video engineers will blanch at the thought, this can be tremendously helpful for a studio using consumer-grade video equipment. There is a drawback: Using a higher line number will make the VITC signal visible on the screen. However, under these circumstances you would only be inserting the code onto a work print; therefore, this is of no consequence.

WINDOW BURN AND GRAPHICS

The Video Setup window handles the various overlays onto the picture. You can use these overlays when you are viewing a tape, or when you are copying a program from one deck to another. When creating a window burn, you can position the time code numbers anywhere on the screen and use a clear or black background. You can also create text or graphics in any Macintosh painting or drawing program, and through the Macintosh clipboard, copy them into this window. They will then be overlaid onto the picture and you can move them to wherever you like. The quality of the graphics is equal to the Macintosh screen — 72 dots per inch — which is no competition for even the cheapest professional video graphics generator, but is certainly good enough for putting titles and logos onto work prints.

In addition, if you play Performer sequences containing markers, you can use the markers as punches. A few seconds before a marker occurs, the Video Time Piece will superimpose the name of the marker on the video, and will then move a streamer (a white rectangle) across the screen, which hits the right edge of the picture exactly at the marker's frame number. You can also display a conductor crawl line, which follows the sequence's tempo and moves a series of white blips across the screen from right to left, hitting the left edge on each downbeat.

The other windows are more simple. The SMPTE Reader window is a display showing the current frame number, frame rate and MIDI format, which can remain active while other windows are showing. The set Video Source dialogue box allows you to choose between NTSC and PAL/SECAM video frame rates, and to choose which input — video or house sync — the Video Time Piece will gen-lock to. Set MIDI Interface lets you choose which Macintosh port — modem or printer — the Video Time Piece is connected to, or if it is hooked up to a MIDI Time Piece, which of the eight cables it is connected to (or 16 cables if you are using two MTPs). Set Click to MIDI converts audio signals coming into the Click input on the back panel into MIDI commands: notes, controller changes, or a 3-byte message of your choice. Performer and some other programs let you record repeating notes and reconfigure them as beat markers. This feature allows you to construct a sequencer tempo map from a recorded click.

IN THE STUDIO

In practice, the Video Time Piece does an amazing number of valuable chores. The majority of studios will find it most useful in preparing video work prints for composing music or designing sound. They will no longer have to worry about the tape the video producer has handed them: whether its code is any good, what format it's in, or whether there is window burn, and if so, whether it's correctly locked to the frame rate. I find myself routinely copying whatever videotape I am given, inserting my own LTC, VITC and window burn in one pass.

The device accepts a wide range of SMPTE levels, and is very forgiving of noisy code. The flexibility of the freewheel function augments these capabilities. Unlike some other SMPTE-to-MTC converters, which audibly change speed when they freewheel, in the Video Time Piece it appears to work quite smoothly.

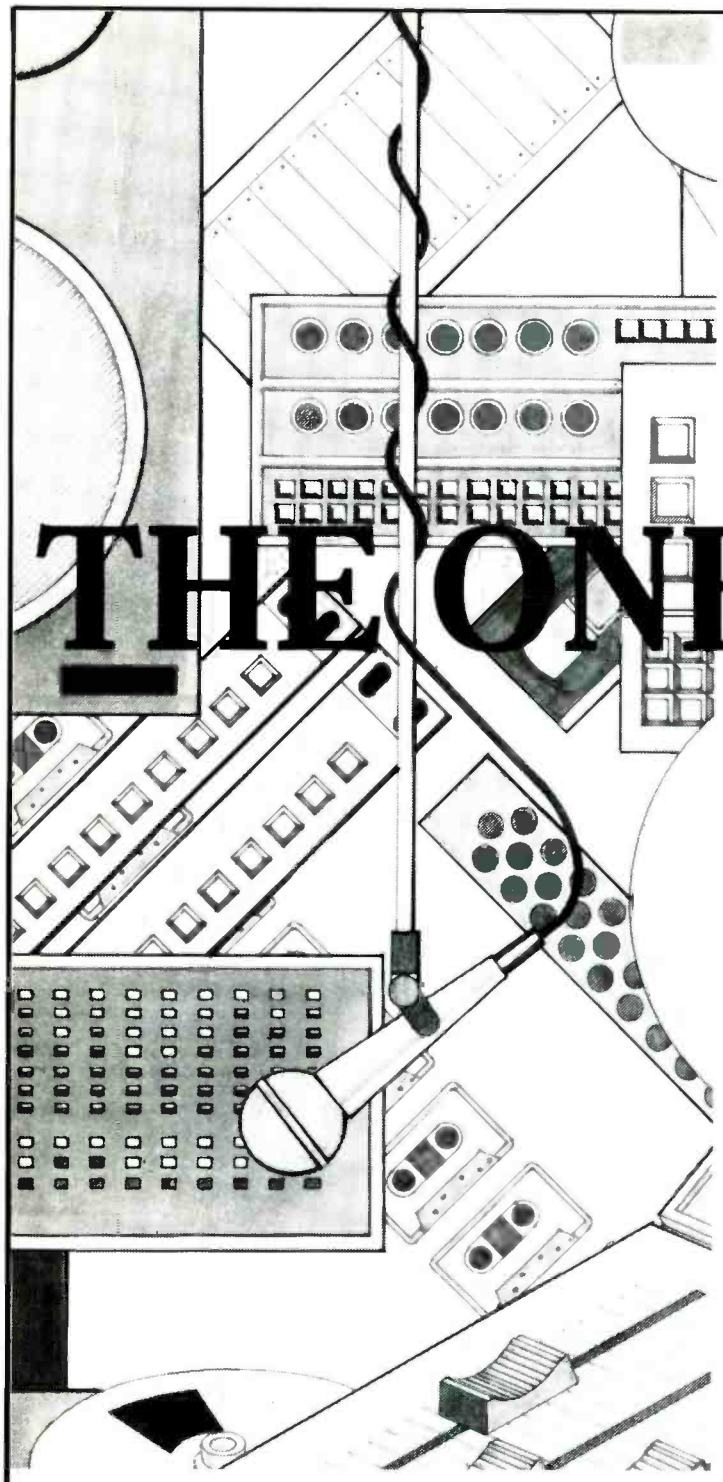
The infinite freewheel function is also useful if you have a videotape to which you want to sync, but you don't want to sacrifice an audio track by striping LTC on it. In this case, you can put a short burst of LTC at the beginning of the piece, and tell the device to freewheel indefinitely, while gen-locked to the video frame rate. You will have to go back to the beginning each time you sync up to the tape, but the lock will always be perfect, and you haven't disturbed your audio.

Another helpful use for the device is to create a syncable workprint out of a rough off-line video edit. An off-line edit will often have discontinuous time code (if it has any), making it impossible to lock to. But by copying the tape and inserting VITC or LTC gen-locked to the frame rate into the copy, you can create a usable workprint with reliable, continuous time code, and continuous window burn as well. There may be framing errors caused by the discontinuities in the video, but they will be minor, and you will be able to get your hit points very close — besides, you will usually have to tweak everything to the final edit later anyway.

GEN-LOCK AND BLACK BURST

One of the major problems of most low-price SMPTE generators is that they cannot lock to an external clock but instead generate time code "wild." When users attempt to stripe a videotape with this, the time code will not only almost always start in the wrong place relative to the video frame, it will then move away from the video, or "walk," over time. When the final tape is married back to the original video, any cues located more than a few seconds after the start of the program will be in the wrong place, and the longer the program, the greater the accumulated error. This situation has created endless agony for many fledgling post-production studios, and the Video Time Piece can help prevent this from happening.

Unlike audio tape, you can't stripe SMPTE onto a blank videotape; you must have some kind of video signal present as well. Usually what is used to prepare a videotape is a black burst signal, which is essentially a black video picture with all of the component synchronization signals intact. Black burst generators are normally fairly expensive because they require super-accurate crystals to ensure the



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sync frequencies are absolutely correct.

The Video Time Piece by itself can perform the same function using a broadcast signal — like from the tuner section of a VCR — for a time base. The timing of broadcast signals can usually be counted on to be exquisitely accurate. Using a simple system-exclusive message, you can shut off the picture of the video signal as it passes through the Video Time Piece, so that what emerges is the functional equivalent of black burst. Right now, it's difficult to send the device a custom system-exclusive message, but hopefully this task will be made easier in future versions of the software by the inclusion of a switch in one of the windows.

MAKING IT BETTER

As invaluable as the Video Time Piece already is, there is still room for improvement. The software is excessively modular, in that you can only work with one function at a time, although you can have several windows visible at once if you're willing to move things around (the software does not remember your layout, so you have to redo it every time). Putting everything into one window would make operation a lot faster and less confusing. The timing accuracy of the internal generator could be tightened up. The streamer and tempo crawl functions could be opened up so that they can be used with other programs besides Performer. Sending text down a MIDI line is not something too many programs do yet, but there are provisions in the MIDI spec for doing this.

The Video Time Piece software is compatible with Apple's MIDI Manager system software, which is necessary if you want to run multiple MIDI applications at one time, or if you want to use internal Macintosh sound-generating devices like Digidesign's MacProteus or SampleCell. However, the current version of the MIDI Time Piece software is not MIDI Manager-compatible; therefore if you're using the Video Time Piece through an MTP, there is no way to control it. This needs to be fixed.

The audio world is rife with misinformation about video, and if the Video Time Piece is going to have the impact it deserves, it needs to be accompanied by a guide to solving the myriad problems of audio/video synchronization. Unfortunately, the manual provided by Mark of the Unicorn is not that guide. Although it does an adequate job of explaining the various functions of the hardware and software, it does nothing to enlighten users as to why they should do things one way or another.

In addition, it perpetuates a number of dangerous myths. It talks a lot about 30-frame time-code for black-and-white video, which, as any video engineer can tell you, simply doesn't exist — which will no doubt get many unsuspecting audio engineers in trouble. The manual was obviously written by someone with no experience in video. If Mark of the Unicorn is going to stand behind this product, it is its responsibility to back it up with much more authoritative and accurate documentation. At the same time, the System Exclusive documentation at the end of the manual could be organized better, so that outside developers can work more easily with the device.

A LIFE SAVER

Despite these small problems, the Video Time Piece is a remarkable, revolutionary device that could have as much effect on the audio-for-video world as the first MIDI sequencers did on the field of music composition. It brings the time code manipulation capabilities of the professional video editing suite down to an economic level, which any audio studio, large or small, can afford to take advantage of. It presents a huge range of options and features, but only those relevant to audio production, and thus users aren't forced to pay for expensive video capabilities they'll never use. ■

Circle (100) on Rapid Facts Card

Promises, Promises

By Laurel Cash-Jones and Fred Jones

At the end of last month's column, we teased you that we would be writing about recordable CDs this month. No lie; on display at the Consumer Electronics Show in Las Vegas (behind closed doors, in most cases) were several models of WORM-type disk recorders, which conform to the "Orange Book" standards for recordable CDs, which were adopted in September 1990.

In case you are not familiar with the Orange Book standard, (there are also various other book color standards, available from Sony or Philips), there are two types of CD-R: WORM (Write-Once-Read-Many) and MOD (Magneto-Optical-Disk).

MOD-type recorders have the capability to erase as well as record, and have been shown by Sony and others at many audio shows. Unfortunately, MOD-type recorders produce a disk that *cannot* be played back on a standard CD player. However, most MOD players can also play standard CDs, making them backward-compatible.

The good news is that the WORM-type recorders shown are standard CD player-compatible. The first thing that you will notice about a CD-R disc is that it uses a gold reflective layer under the clear protective covering, which gives a distinctive gold color to the disc, compared to the normal aluminum layer.

Between the layer of gold and the clear covering is a "dye film." When you record on a Write-Once disc, the laser is focused through the lens of an optical recording head. The laser heats a small area of the dye film (less than one micrometer), which causes it to decompose and change color, and thus creates the illusion of the disc having pits, like a regular CD.

One other difference is that the blank disc has to be manufactured or pre-recorded with "tracking groove guides" so that the laser knows where to put the pits. Recording time is a maximum of between 63 and 74 minutes, which is comparable to that of the playing time of a standard CD.

Laurel Cash-Jones is R•E•P's editorial consultant and a Los Angeles-based free-lance writer. Fred Jones is an audio industry observer and a Los Angeles-based free-lance writer.

After getting excited at the prospect of having one of these items in our possession in the near future, we set out to search for one of these little toys to listen to. At one of the lunch counters, we ran into a representative of a company that had a CD-R on display and I was politely informed that, for the consumer market, there "are no plans to bring this product to the U.S. in the near future; these are prototype units only and there is no pricing or delivery information available at this time." Fortunately, we did not allow this person or his bad news to dissuade us from our search.

LOOKING FOR MR. GOOD-CD-R

The first unit we saw was the one Pioneer was showing in its Elite Series booth. The only information available was that "while the company is selling units in Japan, and while CD-R exists in industrial applications, there are still many issues, like copyright, etc., that must be resolved before we can ship these units into the U.S."

Kenwood showed two systems, one that is designed strictly for professional use, and is being sold primarily to radio stations and recording studios with a price tag of $38,000 (it was shown at the Los Angeles AES Convention last September). It is known as the DD-7200 CD Writer.

The second unit was billed as the "Prototype Consumer Version" and as such, it will be less complex, and less expensive than the pro version (presumably).

We were also given this cryptic comment about the marketing plans for this unit: "If and when it comes to market, it will be aimed toward smaller radio stations and recording studios." Is there an echo in here? Delivery of the consumer CD-R (depending once again on copyright politics in the U.S.) could be "within six to 18 months," said someone who did not wish to be quoted.

Circle (101) on Rapid Facts Card

ON TO NAMM

For the next CD-R we encountered, jump one week to the NAMM show in Anaheim, CA. It strikes us as odd to show this item at this type of show, but what do we know? Marantz has recently been acquired by Philips, and company representatives said they wanted to show people that Marantz is in the professional audio business.

On display without any information on paper, or any information that the people manning the booth could give me was a WORM-type CD-Recorder. No pricing, features or shipping information was given, but it was there. Honest.

IN THE FOOTSTEPS OF R2D2

From Yamaha comes its long-awaited professional DAT recorder, the DTR2. This sleek little number was one of the featured items at the NAMM show in the Yamaha professional audio section and boasts four sets of input and output connections: digital I/O (coaxial and optical), RCA-type phono unbalanced and balanced XLR-type (+4dB).

Separate front-panel switching of the digital and analog sources and sampling frequencies at either 44.1kHz or 48kHz are provided, as well as a wired remote control of all functions. The DTR2 is rack-mountable, and uses the latest Yamaha DeltaSigma 1-bit conversion technology in the A/D converters. On the output, twin pulse-density-modulation D/A converters yield a 94dB S/N ratio, 100dB separation, and THD of only 0.003% on the analog side of things.

Circle (102) on Rapid Facts Card

IT'S MY SECOND GE-GE-GENERATION

Back to Las Vegas and the CES for this last item. Casio introduced its second-generation portable DAT recorder, the DA-7. This unit weighs 2.9 pounds, and has mic, line and digital I/Os. As a result, connecting it to any system should be pretty easy.

Because it is not classed as a professional-only use product, the unit is equipped with SCMS. Also, it does not have a switchable sampling frequency provision. However, it will automatically select the sampling frequency to match the digital input when making digital-to-digital copies.

Circle (103) on Rapid Facts Card

A FINAL NOTE ...

Perhaps the most fascinating piece of news we came across during the CES was the following paragraph I discovered while reading the literature for the Casio DA-7. In reference to the SCMS system, "using the built-in digital input jack, you can make recordings from compact disc, digital tape recorders, and other digital sources for personal use, without infringing on the rights of copyright holders."

Isn't it nice to know that Casio has finally solved all the political problems of digital recording? ■

Cutting Edge

AKG C406 condenser mic

The C406 miniature condenser mic features a flat response and hypercardioid capsule for feedback rejection. It is mounted via a shock-isolating suspension to an 8-inch gooseneck; the base of the gooseneck is detachable from its slide-in mounting plate. Two mic configurations are available: the C406, with the cable terminated by an XL-type connector containing a pre-amp/phantom adapter and the C406/B, with the cable terminated in a mini-plug for use with a wireless body pack or the AKG B9 Phantom Power Supply. Net price of the C406 is $220; the C406/B is $165.

Circle (107) on Rapid Facts Card

Audio Precision Portable One

Portable One audio test set is designed for field, bench-top and studio applications. True 2-channel architecture allows full stereo measurement capability and dual bar-graph displays. It features 12 measurement functions, which are selected via push-buttons. The unit is housed in a custom-designed package, including a captive protective cover for the front panel. List price is $4,000.

Circle (108) on Rapid Facts Card

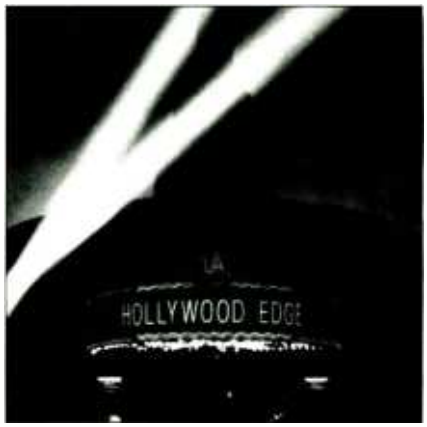
Audio-Technica omni mic

The AT804 is a hand-held omnidirectional mic in an all-steel case. The high-output mic is designed for interviews, sportscasting or as the mono mic when used in conjunction with the AT825 OnePoint X/Y stereo mic. It provides minimum handling noise.

Circle (111) on Rapid Facts Card

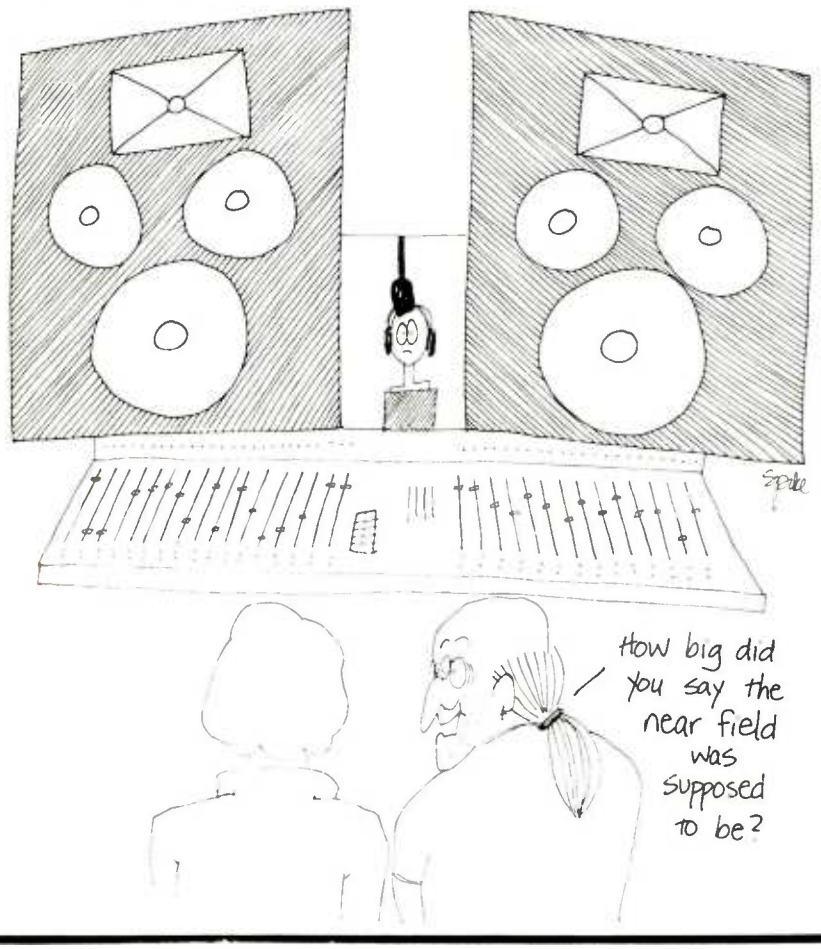
Hollywood Edge SFX

The Edge Edition sound effects CD contains more than 800 effects edited from more than 2,000 hours of field and studio recordings. Recorded primarily on DAT and edited on the AMS AudioFile in full-spectrum stereo, the Edge Edition is fully cross-referenced and indexed. List price is $295.



Circle (109) on Rapid Facts Card

SPIKE and MIC



Electro-Voice RE38N/D

The RE38N/D cardioid microphone features an external HF response and an equalization switch. The eight LF EQ tailoring combinations and two HF combinations provide a total of 16 frequency responses, which allow the user to compensate for proximity effect, LF noise and sibilance. The RE38N/D uses DynaDamp, a vibration-isolation material that eliminates the need for large external shock mounts; a humbucking coil helps to eliminate noise. A pivoting yoke allows the mic to be easily adjusted and the positions are detented to prevent shifting during use.

Circle (110) on Rapid Facts Card

Ampex 467 DAT cassettes

The R-30 and R-46 are 30-minute and 46-minute DAT cassettes, respectively. The R-30 is offered in Ampex's DATpak standard professional packaging and unlabeled bulk configurations. The line of 467 DAT products include 30-, 46-, 90- and 120-minute recording lengths.

Circle (123) on Rapid Facts Card

QSC EX amp line

The EX 4000, 2500, 1600, 1250 and 800 amplifiers offer 720W, 500W, 400W, 275W and 175W per side at 8Ω, respectively. The amps allow interface with control systems as they develop. A built-in limiter prevents excess clipping and reduces power if amplifier temperature becomes extreme. The

rear panel offers 5-way binding posts outputs, XLR/barrier strip inputs and three Neutrik Speakon speaker jacks. Two speaker jacks provide channel "on" and 2-speaker interface; a third speaker jack can be used as a single stereo pair, a bridged mono speaker output or for bi-amping speakers with a crossover.

Circle (118) on Rapid Facts Card

Shure VP88 stereo mic

The VP88 is a single-point condenser mic that incorporates two independent mic elements to produce a classic Mid-Side stereo signal. Two condenser microphone cartridges are mounted to produce a stereo signal that is fully mono-compatible. In stereo mode, the on-board matrix produces separate left and right stereo signals with three distinctive, switch-selectable stereo images. In the MS mode, it sends discrete, fully separated mid and side cartridge signals to its output for external matrixing to left and right signals. Net price is $995, which includes battery, carrying bag, foam wind screen, swivel adapter and Y-splitter cable.

Circle (120) on Rapid Facts Card

Cooper Sound Systems CS 106+1

The CS 106+1 is a 6-channel audio mixer that features three main outputs, three discrete monitor outputs with tape returns, talkback and communications, remote roll, Jensen transformers, P&G slide faders,

true PPM or VU meters, gold-plated switches and connectors, conductive plastic pots, and external and internal powering with low consumption. External power is 10V to 27V dc on a standard XLR-4 connector. Frequency response is more than ±0.5dB. THD is less than 0.01%.

Circle (121) on Rapid Facts Card

Cutting Edge

Media

Live sound videotape

"Live Sound! How to Run Your PA System" is a 75-minute video about selecting and operating a sophisticated live sound system. Hosted by David Scheirman, R•E•P's live sound consulting editor, the video follows a professional soundman around the stage as he works with a music group. Topics include analyzing sound equipment requirements, selecting and rigging loudspeaker components, choosing mics, running the main/house mixing console and organizing the sound check. Suggested retail price is $39.95.

Circle (140) on Rapid Facts Card

Recording industry sourcebook

The Recording Industry Sourcebook 1991, published by Ascona Communications, contains more than 8,000 music industry contacts in 70 categories. Features include 17 new categories, fax numbers, job titles, an artist directory, a travel guide and information on the type of music a particular label, manager or publisher represents and whether the facility accepts unsolicited demo tapes. It features expanded regional coverage of music production listings, covering facilities for the California, Greater New York and Nashville music markets. Retail price is $49.95. The Sourcebook 1991 database is also available on a floppy disk for IBM or Macintosh computers for $195.

Circle (141) on Rapid Facts Card

Fiber-optic cable report

"How to Choose & Specify Fiber Optic Cables" from Pearson Technologies is a 35-page report providing a comprehensive guide for determining the complete optical, mechanical and environmental specifications for FO cables. Information includes cable terminology, advantages and disadvantages of different cable designs, performance and cost considerations, cost data of five commonly used designs and a matrix of cable manufacturers and products. The report is available in bound copy or on IBM- or Macintosh-compatible disks.

Circle (142) on Rapid Facts Card

Azonic catalog

The 12-page Noise Control Products Catalog features application ideas, a step-by-step guide for ordering products, and information on the company's guaranteed acoustical modeling service. Azonic's acoustical foam with a patented pyramid surface pattern is featured in the catalog, along with its flame-resistant version.

Circle (143) on Rapid Facts Card

Sola product catalogs

Catalog #740 features uninterruptible power systems; Catalog #741 features power supplies; and Catalog #742 features power conditioning products. Sola products protect microprocessor-based equipment from electrical surges, spikes, sages, brownouts, blackouts, and common-mode and normal-mode noise. Technical specifications and photos for each product are included. The catalogs are free of charge.

Circle (144) on Rapid Facts Card

Alesis Spanish MIDI book

"Descubriendo MIDI," written by Jose Valenzuela and published by Alesis, provides an introduction to MIDI for the Spanish-speaking musician. The book details a variety of MIDI instruments and devices and covers multiple applications for the more advanced MIDI musician.

Circle (145) on Rapid Facts Card ■

Furman Sound line voltage regulator

The AR-PRO ac line voltage regulator handles 30A through a twist-lock connector. It supplies regulated ac power at each of 12 rear-panel and two front-panel outlets, and can supply a nominal 120Vac output from any input from 88V to 264V. Taps are switched only at voltage zero-crossings; the AR-PRO is not sensitive to line frequency. Other features include 21-LED bargraph meters for input voltage and input current, three status lights, spike and surge suppression and RFI filtering.

Circle (114) on Rapid Facts Card

Hill Audio Chameleon amp

The Chameleon is a single-space amp that uses high-speed bi-polar technology combined with a high-current, non-switching power supply to ensure reliable and extended power at its rated 600W/channel at 4Ω. As the amp approaches its maximum power capacity, it automatically changes to "Head Lok" mode to reduce dynamic headroom and produce greater total audio output. Other features include 5-way protection circuitry, balanced XLR and line inputs, 4-way binding post output, soft-start power on, and forced air cooling. The amp weighs 28 1/2 pounds.

Circle (122) on Rapid Facts Card

Yamaha DTR2 DAT

The DTR2 DAT recorder features four sets of I/O connections (digital I/O, optical, RCA unbalanced analog and balanced XLR). A front-panel switch selects between analog and digital inputs; another switch selects a 44.1kHz or 48kHz sampling when recording from an analog source. Start, Skip and End IDs can be written and erased; Start IDs can be automatically entered and renumbered. End-to-end spooling takes 45 seconds with a 120-minute tape. Specs include a 103dB S/N ratio, 96dB dynamic range, 100dB separation and 0.0025% THD.

Circle (106) on Rapid Facts Card

Soundcraft Spirit consoles

The Spirit console line consists of two Spirit Studio consoles for multitrack recording and three Spirit Live consoles for sound reinforcement applications. Using an in-line format, the Studio consoles are designed for recording up to 24-track. Studio consoles are available in 16×8×2 or

Hardware and Software Updates

Digital Dynamics DSP option

The DSPO is a field-installable, plug-in option for the ProDisk-464 recorder/editor. It provides internal level control of input and output signals, equalization, reverb, delay and mixing functions. A MIDI interface is provided to connect the DSPO to an external fader panel, enabling real-time level control and stereo sub-mixing. Third-party MIDI software, running on a Macintosh computer or sequencer, allows mix automation with fader recall.

Circle (127) on Rapid Facts Card

Digital Dynamics Series III software

Another update for the ProDisk-464 is the Series III operating system, which provides speed capabilities approaching those of RAM-based editors. It also incorporates suggestions for more creative operations. The Series III software will be distributed free to all ProDisk-464 system customers and will be included as standard equipment with all future shipments.

Circle (128) on Rapid Facts Card

Wohler Technologies input options

The AMP-2 and AMP-1A rack-mount stereo audio monitors may now be ordered with 10 mono or 10 stereo inputs. Input connectors for the 10-input option are European-style 25-pin terminal blocks in a horizontal or vertical configuration. CMOS analog switching facilitates remote control of the switching function. With mono inputs, two rotary switches are provided to allow routing of one of the 10 inputs to either the left or right monitor channel; stereo inputs are switched in pairs. A 4-input option in mono or stereo is also available, with the same features and functions as the 10-input option.

Circle (129) on Rapid Facts Card

Tascam noise reduction option

Dolby S noise reduction is now available on the MSR-24 24-track recorder. Designated the MSR-24/S, the recorder incorporates five active noise reduction elements, providing a single staggered band of fixed and sliding band low-frequency noise reduction; at high frequencies it has two. Retail price is $13,999.

Circle (138) on Rapid Facts Card

Tannoy PBM updates

The PBM 6.5 and PBM 8 monitors feature new cabinet architecture. The new medite cabinet reduces stored energy within the cabinet panels and adds extra strength and rigidity. It also uses radius fold edging to reduce HF diffraction. Other features include a low vertical profile for minimal sight line construction, optimum-tuned rear firing port, hard-wired pro duty crossover, gold-plated 3/4-inch-spaced 5-way binding posts, fluid-cooled polyimide HF dome and a long throw poly mid-bass transducer.

Circle (139) on Rapid Facts Card

Cutting Edge

24×8×2 configurations; the Live consoles are available in 8×3, 16×3 and 24×3 frame sizes. The consoles feature Neutrik connectors, Alps faders and Soundcraft's equalizer and mic pre-amp.

Circle (119) on Rapid Facts Card

Denecke frame counter

The Cine Sync EC-2 TC second footage frame counter provides continuous footage and frame information for 16mm and 35mm film, and time and frame information at 24FPS and 30FPS. It also puts out time code to drive remote under-screen displays such as the Denecke Dcode TC-Maxi and TC-Mix Studio Time Code Readers. List price is $1,250.

Circle (113) on Rapid Facts Card

Audix high-resolution monitors

The HRM-1 monitors are 2-way close-field monitors that feature 6½-inch polypropylene, curvilinear LF drivers with rubber surround and dust cap for low self noise. The HF polyimide dome tweeters

are matched with a 3kHz-24dB/octave composite crossover featuring hand-wound coils, soldered connections and acoustical bead mounting to eliminate coupling. A 1½-inch voice coil and vented cabinet design provide 150W power handling and a 48Hz LF response at 3dB down. A neoprene faceplate covers the entire front surface to address comb-filtering and phasing problems from cabinet diffraction.

Circle (125) on Rapid Facts Card

dbx 363X noise gates

The half-rack 363X incorporates two independent or stereo-strappable channels of gating; each channel features separate threshold and hold- and release-rate controls with Key Input, Key Engage, Key Monitor, Bypass and Stereo modes. It uses dbx VCAs that are capable of more than 100dB gain change with more than 1% linearity, rms detection for more musical responsiveness, and separate controls for the two gates and professional operating levels. It comes with hardware for rack-mounting a single 363X or the 363X and another Performer Series processor in one standard rack space. Suggested net price is $369.

Circle (117) on Rapid Facts Card

McCauley Sound 6254 loudspeaker

The 6254 18-inch, extended LF loudspeaker features a transducer that provides a power-handling capacity of 900W continuous and a frequency response of 25Hz to 1.5kHz. Interchangeable magnets can be removed by loosening three Allen head screws, which enables routine inspection or field servicing. Speaker weight is 29 pounds. Retail price is $386.

Circle (130) on Rapid Facts Card

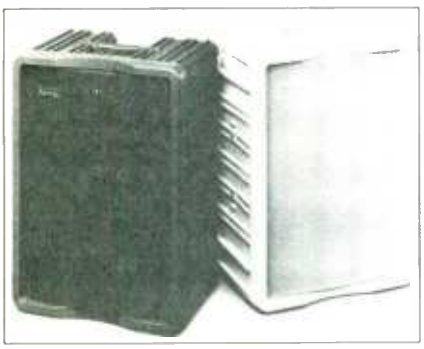
Drawmer DL241 Auto-Comp

QMI has introduced Drawmer's DL241, a dual-channel compressor/limiter with switchable automatic program-dependent compression, soft-knee/ratio, Program Adaptive Expansion, zero crossover attack, multiple LED displays and control functions, including expander/gate and peak-limiter sections. Suggested list price is $699.

Circle (133) on Rapid Facts Card

Ramsa 500 Series speaker system

The 500 Series is a modular speaker system assembled from WS-A500 mid-high frequency modules and WS-A550 LF modules. The WS-A500 is a 2-way modular system component covering the mid-high frequency range of 100Hz-20kHz. When used with the WS-A550 modular LF systems and the WS-SP2A, it delivers 30Hz-20kHz power bandwidth performance.



The modules are housed in high-pressure, injection-molded resin enclosures that are acoustically inert, and they have load-rated attachment points on all four sides for flexibility in array fabrication.

Circle (124) on Rapid Facts Card

Crown Macro-Reference amp

The Macro-Reference amplifier uses a power supply based on an advanced toroid to virtually eliminate EMI. A convection cooling system with a computerized on-demand proportional fan helps to prevent thermal overload. The amp is operable in bridged/mono or parallel/mono modes and can drive loads rated as low as 1Ω. Other features include an internal bandwidth of 3Hz-100,000Hz, ±1.5dB, a power rating of 760W/channel

Cutting Edge

at 8Ω, 0.02% THD with both channels driven, a S/N ratio of 120dB, and a LF damping figure of more than 20,000 while operating at 8Ω. Suggested retail price is $3,500.

Circle (135) on Rapid Facts Card

Fairlight MFX disk system

The MFX is a 24-track disk-based recorder for audio post-production. It provides dedicated controls for track selection and non-destructive editing functions. The MFX features integrated control for external video and audio machines, and an auto locator with looping, marked time code points and automatic punch-in/-out. A color video display shows the content of all 24 tracks in a scrolling display; each audio clip is shown on a track line. It can play up to 16 channels simultaneously for up to 44 seconds and can play an average of eight channels continuously.

Circle (112) on Rapid Facts Card

AKG C407 mini condenser mic

The C407 miniature condenser microphone features an omnidirectional capsule. The housing is 0.3 inches in diameter and a detachable tie pin and clip and a removable windscreen are included. The C407 comes with the cable terminated by a special XL-type connector containing a pre-amp/phantom power adapter; the C407/B comes with the cable terminated in a mini-plug for use with a wireless body pack or AKG B9 phantom power supply. Suggested net price for the C407 is $145; the C407/B is $100.

Circle (131) on Rapid Facts Card

Yamaha AD8X ADC

The AD8X 8-channel A/D converter features 1-bit Delta-Sigma converters with digital floating technology to provide 19-bit linear conversion resolution and THD as low as 0.018%. It offers 48kHz and 44.1kHz sample rates, with a front-panel indicator and back-panel selector. A delayed auto-reset feature automatically recalibrates the entire system after approximately 10 minutes of warm-up time. Analog inputs are electronically balanced with more than 20kΩ input impedance. Input level is from a nominal +4dBm to a maximum of +23.5dBm.

Circle (115) on Rapid Facts Card

GML Dynamic Gain Controller

The Model 8900 compressor/limiter is a 2-channel analog processor that features a "feed-forward" topology using true RMS detectors on both channels. Each channel offers separate peak amplification, selectable soft/hard knee per channel, discrete VCA and audio chain, front-panel side chain, stereo and multiple-unit control link and a 4-segment instantaneous ratio meter. It displays a 40-segment, tricolor meter with a range of −20 to +20 true gain through the unit. Accessories include a GML 9015 external power supply, which provides + and −28Vdc and + and −18Vdc.

Circle (132) on Rapid Facts Card

Sony PCM-7010 DAT

The PCM-7010 includes the RM-D7300 professional DAT edit controller. Up to two hours of 16-bit stereo digital audio can be recorded on each cassette. It is equipped with SMPTE/EBU and film time code recording using the R-time standard for electronic editing. Other features include error correction, a 90dB dynamic range, a frequency response from 20Hz to 20kHz and low wow and flutter. A fluorescent display offers a SMPTE/EBU time code readout.

Circle (116) on Rapid Facts Card

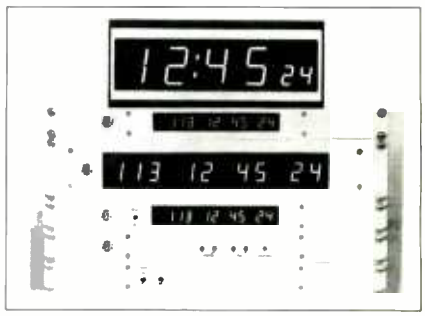
AudioControl Industrial AC-10 weighting filter

The AC-10 is a universal A and C weighting filter that requires 12V-48V phantom power. Packaged in a male-female inline-XLR tube, a 2-position slide-switch selects between the two curves. Both curves conform to the appropriate national and international standards. The AC-10 can apply an approximate speech-range bandpass function to almost any audio signal, from mic level to moderate line level. Suggested list price is $44.

Circle (136) on Rapid Facts Card

ESE time code products

Seven IRIG B time code products include a jam-syncable generator, a PC/XT/AT



reader card, an IRIG B-to-SMPTE converter, a reader/video inserter and three bi-directional, multispeed readers with 0.55-, 1- or 2-inch-high displays.

Circle (126) on Rapid Facts Card

Microtech hard drives

The Athena line of external hard-disk drives includes the A50, a 50Mbyte model and the A100, a 100Mbyte model. Both match the height of Macintosh II, IIx, IIcx/IIci/IIfx enclosures. The portable drives feature an average access time of 17ms and provide push-button SCSI address selection. The Athena drives are powered through the external floppy port available on most Macintosh models. An optional universal input power supply is available for applications where the external floppy port is being used or is not supplied on the computer. List price of the A50 is $899; the A100 is $1,549.

Circle (137) on Rapid Facts Card ■

continued from page 55

son Browne — one of Sound Image's regular tour accounts — canceled his scheduled spring tour of Europe due to the Gulf War.

K-T's Versatile Midas ... The new Midas XL3 Universal sound reinforcement console from Klark-Teknik is designed to be flexible enough for either house or stage work. It has 18 discrete sends, eight VCA masters, eight mute groups, 16 main outputs and two VCA "Grand Masters." List price is $79,950 (40-channel). Sound company Tasco (Camarillo, CA) had one out on the last Judas Priest tour.

Delicate Productions (Camarillo, CA) looks to be keeping out three-plus systems this spring season. The red-hot Jane's Addiction — touring with Delicate off and on since October 1990 — begins another five weeks starting April 22 in Philadelphia. This will be the band's first arena tour; their most recent leg ended in late February. Tracy Kunstmann will be mixing a 56-box Martin F2 main system on a Yamaha PM3000 and monitor engineer Gerry Georgettis gets a Soundcraft Series 4 ... Cocteau Twins started a month long tour in mid-March with a 24-box Martin F2 and Yamaha PM3000 FOH system with a Soundcraft Series 4 onstage. Lincoln Fong is the band's house engineer and Peter Van Der Velde continues on monitors ... The Happy Mondays are scheduled to start off their 7-week U.S. tour in late March. Delicate is supplying four Martin BSX subs and 16 Martin F2 cabinets. Consoles are: a Yamaha PM3000 in the house and a TAC Scorpion 30×12 onstage. Simon Machan is the band's house engineer.

Check out this device ... One of the most interesting new products in the signal processing field is the BSS DPR-901 dynamic equalizer. It integrates level dependent 4-band parametric equalization with dynamic compression and expansion processes. Each of the four non-interactive bands provides an adjustable amount of expansion (up to +16dB boost) or compression (down to -30dB cut) around the selected frequency and bandwidth when the input signal reaches the set threshold level; these processes can also be selected for above or below the desired threshold settings. Compression and expansion have a soft-knee dynamic characteristic at low settings and a harder characteristic at maximum setting. Attack and release times are automatically program-controlled independently for each band. List price is $1,350. ■

Trivia Quiz Answers:

1.) Eight 2.) Clair Bros. 3.) 1981 4.) Buford Jones 5.) Adamson Acoustic Design 6.) Town 7.) Oct. 4-7, New York City 8.) May 19-22, Cincinnati 9.) Electro Voice MT-4 Mansfield 10.) Baltimore 11.) 302 lbs. 12.) JBL

Continued from page 18

an audio distribution amplifier. High quality distribution amps are made by Sigma Electronic and others. Check with your local electronics distributor.

It's also a good idea to avoid mixing time code and audio signals in the same patch bay because of potential bleed problems. Because time code appears at one of the most sensitive parts of our hearing, it can easily be heard even though it's 40dB or 50dB down in level. In addition, because it's a harmonically rich square wave, it's almost guaranteed to bleed through audio grounds. This is the same reason why you want to avoid bringing it up in your console to boost level. When console makers measure crosstalk, they use sine waves instead of square waves for this very reason. It's best to have a separate patch bay for time code and sync signals.

GETTING WHAT YOU WANT

Myth: Do not specify any transfer requirements to the video house. It makes life much more interesting and eliminates the disappointment of always having it done the wrong way. Besides, you can charge your clients extra money for the time you spend fixing all of the problems for them.

Fact: Although this may be true, faxing a transfer requirements sheet in advance can solve problems before they occur and save you and your clients many gray hairs.

THE PROMISE

Myth: Time code ensures a perfect lock without drift. As long as you have time code on all of your tapes you are guaranteed frame accuracy.

Fact: Unfortunately, there are no guarantees. If you don't always maintain the relationship of your audio with time code, your program may drift out-of-sync over a period of time. The longer the show, the more the drift. As long as the audio and time code relationship is never broken, the actual frame rates you use do not make any difference except that the actual pitch could change up or down a tenth of a percent during the process.

I would like to give special thanks to Jeff Evans at AID and Eric Wenocur at KLM Video for their valuable input into this column. Time code is not an exact science, and I was surprised to find the differences in opinions about certain aspects of synchronization. If we keep on asking the right questions, we will all become time code masters. ■

Continued from page 46

STACKS AND RACKS

In similar fashion, a touring show that would use a certain type of manufactured speaker system in the U.S. or England (EAW KF-850s, JBL Concert Series, Meyer MSL-3s, or Turbosound TMS-3s, for example) would like to rely heavily on suppliers on different continents to assemble and provide the same speaker system that the show normally uses. The rental of "stacks and racks" is good business for some firms linked up with this type of owner/user network.

"When a touring artist is used to a certain speaker system, they want to see that same rig even if they move from Europe to America to Japan," says Ken Berger, president of Eastern Acoustic Works. "Most can't ship the same system everywhere. It is prohibitive both for reasons of overall cost and time scheduling. This is a big boost for companies in other countries that stock a large enough inventory of compatible, desirable boxes. We are seeing a boost in our export business, with major systems continuing to be shipped outside of the United States, particularly to Japan and England."

Some companies that specialize in renting only console "board groups" or customized stage monitor systems find a ready market for their services; bands are often ready and willing to carry such specialized sound items along with their band gear, when the budget permits. Even if the whole sound system can't come along for the ride, at least *something* will be provided for consistency.

Sound companies interested in participating in worldwide touring ventures are hard at work down-sizing their hardware packages, attempting to take the hard-won proprietary sound reinforcement technology and modify it so as to take up the fewest number of cargo containers. Today's typical stadium-sized sound system for rock festivals may weigh in at more than 50 tons, and fill four or five of the largest truck-sized sea cargo containers. It's obvious that such a system won't be scheduled for international shipment in a frivolous or unconsidered manner, whether to service one specific tour, or to establish a new European, Asian or Australian operation. ■

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At $1595,* Kurzweil™ sounds better than ever.

You know it's those uniquely pure, impeccable Kurzweil soundfiles that make Kurzweil instruments great. But did you know you can now get those distinctive sounds with the Kurzweil Pro I rackmount module for less than you ever dreamed possible?

That's right. 162 of the most authentic acoustic instrument samples and sizzling synth timbres for less than ten dollars apiece. And, the Pro I's modular editing capability offers unparalleled flexibility. Each of four timbres can be processed, modulated and combined for lush, creative and musically-satisfying programs.

Now don't think this is some "close-out-clearance" product. Quite the contrary. The Pro I is a newly-engineered rackmount version of the very popular Kurzweil K1200. It delivers all the features you'd expect from a professional synth, including 16-channel multi-timbral operation and dynamic voice allocation. And the Pro I is extremely easy to program.

So hurry to your favorite Kurzweil dealer and add the Pro I to your setup today. At $1595, we just eliminated your last reason not to have Kurzweil sounds yourself.

Pro I Features
24-voice polyphony, 16-channel multi-timbral, 162 acoustic, electric and synthesizer sounds which can be arranged in 10 programmable lists with up to 100 entries each. Extended Program changes allow up to 1000 program changes over MIDI. Auto demo highlights the Pro I's sounds and multi-timbral capabilities.

Sound Memory
6 Mbytes sound ROM. Acoustic Pianos, Electric Pianos, Acoustic Guitars, Acoustic Basses, Electric Basses, Electric Guitars, Drum Kits, Percussion Batteries, Synth Clavs, Percussive Synths, Lead Synths, Synth Bells, Synth Brass, Trumpets, Tenor Saxes, Synth Strings, Orchestral Strings, Pop Strings, Harps, Marimbas, Vibes, Choirs, Woodwinds, Organs, Synth Pads, Effects.

Setup Memory
24 Kbyte setup RAM for battery-backed storage of user programs, performance setups and maps.

KURZWEIL
Music Systems

*Manufacturer's suggested retail price. Specifications subject to change without notice. ©1991 Young Chang America, Inc., 13336 Alondra Boulevard, Cerritos, CA 90701, 213/926-3200

Circle (2) on Rapid Facts Card

Small Monitor. Big Difference.

In the recording business, little things can often make big differences. Studio monitors, highly sophisticated critical listening devices, are certainly no exception. Our Control Series™ compact personal monitoring systems each provide the performance characteristics demanded in today's recording environments.

Take our Control 5™ for example. You get power handling capacity of 175 watts, outstanding dynamic range, smooth frequency response and excellent clarity and imaging. This high power, low distortion system is housed in a non-resonant polypropylene structural foam enclosure.

Today you can find Control 1's in home studios and midi workstations; Control 5's in major recording and teleproduction facilities; Control 10's in foreground and background systems, corporate boardrooms and teleconferencing facilities. And the two-way horn loaded Control 12SR, a logical extension of the technology, in sound reinforcement applications from supper clubs and discotheques to small tour sound systems. Control Series meets such diverse applications because they are, above all else, powerfully honest.

Control Series. Compact high performance monitors designed to meet a broad range of fixed and mobile applications.

Versatility, the Other Advantage.

Designed to accommodate a wide variety of specialized mounting brackets, Control Series monitors can go virtually anywhere. On the console, on the wall, on the ceiling, in a rack, on a tripod, keyboard or mic stand. Control 10's and 12SR's even come with a built-in handle so they travel like a seasoned professional.

Next time you're looking for a super compact high performance loudspeaker system, remember Control Series then go see your JBL dealer. Look at the specs, then listen to the big difference.

JBL

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