

January 1990

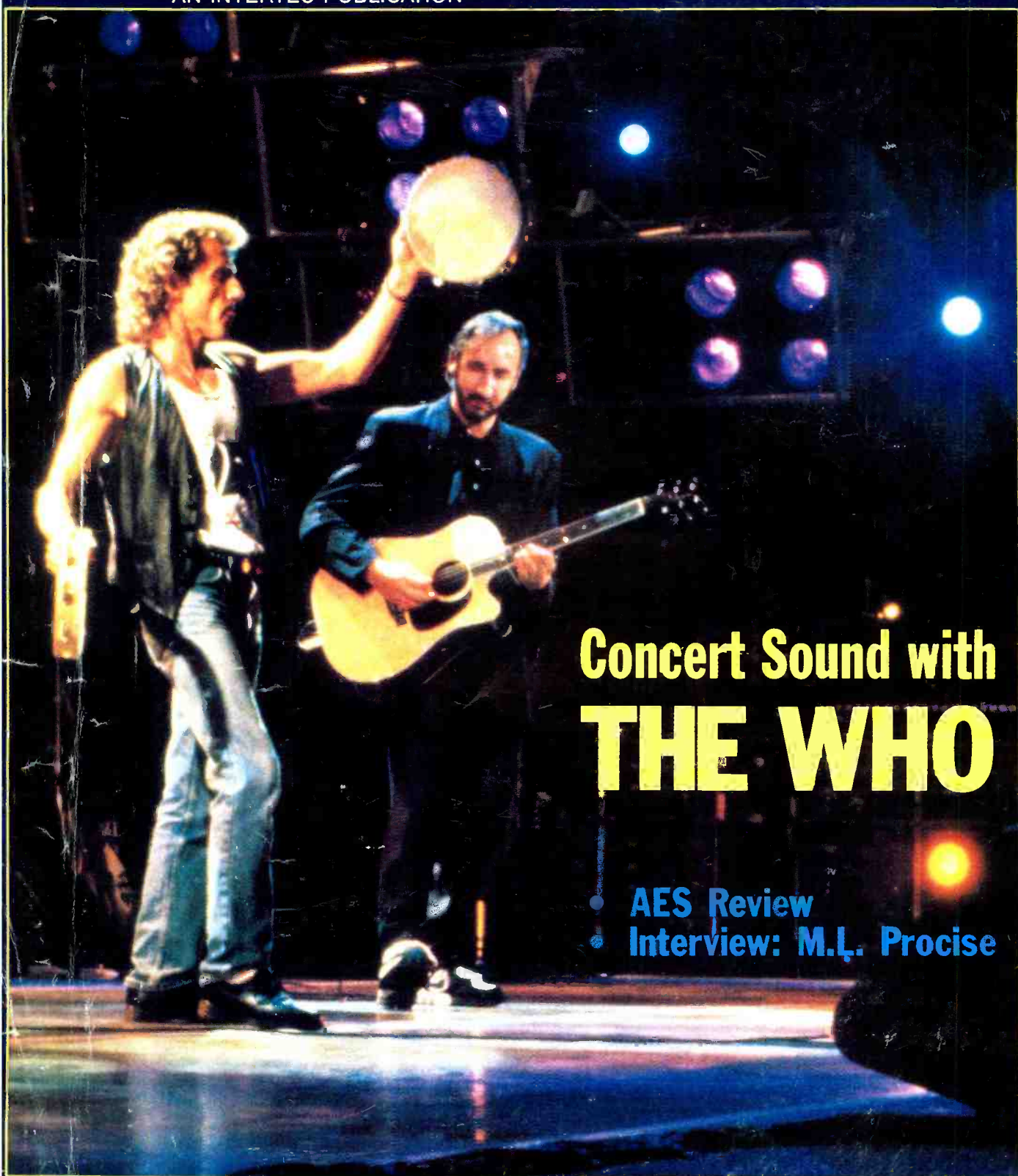
Recording

ENGINEER/PRODUCER

The Applications Magazine for Audio Professionals

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AN INTERTEC PUBLICATION



Concert Sound with **THE WHO**

- AES Review
- Interview: M.L. Procise

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Painless Decibels

Well, almost painless. Is 12dB 11 times as powerful as 2dB, or only six times as much? With a little knowledge, such calculations will become second nature.

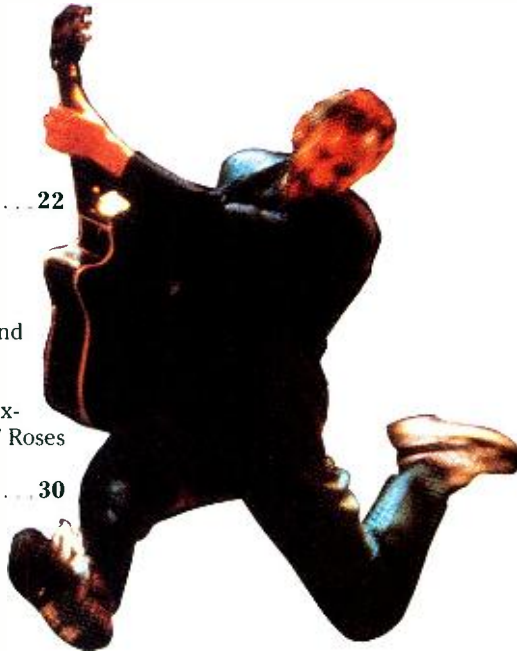
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AES Product Review

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The Clair Bros. stadium concert system for last year's Who tour was praised for its high quality. Photo by Karen Kelly-Beith.

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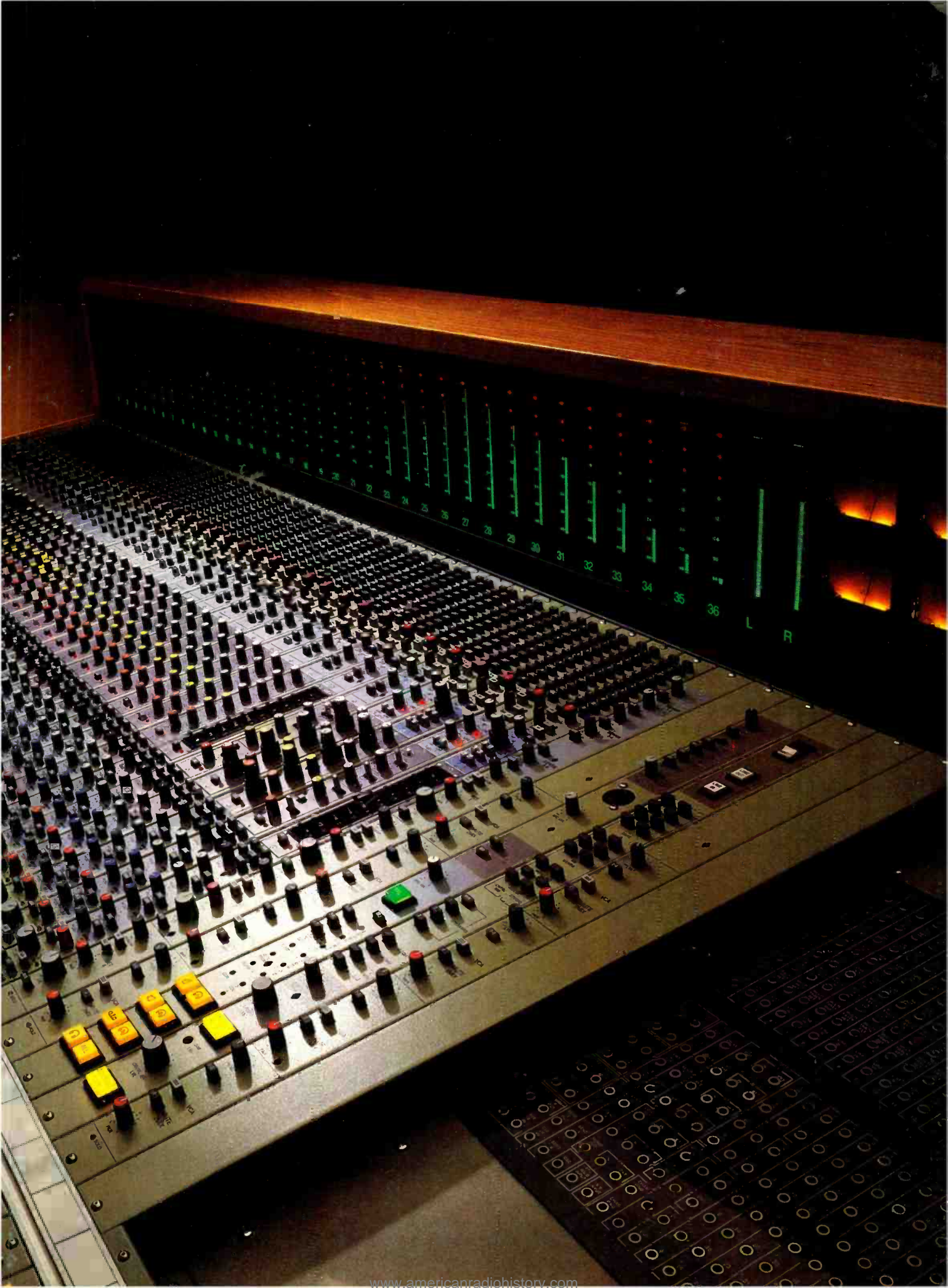
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FROM THE TOP

Welcome to the '90s

Zeitgeist: Never before has so much action been occurring on so many fronts simultaneously—technological, social, geological, cultural.

Structures are toppling. Hackers in back labs are pounding away at networked terminals, feverishly crunching code that forces conflicting protocols to converge and coexist: MIDI/SMPTE, AES/EBU, PAL/SEC-AM/NTSC, HDTV/NTSC, DOS/Mac, DASH/PD, 44.1kHz/48kHz.

As soon as a new medium appears, its application potential scatters and realigns: audio/video/digi data on linear helical scan, on stationary head, magnetic tape (2-inch, 1-inch, ¾-inch, ½-inch, ¼-inch, 8mm, cassette), on CD-I, CD-ROM, CD-V, CD anything, sectored hard disk, optical, WORM, M-WORM, megneto-optical read/write.

We ask ourselves: Why not jump to the inevitable and throw all our efforts into the laser-scanned 5cm square lucite cube, one that holomorphically contains 45 minutes of color video, 30 hours of stereo full bandwidth audio or 1,000 encyclopedias? Whispered hints suggest prototypes already exist. Yes, but can they overdub?

These are technically treacherous times. Interesting yet difficult-to-interpret trends are cresting before our eyes every moment. We're talking about more than just multiple conflicting, non-compatible formats. The leveraged buyout has entered into our cottage industry as big players buy up little players. For some, it's a hedge against new technology; for others it's a financial gambit against tax liabilities.

Everybody's doing it. Japanese giants. American holding companies. European consortiums. Home-grown progenitors. Tape deck manufacturers with huge installed user-bases and mega-dollar investments in R&D are co-aligning with tiny, high-tech, disk-based startups, covering against the techno-squall which will scoop us all along. *So you want 96 tracks of 48kHz clocked digital audio (an hour's worth will be fine, thanks!), full DSP and digital editing/mixing capabilities, synced color video cue track integral, on a disk based random instant access system? That'll be \$25,000 U.S., please, computer included.*

What happens to all of those 2-inch multis? What happens to our industry when

desktop fidelity, if you will, truly surpasses today's multiple stand-alone, high-priced-component production facilities? Do we swing with it? Do we bug out and start selling life insurance? How do we grapple with this project studio issue? Do we recognize it as only the first wave (second, if you count the Tascam/Fostex home studio promise begun almost two decades ago)? Is this a precursor to an all-pervasive convergent desktop audio/video/computer/publishing media world in five, maybe eight years?

It clearly won't go away, legislation or interest groups notwithstanding. Let's bring it into the open and discuss it. As many correctly identify, this is a stellar opportunity for next-wave success by those manufacturers, facilities and individuals that poise themselves effectively. What say you, fellow professionals? How creative and far-sighted are we, really?

On a different note, this issue begins my tenure as technical editor of RE/P. Those in the business who know me recognize a background in studio production, live mixing, field recording, system design, marketing and journalism. Along with editor Dan Torchia, well-known in these pages for his journalistic skill and studio savvy, we'll be addressing the movements and trends that concern professional audio production today, whether it's recording in-studio or out, audio post for video, sound reinforcement, or computer control and interface—the whole nexus.

RE/P will grow and evolve to reflect the changes we are experiencing in our careers, with our technical tools and throughout our professional activities. We will look to equipment technology and scientific development as beacons. We will seek out users and manufacturers for guidance and information, readers for response and course-correction. We will instantiate all that we learn, translating, when necessary, the information crucial to your success during this highly transitory period.

This is, after all, a new decade and Year Two of the second hundred years of audio. We vow to present these important particulars in as useful and applicable a manner as we know how. We hope the excitement we feel right now about our industry shines through brightly.

It's 1990. Welcome to tomorrow. We have seen the future, and it is us.

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Recording Engineer/Producer 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.

Porter

The Great Pretenders

My five-year-old son has a wonderful time fantasizing about being a policeman or a fireman. He loves the paraphernalia associated with those professions. We have helmets, handcuffs, badges and toy fire trucks everywhere.

My childhood dream was to play for the Yankees. I idolized Mickey Mantle and Whitey Ford. I continued with my dream well into high school right up to the time the orthopedic surgeon took out all the cartilage from my right elbow. Until then, I seriously thought I had a chance to realize that dream.

Audio has its dreamers too. Many are musicians, composers and would-be engineers. They read audio magazines and attend AES shows. Most suffer from what I call LED fever, an uncontrollable urge to own equipment that depreciates like a rock. And they dream. I've been afflicted with this disease for nearly 20 years and have enjoyed myself immensely.

There is one catch. At some point you have to make a living. It's time to grow up. Just making the lease payment on the console isn't enough. The five-year-old wants the *big* Tonka fire truck. It is time to get real or get out.

In order to excel at any skilled profession, you have to study that craft and hone those skills over a long period of time. Somehow, audio pretenders have been led to believe that if you buy the right stuff you will have the right stuff to be successful. This is not necessarily true.

Anyone can buy equipment, and as witnessed by the 10,000-plus studios in this country, you would think there was fantastic demand for studio time in this country. This is also untrue.

There is a surplus of mediocre studio time available in this country. Not because the equipment isn't good, but because the operators have not done their homework.

David Porter is president of Music Annex, San Francisco, and the current president of SPARS.

Because the only qualification to enter this business is the dream and the money, the talent pool, full of pretenders, lags far behind the mass of hardware sold into the market.

In this arena, populated by dreamers with more money than skill, the ultimate loser is the client. Why? Because out of the 10,000-plus mediocre studios operated by the 10,000-plus mediocre engineers comes a huge volume of equally bland work. Many pretenders are not motivated by making a profit—only in being part of what they feel is an attractive, creative profession.

Just making the lease payment on the console isn't enough.

In addition, our clients have a prevailing attitude toward the creative professions: Because there is some hint of glamour attached to our work, we should perform our services for free. After all, you "play" music, and if you're in the recording business, you're in it for the fun and the art, right? This attitude, coupled with pretenders giving away their time, further dilutes the value of what we do. It makes it extremely difficult for true professionalism to be properly rewarded.

Shame on us audio professionals. We aided in all this by remaining silent while the hardware manufacturers promoted generic, simulated, synthetic sound. Why? Because it was easy, had a ready market of pretenders, required no particular skill, no special environment (such as a studio), and it was cheap. Just like McDonalds. We didn't sell quality hard enough; mediocrity slipped in the door.

We were also sold on the idea of the artist-operated studio. The premise was that if it were made easy for composers to make these generic sounds in their own environments, then it would stimulate their creativity and free them from the stigma that money and traditional recording environments placed on them. The problem with that theory is that the composers are then working with only a limited bag of tricks. They are limited to the generic bag only.

What's missing is the skill of a trained and accomplished audio engineer with a

full pallet of available sounds and tools. But wait a minute, that costs money and comes with all that excess baggage of the big studio: maintenance, staff, all that "facilities" stuff.

Enter the concept of the Mothership studio, supporting all the artist-owned creative satellite studios in some sort of grand cooperative. That was OK in theory, but the artists and producers who built the satellites got LED fever, too. Many were sold on the idea of building bigger (here's that f-word again) facilities. In order to offset the cost of these overgrown artist studios, the artist/producer began to sell time to others, going into direct competition with the Motherships. The Motherships were accused of being greedy dinosaurs.

There is some truth to the argument, but as the artist-owned facilities grew, the more they started to resemble the very dinosaurs they displaced. What got lost in the shuffle was craftsmanship. The elements the traditional facilities brought to the party were audio craftsmanship and the tools of the trade. I'm sorry to say it is missing from the current crop of generic Burger King Pretender studios.

Why? Because it is expensive. No one wants to pay for skill in audio. Remember, the clients think we do it for fun and art. Why should they pay a real rate for professional audio services when "anybody" can operate the generic equipment?

It's fun and easy, right? Yes, if you are willing to accept a limited synthetic pallet with which to work. We need to utilize every creative tool in the arsenal to maintain our creative edge. Music and sound need character. Much of that character stands to be lost if we continue to place audio craftsman on the endangered species list.

We must educate and convince our clients of the value of craftsmanship and skill in our industry. This not a plea for dinosaur preservation. However, it is an attempt to save valuable elements of our craft and recording culture from the ravages of mediocrity.

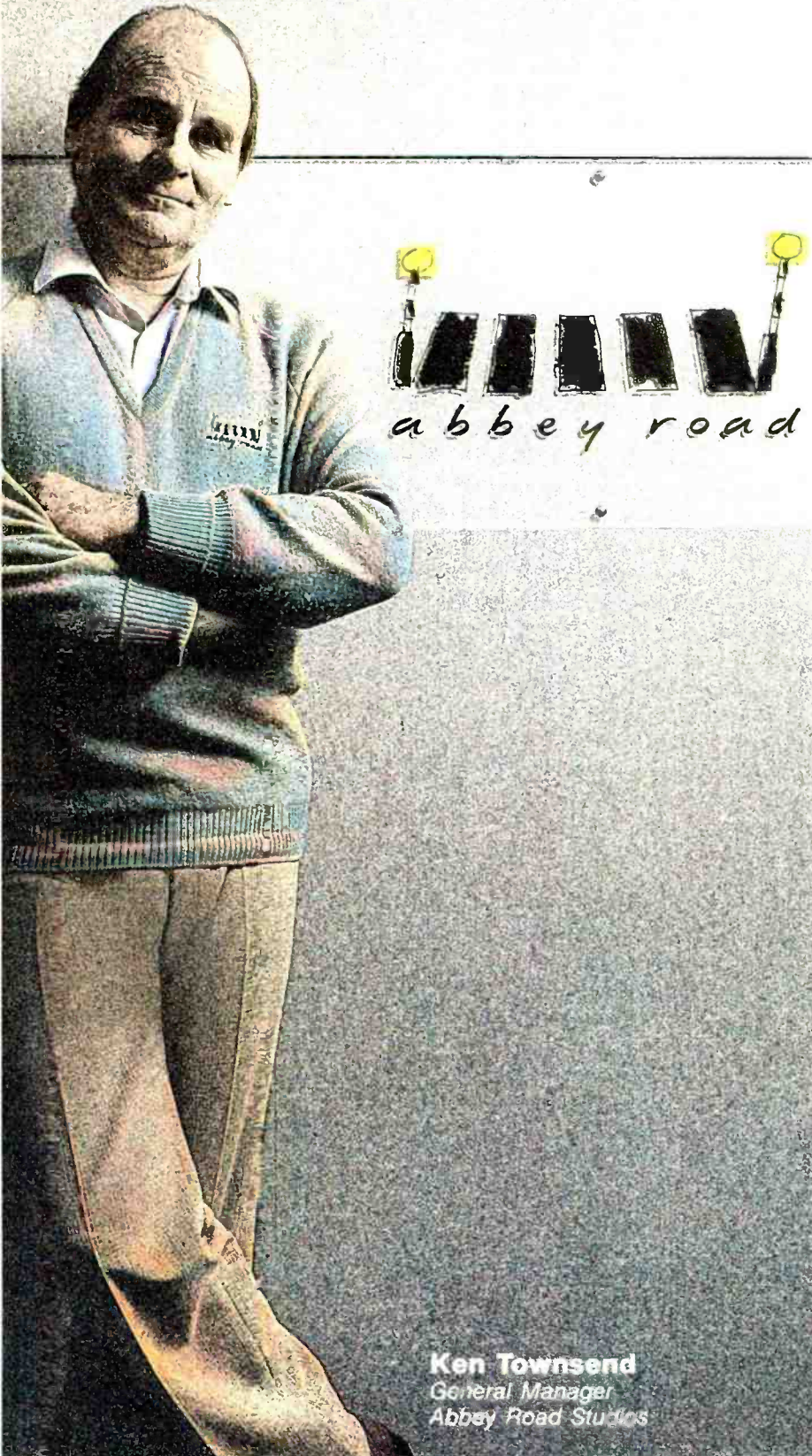
It is also a wake-up call for the pretenders who have blindly consumed hardware, worked for free, and perpetuated the myth that easy access to technology is more important than the quality of the work.

RE/P

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LETTERS

Home studios

From Paul A. Bassett, Surfside, CA.

In regard to the September 1989 editorial on home studios: Whatever you do in your own home is your own business, provided it remains your own business. Once you solicit outside business, you must follow the rules of everyone's business. Which means you must get permission from the city to operate as a business, pay taxes, have the requisite services, etc, etc.

Also, one must think of the community where one lives. To have a business conducted in a community zoned for residences, like operating a recording studio in one's home, places a burden on the community where the peace and serenity are jeopardized. Such tranquility is burdened by additional traffic such as cartage trucks and artists' and production personnel cars. Parking becomes heavily concentrated around this home and affects the security of neighbors. More traffic on the street where the home studio resides affects the safety of children that use the streets as playgrounds.

The laws are quite fair. Businesses are in areas zoned for business. Homes are in areas zoned for residences. I don't think anyone wants to lose their home for the sake of a business. If you do, you will have nothing to go home to.

Pay now, pay later

From Hartley D. Peavey, president of Peavey Electronics Corporation, Meridian, MS.

I read the "Pay now, pay later" editorial in the Oct. 1989 issue. . . Right on! However, I'm terribly afraid that much of the focus of the audio business has been distorted by the numerous trade shows both here in the United States and abroad.

Most people in the audio business seem to forget (except those who pay the bills/display) that trade shows are an extremely expensive affair for all concerned. Perhaps the most costly aspect, in terms of human misery, dissatisfaction and general ill-will among the audio fraternity, is the intense pressure brought about by having to have new products at all these trade shows. This causes many companies to display what has been dubbed "vapor-ware." It is very difficult to display several sets of new gear at the various trade shows around the world. By show-

ing products before they are *really ready*, it hurts everyone. Additionally, audio dealers find that their merchandise in stock is obsolete before its time.

Certainly, there is nothing wrong with progress. We at Peavey always support progress, but there is something very wrong with a set of false deadlines imposed by simply having too many trade shows. I suspect this is a tendency that has gotten out of control with many of the associations that have effectively become "exhibition companies." While these people claim to be not-for-profit corporations, their primary source of income is trade shows. Also, I suspect that having too many trade shows only benefits those people who run the exhibitions and not the buying public, the pro audio dealers and/or installers, and the manufacturers. Too many shows is a losing situation, except for those entrepreneurial souls who run the shows and seem to have us all madly dashing nowhere on their "trade show treadmill."

The October editorial was most timely, and we concur wholeheartedly. To emphasize our feelings about this, Peavey will *not* be exhibiting at the summer NAMM show in 1990.

1989 AES Convention

From Bob Fugett, Sugar Loaf, NY.

I have to let you know about a great experience I had during the 1989 AES Convention at the New York Hilton.

It was toward the end of the first day of the show, and I was pretty exhausted from the usual. Among the usual were some rather ugly instances of sales hype, including a top speaker manufacturer's salesperson trying to convince me that *loud* equals *good sound*, and *very loud* equals *very good sound*.

However, there was plenty of real innovation and good help to keep me interested, and then the happy kicker...

As I was about to leave, a great thing happened. My engineer and I had been asking everyone about a certain problem we were having, and at one point we were referred to Bill Thompson at Ashly Audio.

At the Ashly booth, Thompson gave me 30 of the most informative minutes of my life. He not only answered my questions but added much more on his own. He gave me his card, saying that if I needed to know anything else, just to call him.

Thompson didn't know me from a hole in the wall, and it was obvious from the be-

ginning that I wasn't ready to buy anything; I was just picking his brains. He helped anyway and did a lot more than just "yes" me into the next booth. I can't stress enough how far he went out of his way to make me feel comfortable and to answer my questions. I would bet this sort of kindly flow of information has to be at the core of what the AES show is all about.

I am proud to be a part of a business community that can boast examples of such professionalism and would like to thank Bill Thompson and Ashly Audio again.

The Marriage of SMPTE and MIDI

From Kenneth E. Mullenix, Fort Lauderdale, FL.

I have come to expect ignorant newspaper writers to refer to someone "filming" something with their VCR, but to read in a respectful engineering journal that an author believes that SMPTE time code is an analog signal is quite a shock.

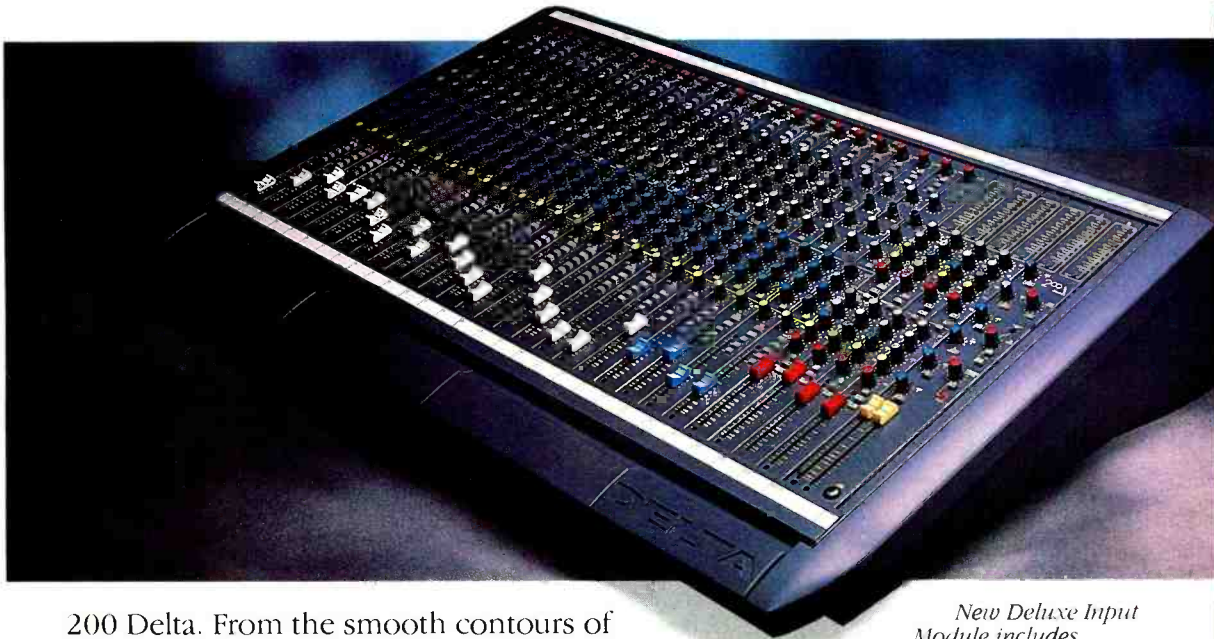
"The Marriage of SMPTE and MIDI" (Sept. 1989) would have been an excellent article had the author, Jeff Burger, bothered to glance at the specifications and recommended practices regarding SMPTE time code.

The errors and misconceptions put forth by Mr. Burger seem to be quite common in those areas of our industry not directly involved in film or video production and post production; but that does not make them correct.

The Society of Motion Picture and Television Engineers is an engineering society which actively establishes and promotes engineering standards and recommended practices. Some of these pertain to the time code standards. According to these specifications and recommended practices:

- SMPTE time code is a digital (not analog!) signal consisting of 80 digital bits (112 bits in Type B), serially recorded per each film or video frame, either as a longitudinal track, or as a horizontal line within the vertical retrace interval within a video signal.
- The Data Stream contains 32 user bits (for scene/take numbers or other info), 16 sync bits, 31 address bits (hours: minutes: seconds: frames) and an unassigned 0 bit.
- There is no provision for identification of partial frames (29.97?). The four time code rates are: 24fps, standard sound film rate; 25fps, standard European film & TV rate; 30fps, non-drop frame, 30 frames every second; and 30fps, drop frame, which periodi-

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200 Delta. Engineered for those who hunger for perfection.

New Deluxe Input Module includes expanded 4-band EQ with two mid sweeps, high pass filter and post-fader direct output. The rackmount Delta, shown below in a 12x2 version using Deluxe Inputs, can be expanded to 24x2 using Dual Line Inputs. Both the streamlined consoles and rackmount models are built to withstand the demands of recording and sound reinforcement.



Soundcraft



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LETTERS

cally drops frame numbers 0 and 1 from the count to maintain time accuracy with NTSC color video signal standards.

Referring to drop frame code as 29.97fps is semi-accurate since that is the net result, but an understanding of exactly what this most common code is (in the United States) demonstrates what the biggest problem is when converting SMPTE time code to MIDI Time Code. The MIDI must be smart enough to also drop those frames.

The drop frame is defined as: "compensated mode (30-frame code only). To resolve the color time error, the first two frame numbers (0,1) at the start of each minute, except 0, 10, 20, 30, 40 and 50, shall be omitted from the count. When this mode is used, bit number 10 (34) of each address shall be '1' as specified in 3.4." (SMPTE RP136-1986, 4.2.2)

I strongly recommend that any authors contemplating writing on this subject first secure copies of the relevant standards and recommended practices from SMPTE.

Jeff Burger replies:

SMPTE is most assuredly a digital signal. However, my reference to converting "analog" SMPTE signals was meant to describe SMPTE's form on a traditional analog tape deck. SMPTE's inherent digital information is encoded on analog tape as a fluctuation between 2,400Hz and 4,800Hz. A 2,400Hz pulse represents a digital 0; a 4,800Hz pulse represents a digital 1.

Further, most SMPTE/MIDI converters only have analog time code inputs and outputs, because they are mainly used in conjunction with tape. Forgive the omission of this qualifier in an article which was intended as a focus on the convergence of SMPTE and MIDI, rather than a dissertation on SMPTE.

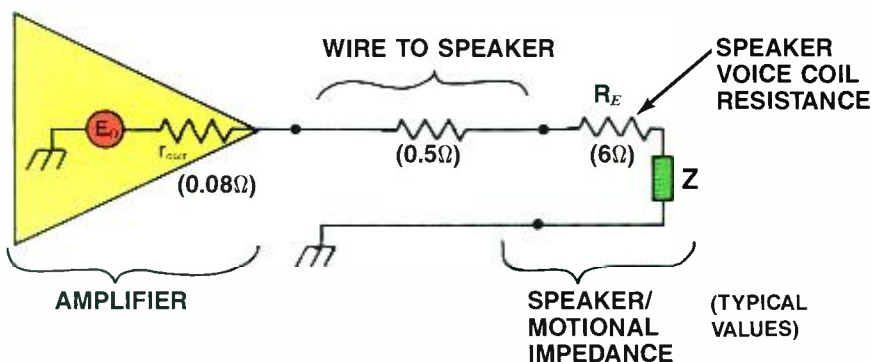
Because I can't seem to find any part of my article that vaguely encroached upon Mr. Mullenix's second point, I'll conclude by agreeing with his third point about the terminology of 30fps drop-frame. This occurred during the editing process. Editorial deadline pressures are formidable, and I'm certain the reference to drop frame as 29.97 was inadvertent and, as the letter points out, not totally inaccurate.

If there are any further questions as to whether I fall into the category of "ignorant newspaper writers" or not on these subjects, my book "The 1989 Murphy's Law MIDI/SMPTE Book" (and other writings) corroborates my complete concurrence with Mr. Mullenix on all of his points.

Damping factor: a factor?

From: D.R. Schaller, P.E., Madison, WI.

The article "Using Power Amplifiers in the Real World" in the May issue very properly mentions that damping factor is "a poorly understood element in amplifier interfacing." Unfortunately, some of the remainder of the article underscores the point, because the (predominant) effect of loudspeaker voice coil resistance on the damping factor is not even mentioned. (See first-order equivalent circuit below.)



Amplifier impedance and resistance of wire to the speaker are usually unimportant to the effect of the speaker's own voice coil resistance, which appears in series with both of the previously mentioned parameters.

Even the popular audio journals have taken notice of this elementary circuit theory and stopped publishing the sort of hoary old fiction implicit in the use of amplifier impedance to "determine" damping factor. Surely RE/P can do at least as well.

John Monforte replies:

I have no disagreement with Mr. Schaller's basic premise. As I stated, "Damping factor has little to do with how the amplifier will perform in real world situations." However, because my article was intended to point out how installations can affect performance of amplifiers, this angle was left unpursued because a user has no control over a loudspeaker's voice coil resistance.

My explanation of the *specification* of damping factor is still valid. A resistance of 8Ω is the common reference point for measurement. Additionally, I warned that real loads are not 8Ω and are not even

resistive. There are a couple of other points that I did not bring up for space reasons but, in retrospect, deserved attention.

Long lengths of wire are also inductive, which raises its impedance as the frequency gets higher and the output impedance of an amplifier also exhibits rising impedance with frequency. Moving coil loudspeakers are also inductive, so the net effect is not very noticeable, but electrostatic loudspeakers are capacitive. Both frequency response changes and damping in the higher frequency ranges become affected more severely in such a load.

Another point is that the presence of

transformers or crossover networks render the amplifier/wire impedance even more negligible, as they further degrade driver control and sonic quality through the addition of even more series resistance.

The specification ignores all this. But that is the nature of specifications—they need to be simplistic in order to be easily reproducible. The reader should also note that the frequency response changes shown in Figure 2 were calculated with the voice coil resistance as a factor. If I were to have ignored this, the alterations would have been radically larger.

It is erroneous to assume that amplifier/wire impedance is of no importance. It is common in a professional environment to parallel loudspeaker bins and have long cable runs. Both of these factors conspire to degrade loudspeaker damping to a point where wiring can be a significant factor. The loss of woofer control and change of frequency response are inarguably audible.

RE/P

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SPARS elects 1989-90 officers

The Society of Professional Audio Recording Services (SPARS) elected David Porter as its 1989-90 president during the AES convention in New York.

Porter is the founder and president of Music Annex, San Francisco. He has been on the Board of Governors of the San Francisco NARAS chapter, president of the San Francisco ITS chapter, and an active member of AES and SPARS.

Showco's \$140 million fraud, conspiracy suit

Jack Calmes, who co-founded Showco in 1966, has filed a \$140 million lawsuit against his former partners in the company, charging them with fraud and conspiracy in the sale of his Showco stock.

Calmes, now the president of Syncrolite Systems, claims that two of his former partners, H.R. "Rusty" Brutsche and John D. Maxson, deliberately prevented Calmes from finding out about a computer-controlled lighting system that had been filed for patenting less than six months after he had sold his 31.25% of the outstanding stock. Calmes had been "expelled" as president of Showco, for reasons not made known to him, in March 1980. The now patented system (Vari-Lite) reportedly brings in the majority of the company's annual sales.

According to Syncrolite, Showco's own documents show that the new technology was being developed at the time Calmes was a director and major shareholder of the company, prior to his stock sale.

Calmes suit, which sites five counts of fraud, conspiracy and negligent misrepresentation, seeks actual and special damages in excess of \$54 million, plus \$50 million in exemplary damages and a 31.25% share in all the royalties and profits of Vari-Lite and Showco.

News notes

Sony Professional Audio has engaged in discussions with GML to offer the GML Moving Fader Automation System as a high-end option on Sony's line of MXP-3000 series consoles.

JBL Professional is offering a new product leasing program which will allow musicians, businesses and other end-users to lease JBL products at 100% financing and very competitive interest rates. The pro-

gram includes speakers, systems, components, JBL/UREI signal processing equipment, and Soundcraft and SECK mixing consoles.

The **Audio Engineer Society (AES)** has reported that 262 companies exhibited and 14,359 persons attended its 1989 convention held in New York, Oct. 19-22. During the four days, 12 technical sessions presented 85 technical papers, and 13 workshops were held.

The **Society of Motion Picture and Television Engineers (SMPTE)** has formed a President's Task Force on SMPTE standards policy, which will consider present policies and procedures relative to all of its standardization activities, and all of those activities as they affect the society's relationships with other organizations and standards bodies.

The task force includes Chairperson Stan Baron, SMPTE engineering vice-president; John Baptista, SMPTE engineering director, motion pictures; Si Becker, SMPTE director of engineering; Ken Davies, SMPTE engineering director, television; Carlos Kennedy, SMPTE past president; Robert Smith, SMPTE former president; Richard Streeter, SMPTE past engineering vice-president; and Roland Zavada, SMPTE former engineering vice-president.

Digidesign and **Otari** are planning to jointly develop a high-end professional hard disk recording system. The new product is scheduled to be available through Otari later this year.

The newly formed **nac Westrex Inc.**, created when the Westrex assets were purchased from Digital Entertainment Corp., is assuming responsibility for manufacturing, engineering, world-wide technical services and sales of all Westrex products. The company will be managed by Jack Leahy, president, and Frank Pontius, manager of sales and marketing.

WaveFrame Corporation has named Martin Audio as its representative for New York state, including the New York City metropolitan area.

Orban Professional Products has appointed William J. Ray & Associates as representative for the southeastern states (North Carolina, South Carolina, Georgia, Mississippi and Tennessee), and AMH Sales

as representative in the Rocky Mountain territory (eastern Montana, North Dakota, South Dakota, Colorado and New Mexico).

During the AES show in New York, **SIGMET Corporation**, Orban's independent representative in the middle Atlantic states, was named Representative of the Year—1988/89.

Ampex Magnetic Tape Division celebrated its 30th anniversary in November 1989.

Intelligent Music recently opened a sales and marketing office at the Center for Electronic Music (CEM), 432 Park Ave., S., Manhattan, NY. The office will be directed by Benjamin Austin, director of sales and marketing.

DDA and **Alpha Audio** have integrated the BOSS/2 automated audio editor and the DDA DCM232 production console into a powerful audio post-production system.

QSC Audio Products reported that its fiscal 1989 sales and profits were up for the seventh consecutive year. Sales for the year represented a 23% increase.

The newly formed **C-Level Distribution Group**, Torrance, CA, has been awarded exclusive distribution rights for Aries consoles. Aries previously was distributed by Aries America.

Shure HTS' Stereosurround production process, an outgrowth of motion picture surround sound technology specifically refined for music, home video and broadcast applications, was selected by CBS-TV for the broadcast of the 1990 Super Bowl XXIV. It is also being used in the broadcasting of Saturday Night Live's 1989-90 season.

Digital House has opened a sales and service center at 101 W. 57th St., New York, NY 10019; 212-333-5950; fax 212-262-5631.

People

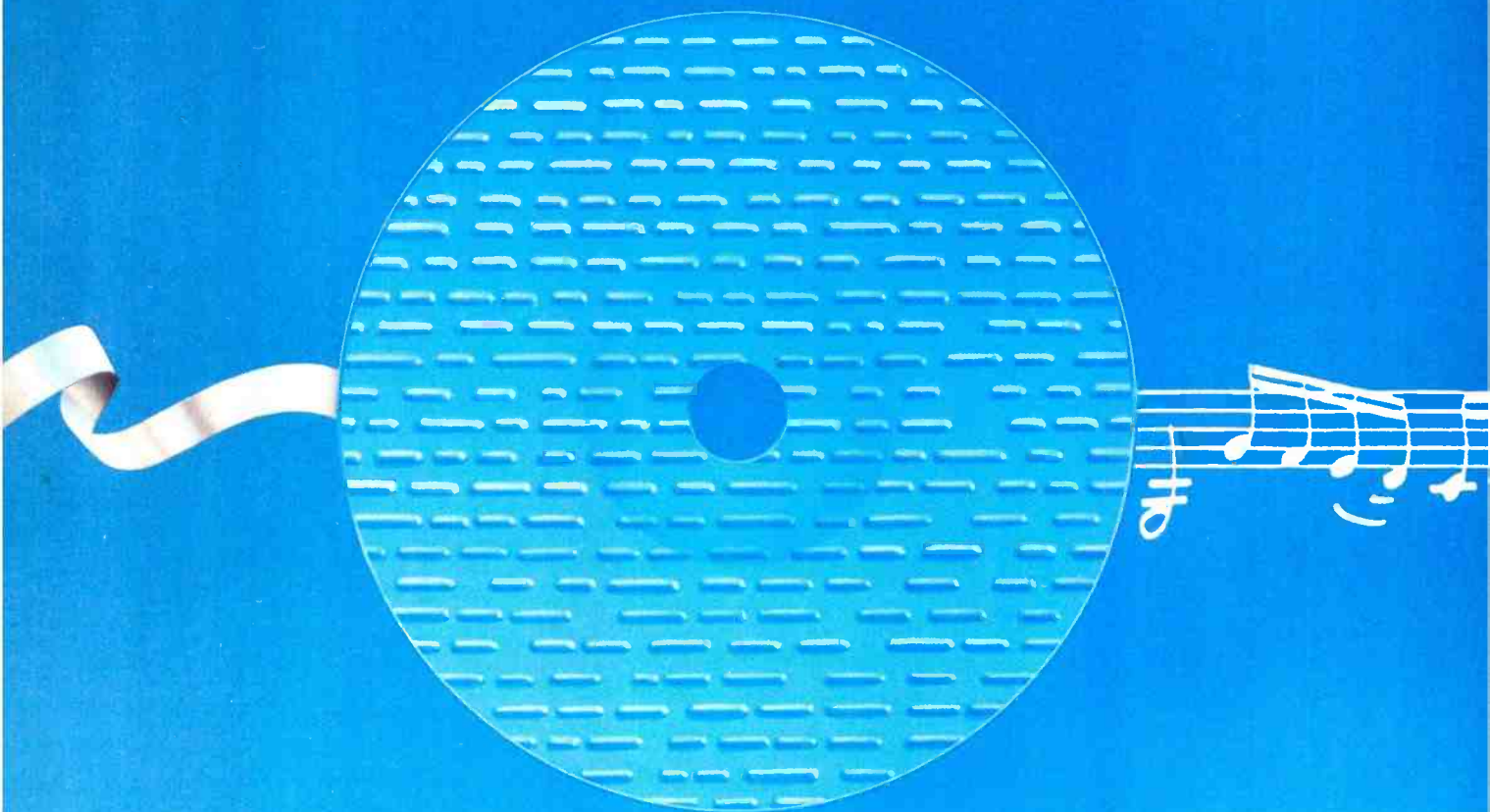
Digital Audio Research has appointed **Bob McNabb** its U.S. regional manager.

Cal Perkins has joined JBL Professional as a product research specialist.

continued on page 73

PDO CD REPLICATION

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MANAGING MIDI

By Paul D. Lehrman

Making Your Voice Heard

Has MIDI come to the end of its road? Has everything that we will ever be able to do with MIDI already been done? Is it time to abandon it and start on a new standard that will better reflect the technological needs of our new decade?

Or is there still work to do with what we've got? And if that's the case, should we stop development and learn to deal with things as they are? Or should we continue to try to develop MIDI 1.0 to do new things in new ways?

These are questions that a lot of people who work with computers and synthesizers are asking these days. And it's no wonder considering the pressures on the industry: Musical instrument makers are faced with flattening sales, mindless resistance to MIDI continues from the larger pro-audio manufacturers, and there's constant chatter on trade show floors about "what's coming after MIDI."

My opinion? There's plenty of life in the old DIN plug, and there is still lots of room for development. At the same time, though, I figure it wouldn't hurt a lot of us to stand back and get a better comprehension of what we already have available. MIDI Time Code, for example, is just starting to be understood by those who stand to gain the most from it, and at least half of the MTC spec hasn't even been implemented in any product you can buy.

But since MIDI Time Code was introduced more than two years ago, there have been no significant additions to the MIDI spec. While some might argue that this is because we don't *need* any additions, I don't think this is true. There is a crying need for a way to transfer MIDI Files over MIDI. Right now, in order to get a piece of music (or even just a tempo map) from one sequencer to another, you have to run it in real time (and hope that the timing resolution doesn't get too screwed up), or you have to save it to a common disk format; if the sequencers run on incompatible computers, you have

to convert them to ASCII files and use (God help us) a modem.

There is a need for a standard protocol for MIDI control of tape decks and other mechanical devices, both video and audio, which will allow a single control surface—a computer, mixing console, or some other dedicated piece of hardware—to become the central control station for the production studio. Many more controller commands should be standardized with common synthesizer functions (filter cutoffs, envelope control, etc.), and then implemented by instrument manufacturers, so musicians will stop complaining about the lack of real-time performance controls.

But changes in the MIDI spec have to be approved by the MIDI Manufacturers Association (MMA) and the Japan MIDI Standards Committee (JMISC). What are they doing? The proceedings and deliberations of these organizations are not open to the public. This is a good thing, because it keeps half-baked information and half-finished concepts from leaking out and finding their way into studios before everyone agrees on how they're supposed to be used.

But the downside of this is that us folks on the outside have no idea what these groups are working on until they're all done, and there's no way we can contribute to the discussion.

From the current dearth of progress on these and other issues, it's all too possible to conclude that not much is going on in these organizations, and that development of MIDI has stopped. Fortunately, that's not entirely true. There are at least a few visionaries within the groups who are working hard on new ideas. But things are without doubt moving slower than they ever have since the adoption of the original MIDI standard.

Some observers blame this on a general sense of apathy among the manufacturing community, while others think it's because companies are reluctant to throw resources at tasks which may not be immediately related to their own R&D. Some point to the fact that the Americans and the Japanese have always had rather different ideas about what should be in the MIDI spec, and each has reportedly been resistant to changes proposed by the other.

Finally, there's the opposition of high-

end pro audio manufacturers. Without their cooperation, it's hard to imagine MIDI making any great strides forward into automation and studio control. But long ago, these companies decided they didn't want any part of it. Many of them continue to think that way even though MIDI has radically changed the working habits of many, if not most, of their customers.

Regardless of where the blame belongs, it's time that more people got involved in the process of deciding the future of the MIDI spec. This means the people who use it: you, me, your clients, big post-production houses, modest bedroom studios. So many parts of our industry are user-driven, and the MIDI side, especially when it comes to sophisticated applications, needs to be, too. If we can think of something to use MIDI for, the MIDI spec should allow it, and the manufacturers should be able to provide it.

So how do we get that clout? One answer is by using information networks. One of those, the PAN Network, is at this moment hosting a heated discussion on the future of MIDI that no one in this business should miss.

PAN, which is accessible by a local call from most places in North America, has been serving the needs of the electronic music community for several years, but lately it's gotten kind of slow and predictable, with the hottest topics being things like bugs in the latest software revisions and who's going to the trade shows.

In the last few weeks, however, a passionate debate has been going on in PAN's public "Synth & MIDI" forum. Some of the best minds in the business, both in America and abroad, have been kicking around ideas of what they'd like to see happen to MIDI, and the issues being raised are fascinating. Next month I'll talk about some of the ideas expressed on the forum.

If you're not a PAN member, it costs \$225 to get on-line initially, but if you have bought just about any piece of MIDI software or domestically-made hardware in the last three years, the manufacturer of that item probably has a deal with the network to waive your sign-up fee. If you've been involved with PAN in the past but have slacked off or let your membership lapse, now is a terrific time to get back on and put in your two cents.

Paul Lehrman is RE/P's electronic music consulting editor and is a Boston-based producer, electronic musician and free-lance writer.

SC Plus

However, one group that has so far been conspicuously *under*-represented in the on-line discussion has been the equipment manufacturers. This is too bad, because it is they, ultimately, who will make the final decisions about what happens, both through their products and through their participation in the MMA and JMSC. A lot of people on PAN are pleading for them to jump in—perhaps if more people were participating and putting more pressure on them, they might be convinced to join in the fray, and then we might see some positive movement.

And there's one more tactic open to serious users who want to make their voices heard: You can join the MMA yourself. Originally, individuals and "non-manufacturers" (like magazines and writers) were discouraged from joining, for fear of information getting out prematurely. (It did anyway, which is why one well-known sampler does weird things with the Sample Dump Standard and a now-defunct SMPTE-to-MIDI converter handles MTC all wrong.) But as users have become more sophisticated—in some cases, more sophisticated than the manufacturers—things appear to have loosened up a bit. It's still a private organization, but perhaps an infusion of new blood could keep it from being a stagnant one.

Membership in the MMA is not for the faint-hearted, and shouldn't be taken lightly. The discussions are all highly technical, and the airing of trivial issues or individuals' gripes is most unwelcome. But if you want to know about proposed additions and modifications to the MIDI spec, and you think you'd like to discuss them and contribute to them before they're carved in stone, this is the place. It will cost you \$250 for the first year, and sorry, no one will waive that for you.

If we want to "Get MIDI Moving Again" (as the Message Thread on PAN is called), studios, songwriters, producers, engineers, post-production mixers and editors, journalists, and other users who are passionate about MIDI should make their voices heard in one way or another. See you on-line.

To get to the current discussion on PAN, from the MAIN menu type "SY FO READ 19289," and after the first message type "FO." Open your telecommunications software's capture buffer, and be prepared to set a spell.



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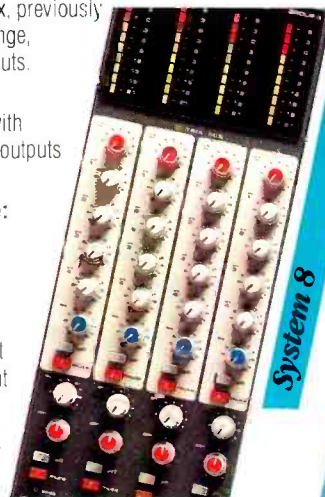
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SPARS-ON LINE

By John Meyer

Reinforcing The Future

Many significant changes have occurred in the sound reinforcement industry, and as we enter the 1990s, the industry's future is bright.

The most important shift has been toward the "one-box" approach of configuring speaker systems in different ways for different venues. Ten years ago, it was common to design various types of systems for various events—one for rock and roll and one for classical, for instance. The sound reinforcer would set up separate speakers for mid-range and low frequency, and assemble the high horn arrays. It was all done in pieces; the mixing engineers and crew would configure the systems per arena, per show.

The industry is much more standardized now. You take a full-range 1-box speaker system, and you use as many as you need for the particular event. There are perhaps a dozen manufacturers who build these systems, which can be assembled in various numbers for a simpler, more expedient approach to live sound.

Economically, there is a higher initial investment with the 1-box method, but this approach has proven to have a longer life. You pay for packaging, electronics and processors, but there is a long-range economy in smaller, more efficient modular packages. You can handle a wide variety of shows, and you get paid back in different ways over a longer period of time.

In dealing with a broad range of shows, from stadium concerts to the smaller venues, today's sound reinforcer varies the number of boxes in the same way that a lighting company varies the number of lights. The process is much faster than when individual systems were built for each tour. The flying and rigging is worked out for each arena, the shows go faster and the results are more consistent. It used to take a week to set up for a Grateful Dead concert—now it takes a day.

Technically, the big advance has been in dealing with reverberation. Ten years ago, it was widely believed that room

acoustics were random, and that reverb was virtually impossible to deal with. You were victimized by the space. The skill of the mixing engineer in dealing with the hall and the speaker system design was challenged with each concert. It was a constant battle to mix a show in a complicated arena with lots of echo and reverb.

With computers and sophisticated analyzers, much of the burden has been lifted from the shoulders of the mixing engineer. The same sound that the mixing engineer creates at the console can be duplicated throughout the hall. The engineer can concentrate on getting the right tonal qualities, balance, etc., and the technical crew can duplicate that sound elsewhere.

The mix engineer doesn't have to worry about a compromise between the sound at the console and the results in the balconies. This is a real advantage, because the chief engineer can concentrate on making the sound work from the main console position.

Computers and advanced analysis equipment have allowed us to better understand the individual properties of a specific hall. For example, we did an experiment that broke the ice. We started with "Les Miserables" in London and were faced with the challenge of re-creating the same sound when the show opened in Washington and New York. We were able to make the sound identical with the opening venue, even though we were operating in vastly different theaters.

Thorough analysis reveals the reverb structure and allows us to make decisions to minimize the specific problems of each hall. It comes down to finding the right number of speakers to cover the area and where to place them to achieve localized acoustic control. Analysis gives you a clear way of making the room more neutral.

If the room has a strong resonance at 50Hz because of the placement of the stage and the cavity itself, it can be seen from an engineering point of view as a very efficient place. You don't want to notch out that 50Hz frequency range; you want to set up a complementary filter so the resonance is used as if it were a speaker resonance. If you're successful, the results will be flat and linear. You must extend the design of the speakers and include the room for the net result, rather than making the perfect speaker and blaming the poor results on the room.

Another issue facing sound reinforce-

ment is the importance of cooperation between live mixers and engineers who are making the live recordings. A live performance is always a more forgiving situation because the audience is excited and likely to overlook minor distortions or acoustic glitches that become irritating in repeated listening.

The recording techniques must be extended to the live performance. The live engineer has control of the house system and the stage monitors. The microphones are split for both the house and the recording. If you listen in the mobile truck and the stage monitors are too loud or distorted, it will hamper the quality of the live recording.

The performance can always get away with being a little rougher, but it's best to have good live sound and a good feel for the recording. This type of cooperation has become more important in recent years as the expectations of superior live recording have become greater.

For those of you contemplating a career in live sound reinforcement, I would suggest spending a couple of years learning the ropes of this competitive and highly professional trade. No matter how clever you are, it doesn't hurt to get into the field and experience how people on the road operate. When you find what it is you can contribute, you will be able to do it in an acceptable and effective way.

There is tremendous room for growth in what is really a young industry. Music is so important—it survives through depression and will often flourish when the economy becomes more depressed. There's a lot of opportunity, but it's a profession that takes real skill. You can't afford to make mistakes: Audiences today are more critical than ever before, and the artists are very sensitive when their performance is on the line. Each show is different, and you will continually hear, "What have you done for me lately?"

You may have the dream of doing a Rolling Stones or Who tour, but there is rewarding work in all levels of the business. Every town has musical groups coming through, and there is lots of work out there. Music is music, and it's all important.

There will always be a need for skilled people who care and have the ability to deliver the sound that audiences appreciate.

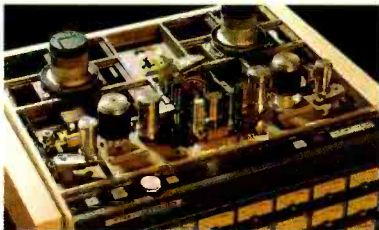
John Meyer is president of Meyer Sound, an AES fellow and a SPARS advisory member.

REP

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.

That's why Otari tape recorders come with something behind the meters.



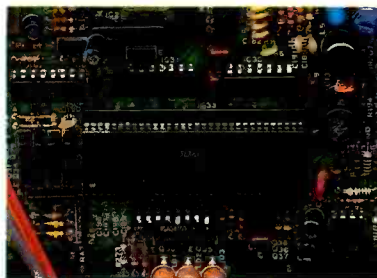
Otari isn't in the toy business. The MX-80 and MTR-90 sport 2" thick cast alloy deck plates, heavy duty swing arms, and motor shafts designed to handle the exceptional acceleration characteristics of these machines.

Our MX-80 and MTR-90 multi-tracks are used all over the world to produce hit CDs and major motion picture sound tracks, and for good reasons.

For example, if you're involved in audio post, you'll appreciate a

capstan motor that is *designed* to be speed-slewed, plus external control connectors for easy interface to any SMPTE/EBU time-code based synchronizer, editor or machine controller.

For *whatever* you do in audio, both machines share constant tension transport technology for high performance, yet gentle tape handling. You'll also get digitally timed, gapless, seamless, punch-in, punch-out. On the "80," an autolocator with search zero and three cue memories comes built-in. And if you're a purist looking for the highest quality sound



Otari's proprietary integrated circuitry provides superior reliability and reduces service time.

possible, you'll appreciate the transformerless balanced inputs and outputs.

The MX-80 and MTR-90 were designed from the beginning to lock to external controllers, and therefore provide exceptional performance under these conditions. Pictured is the MTR-90's advanced EC-101 chase synchronizer.



And to keep everywhere it belongs as you move from one studio to another, something else you have to look beneath the surface to see—a 2" thick, cast alloy deck plate.

It's not that we don't have our imitators. We do. But to coin an old phrase, beauty is more than skin deep. And someday when you're under pressure to get that track out, and you lock a "90" to your video machine and things happen exactly the way they should... Or some early morning after the talent has gone, you sit back and listen to what you've put together, you'll be glad you decided that "compromise is out of the question."

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LIVE & DIRECT

By Mike Joseph

The Next Breakthroughs

Let's talk about technology. Audio technology. Except for signal control, synchronization and delivery schemes, today's U.S. color video performance is roughly comparable to that available in the 1960s.

Not so with audio, where the raw performance is much better. Recording/playback has gone from 4-track and analog vinyl (40Hz to 16kHz, 60dB S/N, 0.5% THD) to 48-track digital and compact discs (20Hz to 20kHz, 90dB S/N, 0.005% THD), with DSP, hard disk-based storage and the capability to send sound bytes and samples between distant locations by modem without raising an eyebrow.

But think about sound reinforcement, audio's smallest sibling, where growth has not been so fast. With the exception of the obvious (more flexible boards with greater features, bigger amps, more sophisticated studio-born rack toys, better rigging), public address and amplified sound haven't changed much compared to the scope of digital or recorded sound technology.

In today's SR world, compression drivers with metal diaphragms still couple to fiberglass-molded horns mounted in wooden boxes. Low-frequency drivers still use magnets and paper to excite the air. Some subtle things have changed, tracking more of an evolving applications-generated need than the traditional engineering-generated credo of "If we can design it, we will build it."

For smaller companies, box tunings and design approaches are getting more adventurous, an area where anyone's creative technical ingenuity can be uniquely applied. A regional PA concern may not be able to make its own 18-inch or 2-inch drivers, but it's happy to figure out a way to cram many of them into a 36-inch square cube with handles. The proliferation of computer tuning programs is a new dimple in this arena, making do-it-yourself easier and better than ever. For the SR market, individual identity scores high.

There is a conservativeness in our sector. As Showco's M.L. Procise points out

in this issue's Interview, live-sound people are hesitant to jump on new technology—proven reliability counts foremost. The show must go on. Factor in the following: Sound reinforcement is a smaller pocket market, targeted by a relatively few application-dedicated manufacturers. The industry's hardware purchasing dollars are modest, which means R&D dollars are smaller.

For perspective, Apple Computer made billions last year on the Macintosh alone. In video, a single high-quality studio color camera with lens and pedestal costs as much as an entire turnkey 24-track analog facility.

The issues that face the SR industry's entrance into the '90s are easily listed. Traditional music-support touring companies, whether regional, national or local, are spreading into corporate and installation markets. Industrial A/V rental houses are fielding high-level systems for music entertainment at 5,000-seat national sales meetings. Time/energy/frequency analysis technology is finding application in all segments of live sound, including design, field use and installation. Communications control protocol is standardizing on MIDI and RS-232, with the digital fiber-optic signal transfer medium sticking its foot in the door.

Imagine mixing your next show from a single Row 10 Center seat, everything you need for total signal manipulation and processing nestled neatly in a laptop-sized package. Intelligent remote control of large multizoned systems is by necessity becoming an operator and design issue. (See Crown's IQ 2000 for a taste of the future.)

In loudspeakers, newer multiway unified box enclosures are replacing driver/horn and bass bin configurations in across-the-board applications. Speaker system manufacturers acknowledge that array capabilities must be designed into speakers before the first box is built. A great-sounding single stack may sound terrible in multiples, or lobe and finger like crazy. Conversely, a good multibox system's response may "fall apart" when hung in less than two or three units.

Constant directivity, although not a new concept, is being implemented more regularly by all levels of users, designers and suppliers as the only real solution to smooth and seamless multisource pattern control over a wide range of frequencies. Signal time alignment on a large scale will allow remotely steerable pattern control

of large multicomponent speaker arrays.

Weight and size for a given output level and bandwidth are coming down significantly, with electronic processing control extending the safe headroom factor and improving the audio performance in predesigned systems. Signal alignment in time and image sourcing, for years an issue in consumer and studio fidelity, is being tackled on all fronts by sound reinforcement folks. The number of coaxial designs on the market is increasing rapidly. These are all good things.

In the next several years we will see a growth in new packaging designs across the board with a continuing emphasis on light weight, improved ergonomic styling and easier user interface. Equipment pricing will be greatly reduced as economies of scale affect manufacturing and marketing costs, allowing more performance bang-for-the-buck. Component power and output will go up further as distortion goes down, notably in mic and speaker transducers, new horn designs and electronics. Digital technology, entrenched on the musical and control side, will filter selectively into live venue equipment as the perception (and, to a certain extent, reality) of reliability improves.

Automatic mixing control for traditional voice systems, such as church or conference, will become the norm. Auto-setup and equalization processing will become prevalent because of the greater understanding of room acoustics and proliferation of variable-state DSP-based equalization.

Look to non-audio manufacturers to provide major breakthroughs in our industry, companies with mega-dollar R&D budgets in other areas. Look to the computer hardware world for processing and amplifier technology, born of DSP and advanced power supply designs. Look to the aerospace universe to provide super-efficient, high-performance transducers quite different from the magnet/coil/paper/metal devices of the past 60 years. Look to light and plastic as the medium of transmission.

Most important, look to all of the other communications technologies (music generation, video, digital data and recording) to affect the sound reinforcement industry more than they have in the past.

RE/P

Editor's note: This is the first installment of an ongoing department on sound reinforcement, to be written by David Scheirman, RE/P's live-sound consulting editor.

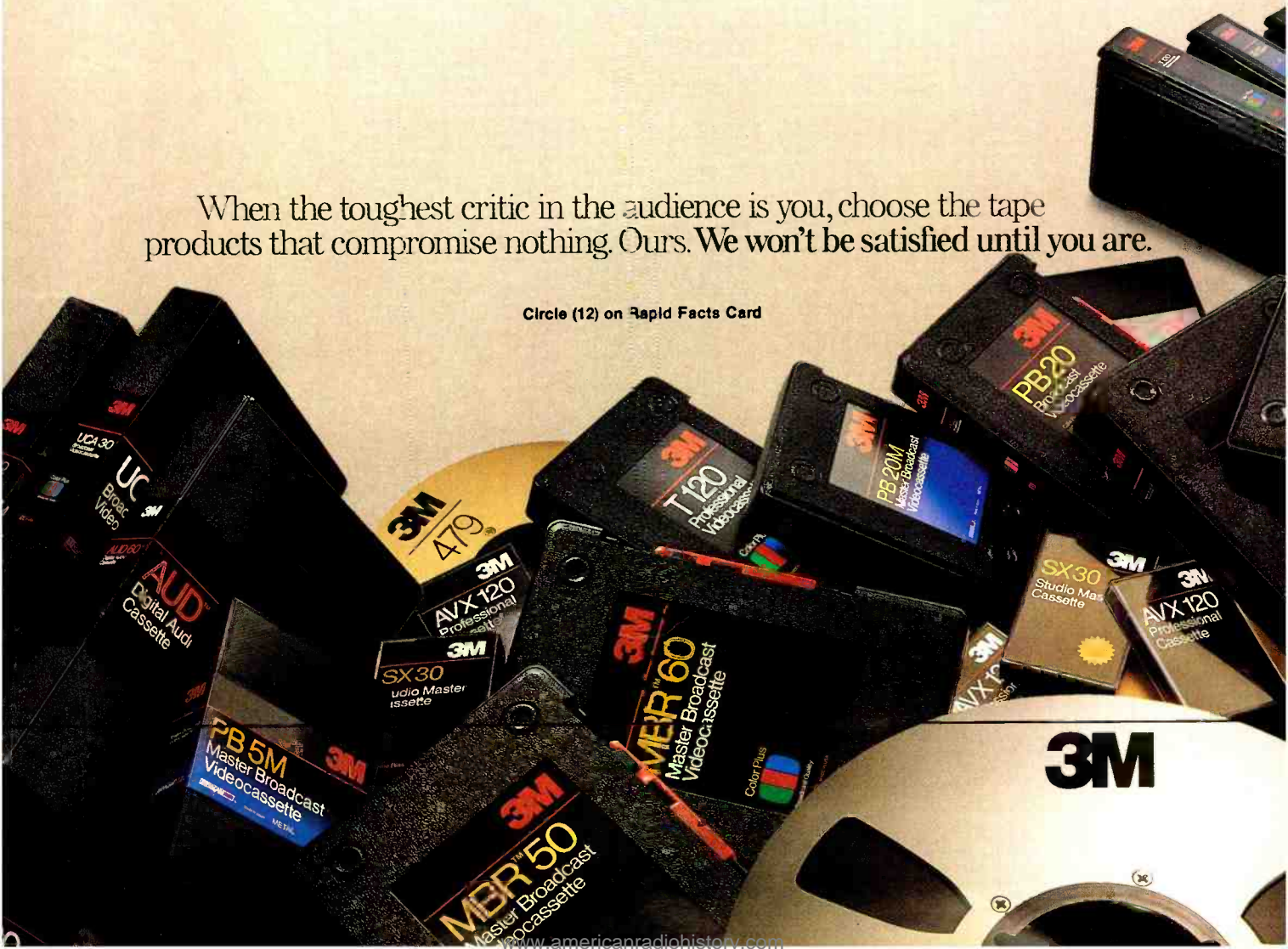
Mike Joseph is the technical editor of RE/P.



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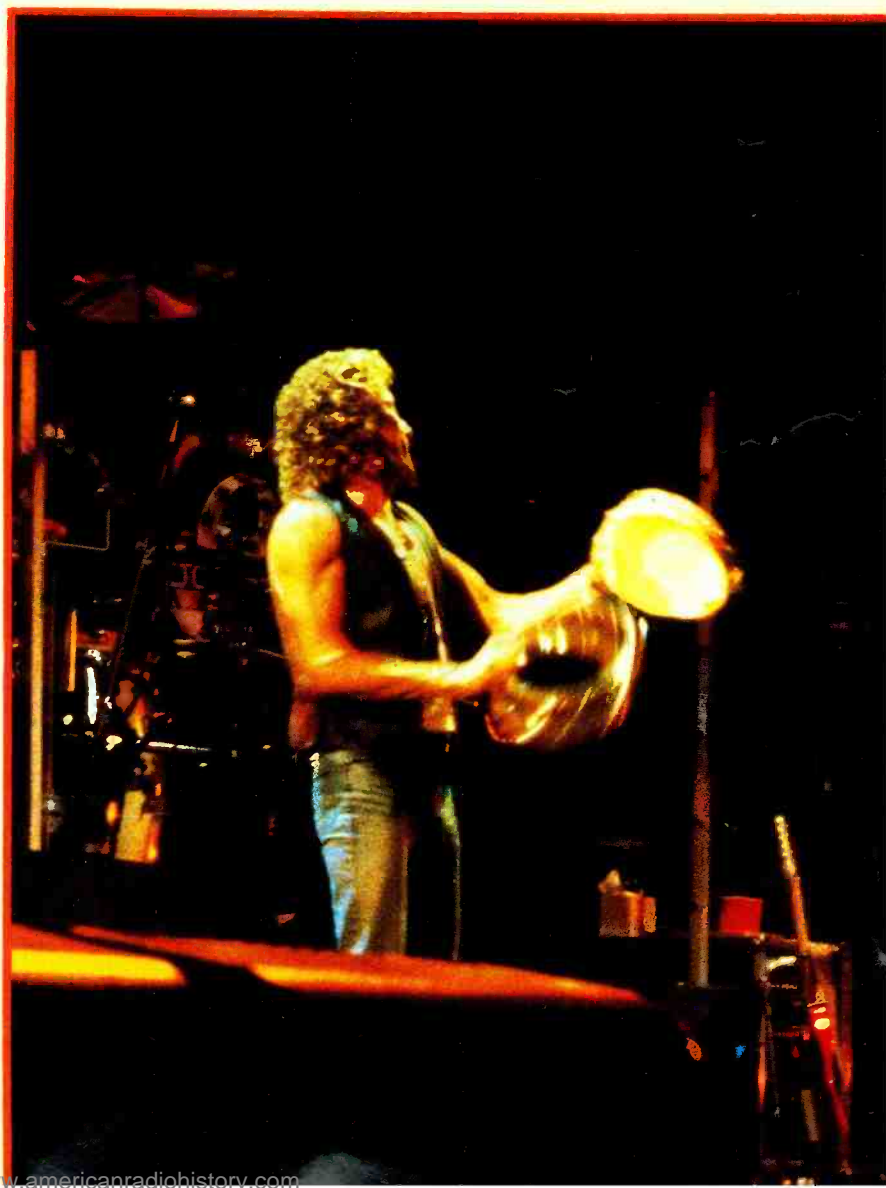
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THE

WHO

Clair Bros. Audio used a high-tech approach to the Who's stadium shows this past summer.



ON TOUR

By David Scheirman

Any discussion of major sound systems on the road during the past year must take into account the stadium system Clair Bros. Audio fielded for the Who's 1989 North American tour. Audience sizes ranged from 40,000 to 65,000, and many music critics found the Who's show much to their liking. One review of the tour's show at Kansas City's Arrowhead Stadium stated that the system "may very well have set a new standard for sound at large outdoor concerts."

So what's happening here? What is Clair doing with those S-4s that we haven't already seen and heard many times before? Aren't those just larger piles of the usual amplifiers and loudspeakers in a very familiar box format?

The answer is no. It's not the same old thing. The Clair touring system today is a far cry from its early predecessor. A tremendous research and development effort spanning the past few years has drawn on everything from innovative electronic design to modern structural engineering. It has made a noticeable difference.

Design philosophy

Clair continues to rely on the S-4 enclosure package as a building block in assembling temporary sound systems of all sizes. However, the company has converted its inventory to the new Series II enclosures, which has been configured in standard-use (F series) and far-throw (P series) versions. Each enclosure weighs approximately 400 pounds and measures 43" x 45" x 22". (See Photo 1.)

The F series box contains wider-coverage horns, a wider-coverage tweeter array and a vertical line array of 10-inch midrange drivers. The P series box includes four 10-inch speakers in a rectangular group, along with long-throw horns and super-high components. The new S-4 Series II was designed to be an incremental improvement to the standard box design.

"Our goal was to achieve better sound for all ticket holders while reducing hanging and trucking weight," said Ron Borthwick, speaking for the Clair engineering team. "Even though the outward appearance remained relatively unchanged, no internal parts escaped our redesign process."

After a survey of available transducers, the best available bass drivers for this application were loaded into the proper box volume with a port tuned to the proper frequency. To hold and protect the various speaker components, a new enclosure was designed for the Series II. Aerospace composite materials technology was used to increase cabinet wall rigidity while reducing box weight. This technology was adapted to increase the wall damping, among other considerations.

"This is of greater concern for speaker enclosures than for aircraft structural parts," Borthwick said. "An aircraft part has some natural 'give' to it. But flexible cabinet walls will add to bass coloration, and will reduce radiation efficiency. Hitting a properly designed cabinet with your fist should feel and sound a lot like hitting a 6-inch slab of concrete. Thus, we applied the principles of structural engineering to achieve this effect."

The low frequencies did not receive all of the attention. With all speakers hung in their final configuration, the midrange direct-radiating elements are formed in a *shaped array*, which modifies the distribution of the sound to more closely match that which is required to cover the typical concert venue.

Computer modeling was used to generate a double-driver, high-end horn assembly. The goal was to minimize interference patterns and throat distortion, while yielding the coverage pattern required for each part of the array. Also, the horn coverage angles are varied to suit the seating area to be covered by that part of the array.

Above 7kHz, coverage angles of super-

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

high frequency components need to be adjusted throughout the array. The required devices are not commonly available to accomplish this. Because the usual components didn't suit its purposes, Clair designed custom devices that were built in conjunction with a major manufacturer.

Because the modular S-4 enclosures are all the same size, regardless of internal components, assembling large arrays is relatively simple. For stadium shows, the boxes are typically raised with chain-motors and stacked in rows two or three high.

To make it easier for technicians to handle the boxes, Clair designed a special dolly system that enables one person to move the stacked boxes by locking the 2-wheeled unit into a strong, extruded-aluminum channel at the edge of the S-4 cabinet. Using leverage, the built-in cam

lever and swivel handle maneuver the stack. With this method, one person can lift an end of a 3-box stack (1,200 pounds) a 1/4-inch off the deck, and can then carefully position it.

For the show that I observed at the Los Angeles Coliseum, a total of 144 S-4 Series II enclosures were used for the main system. The 72 boxes per side were arranged in nine stacks, three high on two levels (45 standard, or F series S-4 Series IIs and nine P series per side) with an additional double-high stack of long-throw (18 P Series) S-4s on each top deck. Some quick addition shows a total of 90 Fs and 54 Ps in the system, or roughly a 2-to-1 ratio of standard to long-throw boxes.

"I can remember when a major outdoor system would use 80 cabinets, and that was a big deal for 10 years ago," recalled Clair crew chief Joe Ravitch. "There had

never been a bigger system. Now, the size of the system has grown with the times. But instead of getting harder to put up, things have gotten easier. Our guys usually put this stadium rig up in four hours flat, depending on things like truck access and stage crew size."

Supplemental loudspeaker systems included a subwoofer section comprising Clair's custom 2"×18" low-bass enclosures. Each heavily braced enclosure housed a pair of JBL 2245 woofers. Twelve boxes per side were arranged in a horizontal line array at ground level. (See Photo 2.) A Crown Macrotech 10,000 amp was set up to power each dozen of the subwoofer cabinets (a total of 24 18-inch speakers per side in the subwoofer system).

A supplemental delay array, positioned high atop scaffolding behind the house

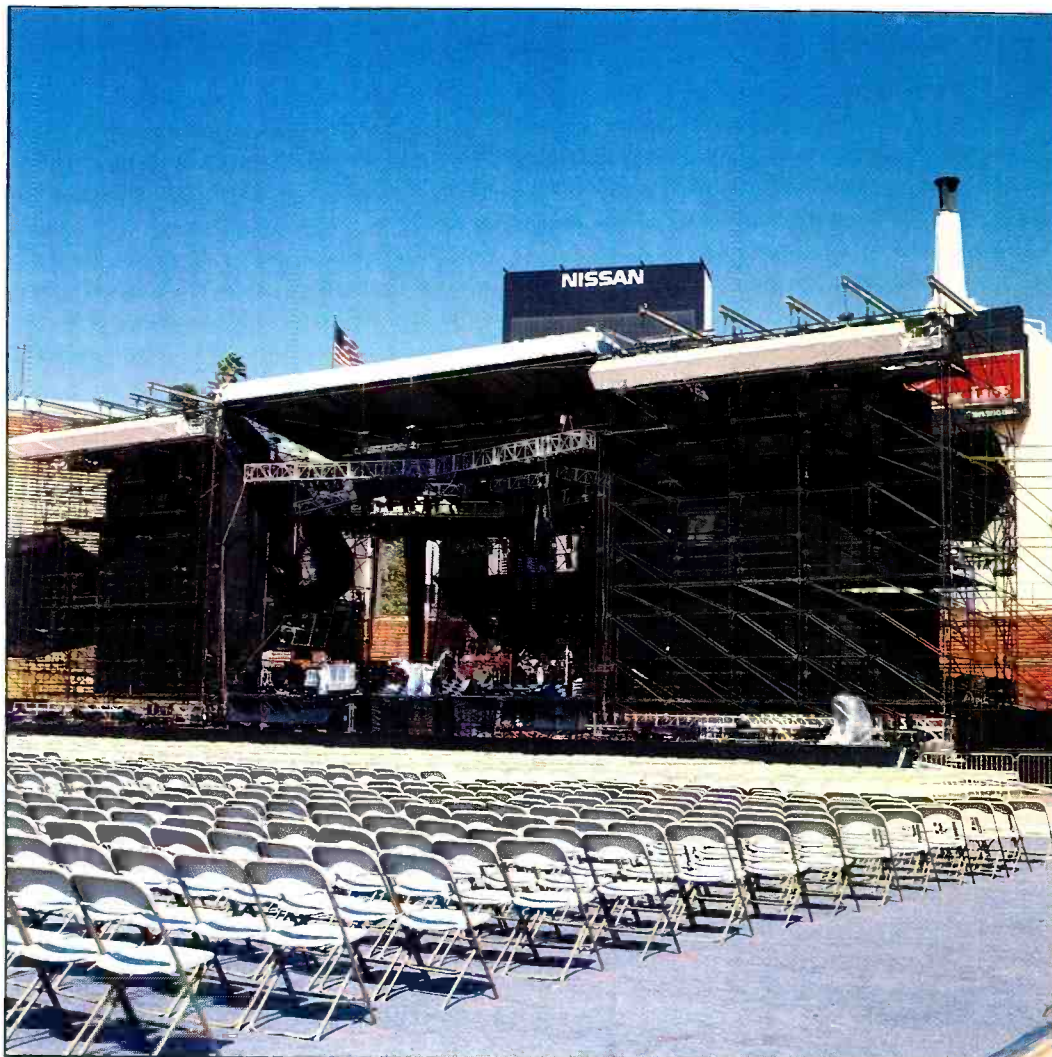


Photo 1. Clair S-4 enclosures are typically stacked two or three high for stadium shows, arranged on levels of scaffolding.

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mixing position, was set approximately 200 feet from the stage to give an added boost to high frequencies. Clair's custom long-throw high-frequency units were arranged in a gentle arc that offered wide-angle coverage. Arranged in three separately adjusted zones, the delay system relied on a Yamaha YDD-2600 digital delay unit, Loft Model 402 crossovers, dbx 903/905 signal processing modules and Carver amplifiers.

"I'm not a big fan of too much in the way of extra delay systems," said Ravitch, who is responsible for the primary system setup

design. "In the bigger stadiums, though, you need some help on the high end as you move farther back. I find it's best to have it all in one cluster in the center. That makes the setup easier; you don't end up having ac and signal cable strung out all over the field, with lots of chances for things to go wrong."

Power amplifiers and signal distribution

Realizing that size and weight are important factors when choosing power amps for a large portable system, Clair

conducted extensive research into the power amplifier field before finally designing special units. Currently, most Clair systems are powered by amplifiers based on the Carver PM2.0 series chassis. Typically, one dozen of these modified units will be housed in a hinged road case complete with custom input/output panels and ac power hookups. One side of an amp rack case powers up to four S-4 Series II enclosures; thus, a single amp rack that can be picked up by two persons will drive eight speaker enclosures.

"Ultimately, the size and weight of the amplifiers determine the amount of headroom that a portable system will have," Borthwick said. "There is a limit to how much you can haul around. By working with a number of manufacturers, we were able to almost double the 'watts per truck' without sacrificing real-world audio quality."

Large sound reinforcement systems will typically require a tremendous amount of heavy-gauge speaker cable; for indoor hanging arena shows, speaker cable runs can be 200 feet in length.

"The majority of our shows are done with speakers rigged in the air to provide better audio coverage and to block less sight lines," Borthwick said. "To maintain service access to the power amps, we like to locate them on the ground. The long cable runs needed can become a source of significant power and damping factor loss. With arrays of up to 1,000 separate loudspeaker units, one can quickly hear the effects of too much impedance in speaker wiring."

Clair's new special "High-D" speaker multi-core cable is a non-traditional approach to the amplifier/speaker interface. Because of the large number of speakers employed, the company was able to interest vendors in fabricating custom wire and connectors to its specifications. This has allowed Clair to design the amplifier, cabling and speakers as a dedicated, integrated system. According to Borthwick, the company was able to put the copper where it was most needed for power transfer. It also used a technique commonly employed in another industry, but not normally applied to audio power systems, to increase the effective damping factor.

The result is that power transmission more than 200 feet of the "High-D" speaker system cable is said to suffer only as much signal degradation as that of 25 feet of conventional 14-gauge speaker wire used in the classic amp-to-speaker wiring.

One method used to create the most efficient speaker wiring harnesses to match the S-4's needs is to use custom-made cable. The firm needed to find wire that had enough internal slippage to prevent copper wire-strand breakage, yet was heavy



Photo 2. Group of eight 2x18 Clair custom subwoofer enclosures, positioned at ground level.

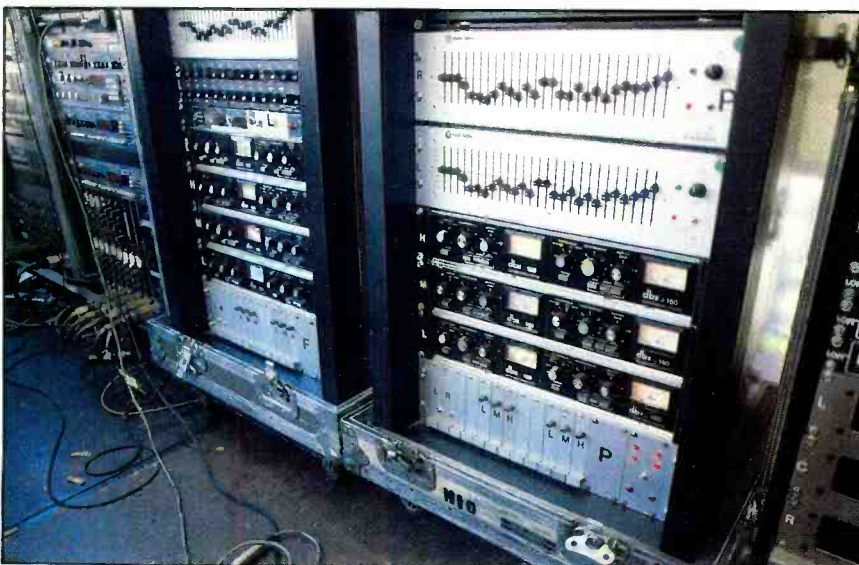


Photo 3. Main system drive racks include Clair's new Coherent Transfer System electronics package (modular cardframe unit at bottom of rack).

enough to take years of road abuse. The heavy-duty cabling includes 12-, 10- and 8-gauge wiring in one rugged, specially lubricated, insulated package.

The Clair crew carries its own 480V electrical transformers, so that high-powered ac is brought from the hookup panel or generators right to the sound wing. The power line is then dropped down to 208V 3-phase, with the ground-to-neutral bond happening within a few feet of the amp racks. Two 150kVA transformers are available, one at each sound wing; a 45kVA transformer offers electrical power for band gear, the monitor system and front-of-house equipment.

House mixing setup

In the driver's seat was Clive Franks, perhaps best-known for his many years of mixing house sound for Elton John. Having worked with a variety of artists, including Hall & Oates, Peter Gabriel, Toto and Robert Plant, Franks was particularly interested when the call came in for touring with the Who.

"I'd done Elton's live sound since 1972, and produced three of his albums," Franks said. "I was first introduced to Clair when Elton toured the United States for the first time. I'd never been on the road before. Gene Clair was out with us for a 3½ week tour, and that gave me some good training."

Franks mixed the Who on a pair of Yamaha PM-3000-40 consoles. Signal processing available at the house position included two AMS S-DMX dual-channel digital delays, three Yamaha REV-5s and two Eventide H949 Harmonizers. Brookes-Siren DPR-402 noise gate/de-essers were channel-inserted for each vocal mic input.

"I was first introduced to the Yamaha console in Australia, when Elton did a symphony project with 102 people on stage," Franks said. "Gus Dudgeon was there to do the orchestra submix, and we came to like the console with its mute groups and VCAs. Here, we are using audio subgroups 7 and 8 on the drum sub-mixer console, going right into a pair of input channels on the main desk."

A pair of dbx 900 racks loaded with 903, 904 and 905 modules were channel-inserted on instruments such as the electric bass, guitar, keyboards, and Leslie mics. Dbx 160x compressor-limiters were available for use on the vocals. An AMS rmx-16 digital reverb system was used for the drum submix, and Drawmer noisegates were supplied for the drum kit.

Drive racks for the system included Clair's new crossover, and modified dbx 160s were used for signal monitoring, level adjustment and bandpass protection. (See Photo 3.)

More than just a traditional crossover,

Clair's new system drive unit has been named the Coherent Transfer System. A study in classical frequency-dividing network analysis and synthesis as applied to a specific loudspeaker system, the Coherent Transfer System was designed and prototyped by Clair to complement the S-4 Series II family of 4-way speaker systems.

The new electronic system has been designed to do the following:

- Provide active correction networks for broadband on-axis amplitude, phase and group delay errors inherent in the response characteristics of the raw drivers.
- Provide active correction networks for broadband on-axis amplitude, phase and group delay errors in the response of the speaker enclosures caused by closely-spaced drivers in the boxes (i.e., multiple 18- and 10-inch speakers).
- Provide active signal delay networks for signal convergence of the low, mid and high ranges of the enclosures. (The signal delay is an analog realization with 137dB of dynamic range, 41dB better than 16-bit digital systems.)
- Provide active crossover networks that result in a "flat" on-axis amplitude vs. frequency response, such that the flatness is limited by the narrowband amplitude vs. frequency response anomalies of the drivers in the enclosures.
- Provide active crossover networks that result in the main lobe of the polar response always being on-axis.
- Provide active crossover networks that result in a smooth off-axis amplitude vs. frequency response over the useful coverage angle of the enclosures.

In conjunction with the new Coherent

Transfer System units, Klark-Teknik DN27A graphic equalizers were available for system control. A White Series 4000 filter set with 1/6-octave precision adjustments was available for use on the subwoofer send.

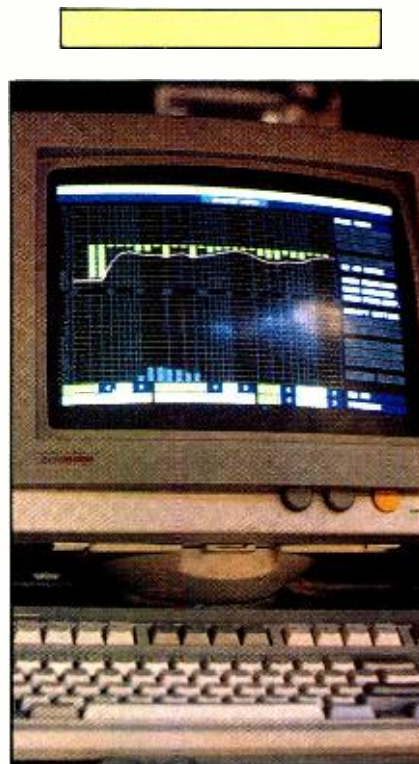


Photo 4. This personal computer is running beta-test software as Clair works on the development of an automated EQ system for live concert use.

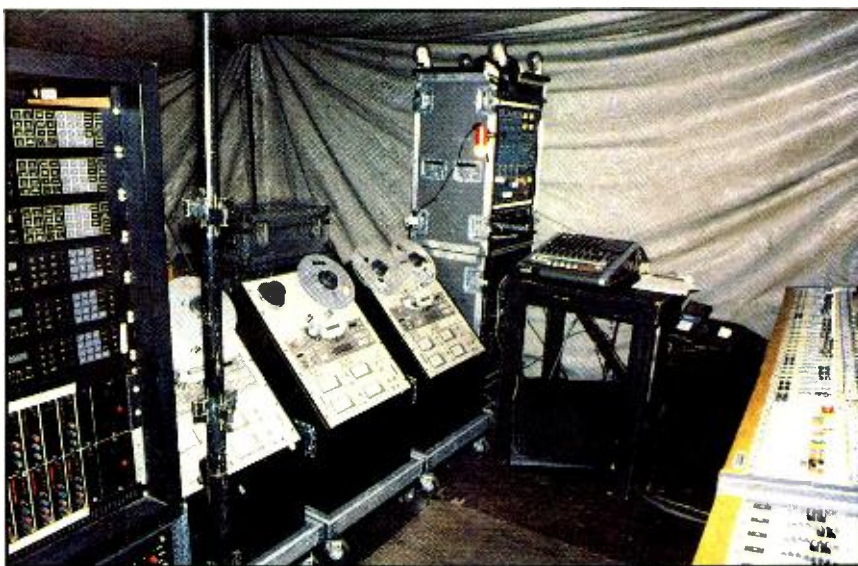


Photo 5. Three Tascam ATR-60 4-track tape machines were operated backstage to insure that recognizable "signature" sound effects and musical passages were available at the house mix position, taken directly from original master tapes.

Townshend's 'QUIET ZONE'

By Bill Beith

Long-known as one of the world's loudest bands, the Who has not toured in recent years because of Pete Townshend's well-publicized hearing problem. He has Tinnitus, an irreversible audiological disorder exacerbated by high SPLs, and had refused to play live.

In order for Townshend to avoid a high SPL environment on stage, changes were made to the physical setup of his monitor and guitar systems. To appreciate and understand the need for these modifications, a brief overview of the ear is necessary.

The anatomy of the ear is broken down into three sections: the outer ear, the middle ear and the inner ear. Air motion is passed from the outer ear to the eardrum, and is then replayed to the inner ear, where this motion is changed to neural impulses that are transmitted to the brain.

The Cochlea is a small snail-shaped structure in the inner ear that contains tiny hair-like sensory cells called Cilia. On average, there are 25,000 *non-replaceable* Cilia for each ear. One end of the Cilia is anchored to the Basilar membrane (the floor of the Cochlea), while the other end makes contact with the Tectorial membrane (the ceiling of the Cochlea).

When air motion is introduced from the outer ear, a displacement of the Basilar membrane causes a shearing action of the Cilia and Tectorial membrane. This results in neural activity. The physical properties of the Cochlea are such that high-frequencies tend to localize at the narrow end, while low frequencies tend to localize at the wide end.

Tinnitus is a sensation of noise that is most noticeable in a quiet environment. The analogy is a decrease in the signal-to-noise ratio

of the ear. Sound appears to be in the head, as opposed to the ear. This symptom can affect one or both ears.

Physiological causes include middle-ear infection, circulatory disease, otosclerosis and neuritis of the auditory nerve. Self-induced causes include, but are not limited to, exposure to intense noise, large doses of aspirin and excessive amounts of coffee, tobacco or alcohol.

In the old days, Townshend's guitar amps were miked and an echo send was routed to the side-fill monitors to fatten the guitar sound on stage. On the latest tour, Townshend used two electric and numerous acoustic guitars. The electrics were fed through Mesa Boogie pre-amps to a small Ramsa mixer, while the acoustics were fed direct. An echo send routed the guitar sound through a digital reverb before returning to the monitor, which simulated the old side-fill method.

At the mic position, Townshend had three monitors, one for the guitar feed, one for vocals and one that carried a low-level band mix. Side-fill monitors were used for the rest of the band, but were arrayed in a split configuration to remove mid- and high-frequency energy for Townshend's side of the stage.

John Entwistle, bass, and Steve Bolton, the full-time electric guitarist, had their speakers and amps opposite of Townshend. This limited Townshend's stage movement to nothing beyond center stage. The horn section, keyboards, drums, percussion and backing vocals were on a riser running the width of the stage.

A large sheet of Plexiglas separated each instrument section. This served to isolate and improve miking, but also prevented a wash on Townshend's side of the stage. Each outer edge of the stage also had a Plexiglas sheet place against the house speaker system, again for isolation and to prevent leakage.

Stage monitor system

Band employee Bob Pridden, a long-time Who road veteran, piloted a precision stage monitor system that featured Clair's new 12 AM floor wedges. These compact boxes, featuring a special 12-inch speaker and a compression driver mounted on a custom, asymmetrical high-frequency horn, were in place on the stage set nearly everywhere that a performer might need reference sound. Thirty monitors were available for the show.

The heart of the monitor system was a Harrison SM-5 (a 32-channel mainframe with 20-channel extender). Located close to the performers in the downstage left corner, the monitor mixing console was set up to provide a total of 14 mixes to the stage area. Compact Carver amplifiers with Clair's custom time-correction crossover modules built in were located near the Harrison console, within easy reach of stage technicians. Front-panel access to input and output connectors is built into each monitor amp rack. The amplifiers are packaged either two or four to a rack.

The monitor system was provided with three Yamaha REV-5s and three Yamaha REV-7s, along with a pair of dbx 900 series racks for channel-insertion problem-solving. Each output mix was provided with a TC-1128 programmable 28-band graphic equalizer with integral spectrum analyzer.

"With these new EQ units, we are taking the first step toward really getting stage monitors under control for a complex show," said Clair technician Frank Farrell. "In conjunction with the TC-1128's, we have set up an IBM-compatible personal computer equipped with a video driver card. We have Beta-test software now, and are working on an automated method to identify and correct feedback online.

"The system has a search-and-destroy mode for feedback. It has an auto-search format, and the cursor automatically moves to the feedback frequency that is graphically depicted on the monitor screen. The biggest challenge now is getting the unit to differentiate between feedback and artistic intent." (See Photo 4.)

In addition to the multiple floor wedges, the monitor system included traditional sidefills with horn-loaded bass bins, and a powerful drum monitor system that included a 24-channel Soundcraft 200SR console for use by drummer Simon Phillips on his own riser. Full-range monitor speakers were suspended overhead for the downstage performers, including singer Roger Daltrey.

Stage inputs

Expanding a bit with maturity, the Who treated fans to a show that featured more than just bass, drums and guitar. The 15-

Bill Beith is the owner of Brick Audio in Elgin, IL, and a free-lance writer.



piece ensemble included five horns, three backup vocalists, a support guitarist, keyboards and percussion. The keyboard setup featured a traditional Hammond B-3 with Leslie, which was housed in a soundproof box and covered with a trio of Sennheiser 421s.

The drum kit hosted a specialty microphone complement that included AKG condensers for the cymbals, a Beyer M88 for the large tom, Shure SM-57s for snare top and bottom, and compact E-V 308 and 408 microphones for the rack toms. The percussion kit was picked up with AKG 460s, 414s and an E-V 408.

As always, Roger Daltrey relied on a Shure SM-58. "We can go through as many as three or four a week," Ravitch said. "It's not so much that they quit working, as that there is a subtle change in the frequency response due to misalignment of the moving coil. Roger hits the mic very hard in the palm of his hand, which he's done for years."

Shure SM-57 mics with special shock-absorbing stands and direct-input boxes were set in place to pick up the sound of Steve Bolton's and Pete Townshend's electric and acoustic guitars. Multiple speakers were miked, which gave Clive Franks

the opportunity for stereo panning, "fattening" and other special guitar effects.

For duplicating recognizable "signature" musical passages from popular tunes like "Won't Get Fooled Again" and "Pinball Wizard," a trio of Tascam ATR-60 4-track tape machines were set up near the monitor mix position. A custom switcher was developed so that a backup unit was always running, ready to go on-line at the punch of a button. Original master studio recordings were accessed to provide such elements as synthesizer lines and background vocal textures, which were then blended into the house mix. (See Photo 5.)

During the past few years, Clair has made a tremendous investment in new audio hardware and specialized engineering talent. Under the direction of Ron Borthwick, the company has made great strides in the direction of achieving its own stated design goals: to have more efficient sound systems that set up more easily and to offer better sound to more of the audience.

Perhaps the greatest improvements have been made in whole-system design integration. The company now boasts a specialized crossover that is intended for use with optimized speaker enclosures, all

held together by a fail-safe amplifier/cable/ac system that is nearly unmatched in terms of electrical power transfer functions.

Not content to stop with these recent technological developments, the Clair Bros. design and engineering team is continuing with other long-term research and development programs that may have a significant impact on the concert sound industry. Perhaps the most ambitious is the development of a new-generation mixing console.

The Who's recent tour was perhaps an ideal showcase for a system that shows the hard work and high-dollar investment that has been poured into it. The massive sound system enhanced the show, rather than detracted from it, a sure sign that the design work and capital investment was well worth it.

RE/P

Photos by David Scheirman.

At the top of the concert sound heap is a cadre of house mixing engineers who are always working, always on the road. Some have been doing it since the 1970s, when mega-tours and monster sound systems first hit the 20,000-plus arenas.

M.L. Procise is one such person. The depth and breadth of his experience is incontrovertible. He has mixed and toured with the Average White Band, Thin Lizzy, the Electric Light Orchestra, Joan Armatrading, Nazareth, Pat Metheny, Lynyrd Skynyrd, ZZ Top, the Bee Gees, Boston, Michael Jackson and the Beach Boys.

The interview took place at Procise's home base in Dallas, where he had just come off the road mixing Guns 'n' Roses, openers for the Rolling Stone's Los Angeles shows. Topics included touring, artist's personalities, the Showco Prism System's incumbent technology, and the reknown rehearsal techniques of the real M.L. behind the board.

Career beginnings

"This is my 15th year with Showco. I originally came from Fort Wayne, IN, where I worked for the group Ethos, with two albums on Capital records. They were a progressive rock band that constantly investigated the newest musical instrument technology, and very unique.

"The guy who built their first PA worked with Showco. He called me up one day and said 'Listen, they're about to hire somebody off the street to mix monitors for Genesis. Are you interested?' Absolutely. Within a month I was living in Dallas and doing rehearsals at the Electric Ballroom. Genesis happened to be my favorite group in the world at that time. I got a very lucky break. I spent nearly four years with Genesis and did 350 live shows."

One of the country's top live sound engineers stays in one place long enough to talk about new technology.

Michael Jackson

"Michael Jackson and the Jacksons came to see the Bee Gees' Dodger Stadium show I was co-mixing with Jack Maxson, and were so knocked out with the sound that they inquired as to who was responsible. This started a relationship with Michael Jackson and the Jacksons that lasted for nearly six years, from 1979 to 1984. I've mixed more than 200 Jackson shows.

"The 1984 Victory Tour was my last with the Jacksons. Industry people were interested in hearing the "Thriller" album, and they didn't realize that what the Jacksons were bringing to the table wasn't anything like "Thriller," or any album. It wasn't a Michael Jackson "throng of studio musicians" thing. The live show was executed with totally different singers, totally different players, different instrumentation and different arrangements. It was a performance-oriented live show with heavy rock 'n' roll overtones.

"The Jacksons didn't realize what kind of crossover crowds they were going to be appealing to: ages 6 to 16. I miss Michael Jackson. He's the world's most brilliant performer.

The Boston sound

"I looked at working with Boston as a challenge. Everybody had said that Tom Scholz would be very difficult to work with. I had heard about the way he would drive the house engineer crazy and totally dictate everything about the live sound. The second part of that statement is true, but not the first.

Mike Joseph is technical editor of RE/P.

THE RE/P INTERVIEW:

M.L. PROCISE

By Mike Joseph



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 **PRODIGI**



"The guy has got an incredible vision of what he wants to do live and how to transfer that studio sound to the arena. He described the concept and I had no problem taking the ball and running with it. It makes my life much easier if the artist has a clear view of what they want to do. Tom is an engineer and a musician, building the Boston Sound with his engineering talent and delivering it through outstanding musicianship. Tom's top priority is to preserve the integrity of the album sounds and recreate that same sound of his megaduel guitar leads live by taking everything direct and maintaining all the original effects. He is famous for the Rockman equipment. The only live mics used on stage were the vocal mics, hi-hat and over-heads. A sound system with no pre-emphasis equalization or processing is important to Scholz and the linear transfer characteristics of the prism is a perfect marriage with the Boston concept.

Working with artists

"First determine whether or not the band is trying to reproduce the album live. With ZZ Top, for example, that wasn't the first priority. Yes, they wanted it to sound like the album, but they weren't going to sacrifice the live raw sound to do that. It's easy to figure out what artists want, just

ask, because they'll either say, 'Hey, this is the sound of our band and this is what we want,' or they won't say anything, leaving the interpretation up to you. They'll just expect you to come in and do the best you can with what they give you to work with.

"Recently, I got to work with Guns 'n' Roses on the Stones tour. I went into a situation that I perceived as an incredible challenge, based on the reputation and persona of the band. In actually digging into the basics of their sound—getting the rattles and buzzes out of the drum kit, tuning the drums, listening closely to the sound of the bass and guitars, finding out what they were doing with the instruments—it was actually easy to mold it into a good live sound.

"I think that they are such a raw-energy, emotional kind of band that you can only get their audio to a certain point and then it relies totally on the performance. My approach basically is first get the source sound as good as it can possibly be. I believe most of the work to be done on any new project is on the stage.

Pre-production

"I have different ways of preparing for work with a new artist, and one way to prepare when pre-production time is min-

imal is to visualize the mix while listening to prerecorded music. My friends have kidded me in the past about standing in front of a board and mixing to a CD. I call it 'practice mixing.' I take a compact disc and imagine what I would do if I were mixing. I layout and label the board like I would imagine the inputs to be, and I practice mixing the songs.

"It really helps me to understand the band's music and properly present that music to the audience. I used this technique on Guns 'n' Roses. I got their two CDs, and listened to them extensively. I made my cue cards based on some presumptions. I analyzed the music. I analyzed the frequency response of the material and how all the parts were related. I analyzed how the instrument groupings sat in frequency bands. Knowing where those groups were helped me understand if a song had too much going on in a specific frequency range, and therefore what I might have to do EQ-wise to give the instruments a little more individual space or taste of their own.

"What happens a lot is that you don't get the time in pre-production rehearsals to actually go through the moves. Either the band has not rehearsed enough themselves to be prepared to go through the set that they will present to the audience, or it's a start and stop rehearsal, or one of the key players in the band won't be at the rehearsal or something else. For me, the practice mixing I do is a mental thing that really builds my performance confidence. The second Boston show I mixed completely through was "Texas Jam" for 70,000 people. My personal preparation got me through the complex layers of Boston Sound. Pressure was big.

Sound companies

"I have been with Showco for many years, but I have mixed on many different systems and I don't believe there's a house console I haven't used. I prefer the Harrison HM-5, designed by our engineering staff. I recall the summer in 1982 working the state fair circuit with the Beach Boys. We encountered 13 different sound companies. I learned versatility that summer.

"I am comfortable with my mix of responsibilities at Showco. First of all, I believe in the leadership and management of our company, but most of all I believe in the ownership and their vision. There is an excellent group of individuals on the senior engineering staff; our affinity is very honest and open. We are a team. You must recognize that Showco is not just another sound company, we are a technology development organization. We are upwardly expanding on a worldwide basis with a very intense mission statement, an

abbreviated version of which is: to be the absolute best sound reinforcement company in the world, technologically superior, and to have the finest field team leadership in the business. Now that is an inspirational commitment. I get off on that.

The Prism System

"The design goals of the Prism sound system are well-documented and so is the success. All I want to say is I feel extremely lucky to get an opportunity to work with this system.

Applying new technology

"In the sound reinforcement business, you have to consider all new technical advancements and then determine what impact it can provide to your product. When exploring the new trends, one must keep the big picture in close view. The keys to our industry is making the show go on, service and reliability. I love the editorial by Fred Ampel in *Sound & Video Contractor* [RE/P's sister magazine, October 1989]. Two scenarios at a club are given: one, the lights go off, and everyone keeps dancing, and the other, the sound goes off, and everyone leaves. How true. We have never had a show go down because the sound system wouldn't work.

"One of the things that most concerns me is noise control and the potential for government agency intervention. There is a huge misconception of who is engineering our live shows. The management who administers our major sound reinforcement companies has a very keen interest in preventing potentially harmful sound pressure levels at rock shows. Education is important and a major priority for our company. The Supreme Court abatement ruling is very disappointing. They obviously took a political topic and got it mixed up with something totally different: artistic rights. The end result may be a disclaimer on the ticket stub regarding exposure to high SPL. In my travel to other countries where outside agencies have intervened on this issue, it is my experience that they often assign unqualified noise control officials to monitor SPL. The leading professional audio engineers are aware of the challenge of noise abatement. Here are a few important guidelines: Minimize your exposure to loud SPL for extended periods of time, both on the job and recreational. Avoid loud concussions or transients, especially in the near-field range. Avoid prolonged listening under a pair of headsets and don't forget to carry a good pair of ear-plugs everywhere your go!

The future of touring

"The thing that drew me to this business

in the first place is this: Nothing replaces the magic and passion of a live performance. It's the rush of having 20,000 screaming people in front of you—that tremendous release of energy. The artist loves that admiration and the vibe of playing music live. That's the juice that motivates and cannot be replaced by any other medium.

"There is a great future ahead for live music and touring audio engineers. I still get excited by taking on completely unknown challenges like Guns 'n' Roses and

Boston. I still enjoy employing my tried and true methods of getting the most out of bands on stage while I utilize my experience to share with upcoming engineers. I think I always will."

RE/P



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The decibel system as a mathematical concept is arcane, and learning the math takes a lot more effort than most working engineers have been willing to give. Until recently, an engineer who was not involved in equipment design or modification could have a studio career without knowing exactly how decibels worked. Any number of engineers did. They treated decibels like horsepower. While that led to an occasional absurdity, getting by without really understanding the system was common.

However, that was then and this is now. Life is getting tougher as equipment grows more complex and less forgiving. As an example, digital gear is far less flexible than analog in terms of peak levels. This is especially true of compact discs with their rigid overload characteristics.

The ability to translate decibels into the real world has always been useful, if hard won. When it can be learned without spending a lot of time and energy, it's a cheap trick. Knowing that 12dB is 11 times as much as 2dB, rather than six times as much, helps to avoid a lot of nasty surprises during playbacks, let alone during the checking of test pressings.

With a little explanation and the use of a simple mechanical aid that is always available to a working engineer, the decibel system can be mastered quickly. The system, however, is only half the problem.

The other half is the framework in which decibels are used. There are five ways the decibel system is used, and the framework or reference in use is rarely defined in conversation or in general articles about sound and recording. The context supplies the framework and reference, which is fine for someone who's familiar with the system, but is no help to the engineers who don't have decibels wired tightly.

The sidebar "The dB and Its Uses" lists the frameworks and standards used. With the references at hand, it's time to take a look at the decibel itself. For openers, what's a decibel?

Easy. A decibel is one-tenth of a Bel. So what's a Bel?

Also easy, but a bit obscure. The Bel, named after Alexander Graham Bell, who did a lot of work besides inventing the telephone, is the volume increase needed to make something sound twice as loud. In sound pressure levels, and therefore amplifier power, one Bel equals 10 times as much. This is not only obscure, it is unsettling because it states that twice the loudness of 100W is 1000W. It is also a fact.

Because a Bel represents an increase or decrease of 10, it's pretty much a blunt instrument, and is divided by 10 to make things more manageable: hence the deci-bel, one-tenth of a Bel.

So, 10 decibels equal one Bel, it is twice as loud and has 10 times the power. This accounts for the odd-sounding statement

Ampex has been making on its alignment tapes since the 1940s that the average recording level is -10dB. Odd sounding it may be, but it makes a lot of sense to make the solos and leads twice as loud as the background. A -10dB background achieves just that.

Well, almost painless. Is 12dB 11 times as powerful as 2dB, or only six times as much? With a little knowledge, such calculations will become second nature.

By Malcolm R. Chisholm

PAINLESS DECIBELS

Malcolm R. Chisholm is a Chicago-based recording engineer, acoustician and audio consultant.

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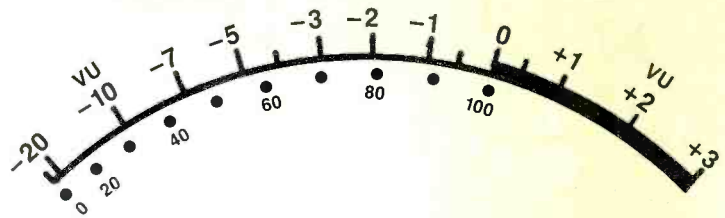


Figure 1. The standard VU meter is a readily available voltage dB-to voltage ratio converter. The top scale shows decibel values, with modulation percentage values shown on the bottom scale.

The dB And Its Uses

The decibel is used in five different ways, as explained below.

1. Gain and loss: How much more out than in for amplifiers, how much less out than in for faders, inactive equalizers, lossier networks and the like. Expressed in simple decibels. No zero reference level.

2. Line level zero, used for all in-line equipment, such as consoles, tape machines and limiters. One milliwatt across 600Ω, 0.775V. Zero dBm, with m standing for milliwatt. Plus 4dB is 1.23V. There's also a 1VdBV zero, about 2dB over 0dBm, but it's not used for professional units. Microphones are rated at

150Ω. On a transformerless input, the output is as stated. An input transformer multiples voltage by the square root of its impedance ratio. For 150Ω to 600Ω, it's twice the mic voltage, or +6dB.

3. Tape level zero, expressed in nano webers. Generally 165 for cassette, and 185 to 200 for standard professional machines. Higher references are sometimes used, but at the cost of peak signal headroom.

4. Vinyl record level, zero at seven centimeters per second.

5. Sound pressure level, a power system. Reference zero at the threshold of hearing.

Minus 10dB is one-tenth the power of zero dB, but it's a little under one-third the voltage because of the power laws. Specifically, power increases as the square of the voltage and decreases as the square root of the voltage. So to double the power, increase voltage by the square root of two, or 1.414. To increase power by 10, bump the voltage by 3.16, the square root of 10. To decrease power by two, drop the voltage to 70.7%; by 10, to 31.62%.

This brings us to the mechanical aid mentioned earlier. It's the VU meter, and anyone working with professional audio equipment has a voltage dB to voltage ratio converter at hand.

The standard audio VU has two scales, above and below a curved line. (See Figure 1.) The top scale shows decibel values, with modulation percentages shown on the bottom. These two scales are in precise alignment, and constitute a Rosetta stone for voltage decibels.

Under the -2dB line is a dot for 80%. Therefore, -2dB is a loss of 20% of voltage. Under the -6dB line is 50% or one-

half voltage. Under the -12dB line is 25%, and under the -20dB line is 10%. The 10dB—70% and 3dB—30% modulation dots look to be off a bit, as the exact percentages are 70.7 and 31.62, the square roots of two and 10. For decibel figures less than 6dB (50%), the meter conversions work only for minus values, because 50% of something is half, but 150% is not double. For 6dB and higher, decibels work both ways: -6dB equals 0.5, and +6dB equals 1:2. Minus six is half the previous or reference voltage, and plus six is double the voltage.

There are no percentages given for the plus figures on the meter, and the first few minus decibels are not noted. Table 1 lists the exact ratios for the first six minus and plus decibels. With the framework and some ratios in hand, it's time to look at how the decibel system is used to express gain, loss, and relative levels.

First keep in mind that the system is not exact. None of the decibel figures are in even ratios except 20dB (10:1 voltage, 100:1 power). Six decibels (2:1 voltage, 4:1

power) is close. However, precision's not the point; relativity is.

Six dB (plus is assumed, minus stated) is twice the voltage. Six dB is always twice the voltage. Twelve dB is twice 6dB, 26dB twice 20dB, and 106dB twice 100dB. And if the voltage is -6dB, it's always half. At any level, the percentage or ratio of change is instantly apparent.

An example: working in dBV, which puts zero at 1V, +6dBV at 2V and +12dBV at 4V. Plus 20dBV would be 10V; +26dBV, 20V; +100dBV, 100,000V; and +106dBV, 200,000V. The change from zero to +6dBV is only 1V, and from +100dBV to +106dBV is 100,000V, but the relative change is identical at 1:2.

Another characteristic of the system is made obvious by the above examples. The ratios get larger quickly as the decibels increase. Sticking with zero dBV and adding 6dB increments: +6dBV=2V, +12dBV=4V, +18dBV=8V, +24dBV=16V, +30dBV=32V, +36dBV=64V, +42dBV=128V, +48dBV=256V, +54dBV=512V, and +60dBV=1,024V. The ratios add up quickly.

Actually, 1,024V is a bit off, as 6dB is not exactly double. Running the series at 20dB, the only even ratio in the system, we get +20dBV=10V, +40dBV=100V

Table 1. Ratios of decibels to voltages.

dB	Voltage
+1	1.122
+2	1.259
+3	1.413
+4	1.585
+5	1.778
+6	1.995
-1	0.891
-2	0.794
-3	0.708
-4	0.631
-5	0.562
-6	0.501

(10x10), and +60dBV=1,000V (100x10). Plus 20dB is always 10x and -20dB one-tenth of the reference, or last voltage.

Concerning power: The system is the same, but because of the way power works, increases are made by only half the voltage figures. This again is due to the power laws. Double voltage (+6dB) yields 4x power. Double power is +3dB. 1.414 multiplied by zero. The same applies to other decibel figures, as in 20dB, which is 10x voltage, but 100x power. It's easy as power decibels are simply half the voltage figure for any given ratio. You can look at +20dB as either 10x voltage or 100x

power, but because VUs read voltage, it's logical to think in voltage decibels when reading levels.

Finally, a look at how to decipher existing decibel figures. For small figures, use the meter. For example, plus or minus 2dB is roughly 20% each way, so the tolerance is about 40%.

For big numbers, go to or just over the figure in 20s and sixes, and go down with the smaller increments. With a little thought, the conversions can be done mentally. Some examples:

1. Gain 46dB. 20+20+6; x10, x10, x2 (10, 100, 200). 46dB is 200:1.

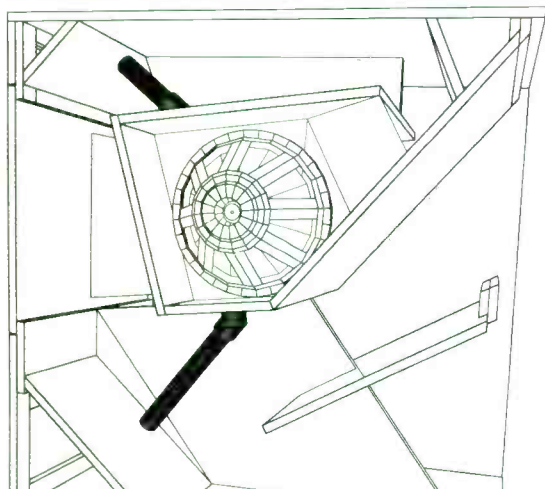
2. Signal-to-noise 58dB: 20+20+20: 10, 100, 1000: -2 (80%). 58dB is 800:1.

3. Headroom 15dB. 20-3-2, or three sixes minus three. Either way yields 5.6:1.

To end, return to the beginning. This method of learning decibels is almost painless not because there's no math, which is an advantage, but because the learning process is automatic during work once the references are understood. We all spend hours a day staring at a VU meter, and the conversions from decibels to ratio seem to osmose into the mind. Try it and see.

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January 1990 Recording Engineer/Producer • 37

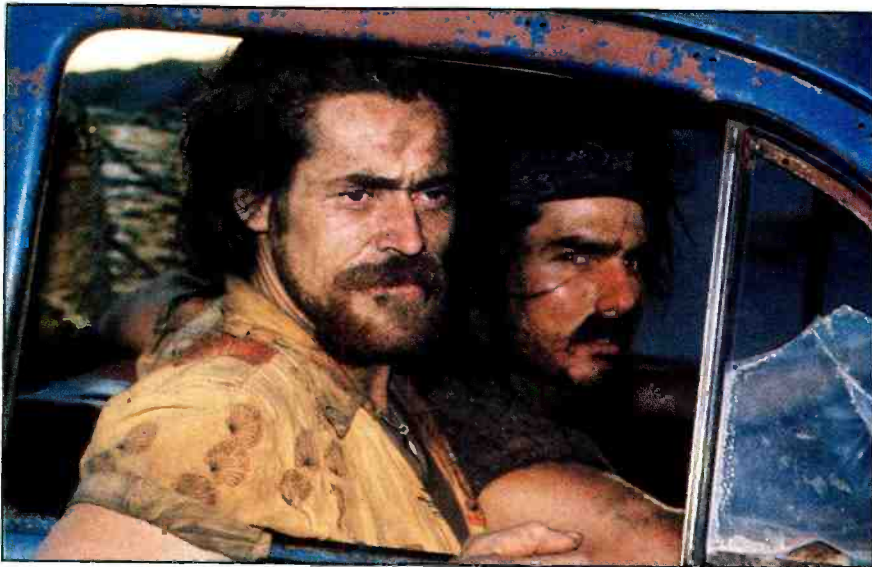
Universal Studio's epic "Born On The Fourth Of July," directed by Oliver Stone and starring Tom Cruise, is a story of the tragedy and triumph of Ron Kovic, a disabled Vietnam veteran. It is a story which spans the innocence of the 1950s and the chaotic turmoil of the 1960s.

The film is also notable for the 18-week sound production effort that had a smaller-than-usual crew involved in every phase of development. The result was the audio playing an integral role in the film's emotional impact.

Stone's films are about words, characters and the emotions they feel, and the sequences are often carried by the dramatic delivery of dialogue. The need to deliver the production dialogue tracks in that kind of depth with good quality SR and DAT stereo recordings was a very challenging and exciting experience.

Wylie Stateman, of Soundelux, and mixer Mike Minkler first consulted with director Oliver Stone in August 1988 when the film was nothing more than a script.

As the 150-page script transformed into 60 pages of sound notes, Stateman began assembling a small group of people to become intimate with the concept of the story as well as execute the various tasks to complete the production. The primary players included Todd Maitlin, production mixer; Scott Gershin, sound effects design; Bill Abbott, production recordist; Mike Minkler, dialogue/music mixer; Greg Winkler, effects mixer; Hugo Wang, Dan Rich and Mike Wilhoit, dialogue editors; Joe Myer and Avram Gold, ADR; and Chris Hogan, additional effects. This team was made a part of every phase of the picture's development.



"Historically, the sound editors cut for a small period of time and then say goodbye to their material as it heads out to the mixing stage," Stateman said. "Because we were a small cohesive group, it made sense that we stay intact to deliver our various inputs throughout the process. To actually see it all the way through the final mix was a tremendous advantage."

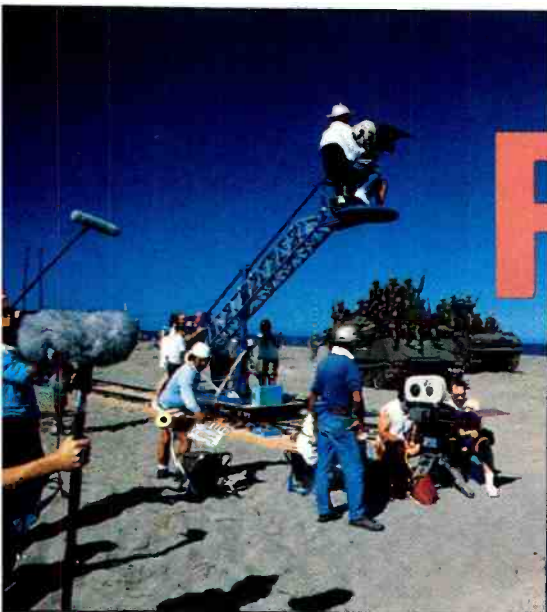
The ability for all parties to communicate was extremely helpful, as Maitlin's approach was untraditional. For starters, he used two stereo Nagra's in tandem—one with Dolby 365 SR and one without. The SR machine was used for production tracks, while the standard machine was used for dailies and backup. The 70-pound SR package was strapped to the sound cart and included four modules (two for encoding and two for decoding), which were powered by a 24V

Jeff Burger is a San Francisco-based free-lance writer.

The production of Oliver Stone's latest movie featured a sound crew intimately involved in every phase of development, a departure from the Hollywood norm.

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By Jeff Burger



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Nicad battery. The SR package smooths out the high end, especially with female talent and wireless mics, and acts as a natural de-esser.

Dialogue

Because Abbott was assigned to cover all of the production effects and background ambiences, Maitlin was free to concentrate on dialogue work. The biggest challenge was getting things while they happened so that production would not be impeded. According to Abbott, rehearsals are great times to record because the special effects usually aren't being used. Everything he recorded went onto a Sony D-10 portable DAT machine, resulting in 50 hours of production and background effects.

One of Abbott's criteria in his mic experimentation was ease of use.

"I had an Army belt that held the battery power and phantom power for the mics and in some cases the matrixing system," he said. "I started with the Sennheiser 416 X-Y setup, which had two separate zeppelins. Unfortunately, it became too bulky and clumsy to carry around the set. I preferred something that was easier to move around with.

"I found the Schoeps were nice and the Neumann was fantastic in the sense that the stereo components are housed in a single zeppelin. But what I wanted ultimately was what sounded best. Wylie was real hot on the Schoeps MS system, so I tried to use that as much as possible."

Meanwhile, Scott Gershin was busy designing and recording the sound effects. One of his biggest challenges was the 20-minute Vietnam battle sequence.

"We didn't want Hollywood guns—we wanted the real thing," Gershin said. "A lot of Hollywood explosions have a lot of high-end and white noise. The problem, other than the fact that it doesn't really

sound that way, is that in film there's only so much spectral space you can take up both dynamically and frequency-wise.

"I hit the audience with a lot of low-end waves. By doing that, I left all of the mids and highs open for music and dialogue, and they never clashed. And it still had the emotional effect of intimidation on the audience."

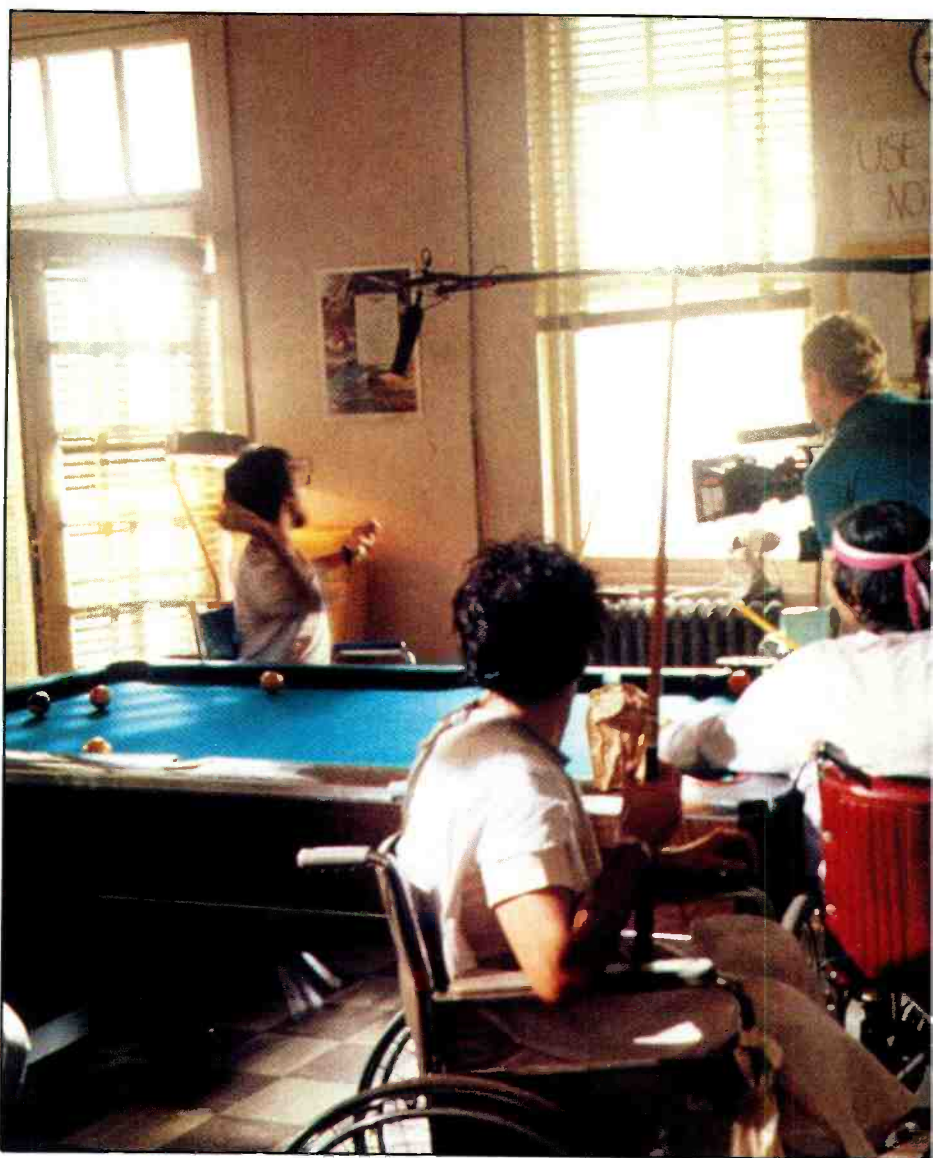
The Los Angeles Police Academy was cooperative in shooting Uzis, Chinese AK-47s, Russian AK-47s, M-14s and AR-15s while the Soundelux crew recorded them. Three different DAT recorders and mic setups were set up simultaneously at different distances, allowing for each effect to have a different perspective.

"For distant war sounds, we shot as much as a half a mile away in a canyon that's 5 miles by 10 miles with mountains all around," Gershin said. "It just echoed forever."

Outdoor ADR

At one point during the post, the sound team needed the sounds of protesters and soldiers yelling, which in most films would be done in the controlled environment of an ADR stage. To get a more natural sound the Soundelux crew took the entire group to a state park and re-enacted the scenes while recording to DAT using a Sanken single-point stereo mic and a Schoeps MS setup. The editing team felt that the exterior ambience combined with the group's vocals gave a more realistic performance and better matched the production dialogue.

All of Gershin's effects and Abbott's production effects were transferred digitally from DAT directly into a WaveFrame AudioFrame to eliminate analog degradation. These effects alone took a total of 3Gbytes of memory. The machine's configuration offered 16 voices, 30Mbytes of RAM, a





1.8Gbyte hard drive and a 2.4Gbyte tape streamer, which was used daily to guarantee that no material was lost. Mark Lanza, Gershin's assistant, used a tape for each day of the week, and effects were also backed by type.

"I needed a machine I could slow down as much as an octave or two without getting aliasing because of the AudioFrame's interpolation feature," Gershin said. "It also had the digital I/O and the capability to apply digital EQ while sampling using the built-in digital mixer."

The editing room at Soundelux was set up with surrounds and left/center/right speakers to simulate the theater, allowing Gershin to pre-dub a lot of pans and movement while he cut the effects. All of the sound effects were laid on an Otari MTR-90 with Dolby SR, saving a lot of time during the dubbing stage. For example, he would make bullet-bys appear to move through the audience by splitting channels and panning the left side manually from left to right while putting the right in the surrounds.

The result of the pre-dub was fewer tracks than found on most big shows. A total of five 24-track tapes were used for each of the movie's 16 reels—one each for guns, explosions, helicopters, background sounds and crowds. That's about 110 tracks, compared with 300 to 400 using traditional methods.

Foley work

Stateman recorded all of the Foley work at Meridian Studios, where it was recorded on 24-track, transferred to an AMS AudioFile and cut digitally by Mark Lapointe.

"Foley is sort of a black Hollywood art," Stateman said. "It can create the sort of paste that sticks the voices to the screen. We only had 15 days on the Foley stage so we had to be selective about what we spent our time on. We chose to detail the Vietnam experience and the childhood portion of the film while just highlighting the large convention and riot scenes.

"We had a very interesting time with the Vietnam sequence where we had moments of great noise density and then moments of complete silence."

The fact that production dialogue was recorded in Dolby SR made things difficult for the dialogue editors because there is no SR decoder for Movieolas. The work of editors Dan Rich, Hugo Wang and Mike Wilhoit was compounded by Stone's fondness of busy tracks and a propensity for stimulating actors on the set.

"As an explosion goes off right next to the talent or bullets are going over his head, Oliver will use blanks and explosions so that the actor feels the part," Gershin said. "Even at the riots, he'd have people yelling full blast. The problem is that



Audio was recorded using two stereo Nagra's in tandem—one with Dolby 365 SR for production tracks, and one without, for dailies and backup.

the production mixer can only mic one thing—you can mic the people and get the ambience or put it on the talent and get the dialogue. Sometimes the dialogue was dirty, sometimes it was clean. Oliver likes a dirty sound if that's what the scene calls for. He'd rather not ADR and make the line lilly-white."

The post team had only two mixers instead of the more traditional 3-man team. Head mixer Mike Minkler handled

dialogue and music while Greg Watkins mixed the effects.

"The process of mixing a soundtrack has to take a natural course which starts with pre-mixing the ADR and dialogue," Minkler said. "Having done that yourself, you segue right into mixing the Foley to augment those missing sounds that were not recorded in that dialogue track. Then you progress naturally to harder effects and then backgrounds.

"If the same two guys are following this path, by the time you're finished pre-mixing, both people know the entire content of the picture. While one man is mixing dialogue and the other is mixing effects, they've both helped one another along the way."

There were a total of 28 tracks of dialogue instead of the usual five. The extraneous background noises from those live takes forced the team to keep splitting off tracks while they were building reels. This was complicated by the availability of three alternate dialogue readings that could be chosen for each visual.

On the dubbing stage, Watkins sub-mixed all of the effects elements from a given reel, such as Foley, down to two or three sub-groups on mag SR. While those outside of the film world may have a hard time understanding the need of this seemingly arcane technology, pre-dubbing tracks to individual mag reels makes it easier to conform to the picture and slip and slide individual pre-dubs by changing the offset of a single mag machine.

Minkler's approach to outboard gear can be summed up in one word—simplicity. "You can do certain stuff with all this gear out there, but what you're really looking for is a good clean track. You're sort of eliminating that right off the bat when you start throwing 10 pieces of hardware in-line."

Still, certain tools became indispensable. "I think I used the Lexicon 480L in every scene and I don't think I used the same program twice. I also used the Aphex CX1 primarily for dialogue compression. Dialogue needs compression, not to hold its level down but to keep its dynamics down. You can lose low-level dialogue in the theatre once the sound effects are in. If you raise it up, the high-level dialogue is going to go right through the roof."

All-in-all, the sound team's experience working on the film was rewarding and refreshing. Unlike most movies, the director and the backing studio set out to tell a story that hit the audience equally on all levels through balanced attention to all media.

Sound was not merely an afterthought, but an integral element from the first day of pre-production. A decent budget was established for audio. Digital recording and SR were used at every stage. The right people were involved at all levels, got fired up and did the best job they could for artistic sake rather than money's sake.

Said Minkler, "It was a tremendous effort—a magical thing."

REP



Protest scenes were recorded outdoors in a state park, rather than an ADR stage. Audio was recorded to DAT using a Sanken single-point stereo mic and a Schoeps MS setup.



Director Oliver Stone (blue shirt, right rear) on the set. For "Born on the Fourth of July," the sound crew was involved in every phase of development, resulting in audio playing an integral role in the film's impact. (Photo by Cindy L. Manekofsky.)

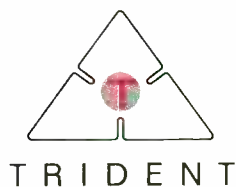
Editor's note: Technical assistance and interview material were provided by Scott Gershin.

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The biggest news at the 87th Convention of the Audio Engineering Society in New York actually came from 3,000 miles away. The night before the convention began, the Quake of '89 struck Northern California. For at least the first couple of days, most of the conversation on the convention floor centered on the fate of those in the Bay Area, especially attendees who arrived late or not at all due to the chaos.

At least one company that came out before the quake went back the next day to take care of home and family, leaving local representatives and friends to staff the booth.

Despite the events looming in the background, the convention proceeded as scheduled. In fact, it was one of the more satisfying AES shows in recent memory. In addition to the usual big guns showing their usual latest megabuck toys, there were plenty of exciting developments at the middle and lower budget ranges.

87th AES: BUSINESS AS USUAL

By Paul D. Lehrman

Even if the Northern California earthquake dominated conversations, there was still plenty of exciting product developments, from both large and small companies.



Workstations

I promised all my friends never to use "the W word" in an article, but unfortunately there's no other term to adequately categorize the variety of digitally based recording and editing systems that were on display at this year's AES. The Apple Macintosh II family has inspired a flood of computer-based digital audio systems, from the simple to the extravagant. The low end (which is not very low) was represented by **Digidesign**, which showed the new DAT I/O digital interface for its Sound Tools system. Sound Tools provides stereo hard-disk recording and editing, using a Motorola 56001-based circuit card that fits inside the computer for processing, and off-the-shelf products for storage.

DAT I/O allows direct interfacing of the system with DAT decks and other devices that have the AES/EBU consumer interface. In a surprise move, Digidesign announced a co-development agreement with Otari, in which the California company will help the Japanese giant develop hard-disk technology, while maintaining its own identity and product line.

Studer EdiTech, formerly Integrated Media Systems, showed a more elaborate system. The maker of the Dyaxis Mac II/hard-disk-based system was bought by the Swiss company earlier in the year, and several major improvements have been the result.

"It's a very exciting time," said one spokesman. "Lots of new engineers are arriving from Studer, and we don't even know their names yet."

The system is now capable of 4-channel overdubbing and playback using a second rack-mounted processing module. The editing software has become faster and more intuitive.

A new synchronizer module allows the system to lock to SMPTE, VITC and MIDI Time Code, as well as tach pulses. An "EX-cellerator" card, which is installed in the computer, uses a 56001 chip to enhance the system's signal processing capabilities, including equalization, dynamic mixing and time scaling. New software allows the Dyaxis to emulate Ampex and Abekas video equipment in the post-production suite, for direct slaving to video editors.

Paul D. Lehrman is a Boston-based producer, electronic musician and free-lance writer.

Do You Know these terms?

Monitor — a reference loudspeaker system for the mixing and mastering of recorded music.

Standard — a reference from which qualitative judgements can be made.

Tracks — (noun) channels on a multi-track recorder (verb) accurately reproduces the audio qualities of another transducer.

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Circle (21) on Rapid Facts Card

RADIAN
AUDIO ENGINEERING, INC.

Symetrix is a new player in the workstation game; it showed the DPR100 Digital Processing Recorder, offering eight tracks of simultaneous hard-disk recording, with access to up to 40 tracks for mixing. The processing hardware fits in a 9-unit "Eurocard" frame, and 630Mbyte hard drives are used for storage, along with 8mm streaming tape.

The Macintosh connects with the hardware via a fast Ethernet link, and acts simply as a controller. A 19-inch monitor is essential for this system, as the controlling screens use every pixel. The various screens show 40 channels of parametric equalization, dynamics control, synchronization, EDL and signal routing, as well as a real-time mixing console. By the time the unit is released, now scheduled for spring, the mixing portion may be moved off to a dedicated hardware control surface.

And there was even a 64-track system on display. **Digital Dynamics** showed the ProDisk 464, which can be ordered with as few as four tracks using a single rack-mounted processing unit and hard disk, under the control of a Mac II. The system can be expanded in track-increments of four.

New England Digital has been using

More Info

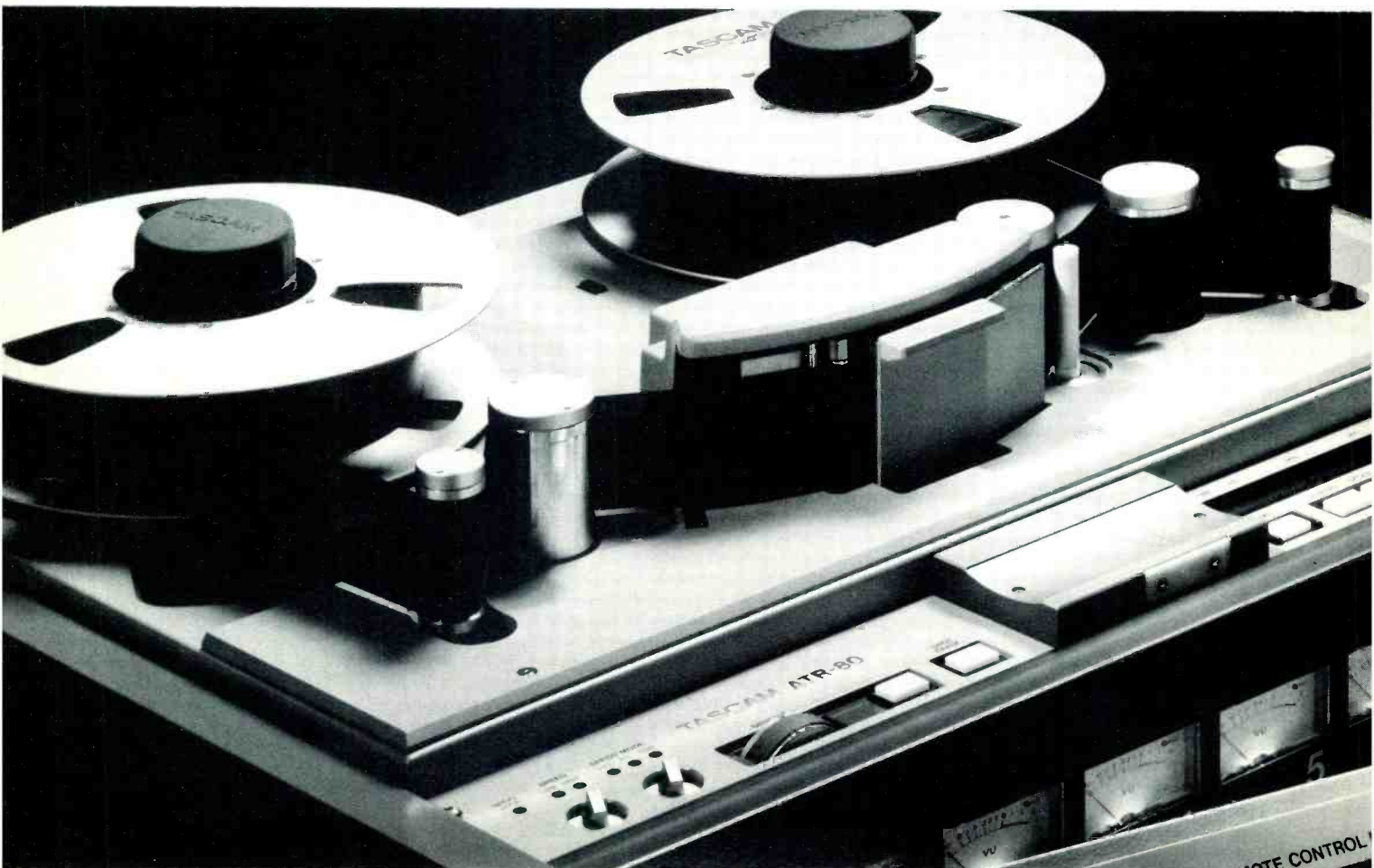
For additional information on the products mentioned in this article, circle the appropriate number on the Rapid Facts Card in the back of this issue.

Akai A-DAM	(150)
Akai DD1000	(151)
AKG Digital DSE-7000	(152)
Alpha Audio DR-2	(153)
Ariel DM-N	(154)
Digidesign Sound Tools	(155)
Digital Dynamics ProDisk 464	(156)
Fostex 4020	(157)
Hybrid Arts ADAP II	(158)
New England Digital MIDInet	(159)
Sony MU-R201	(160)
Studer EdiTech Dyaxis	(161)
Symetrix DPR100	(162)
Tascam MIDiiZER	(163)
Technos Axcel	(164)
Toa Saori	(165)
Yamaha DMR8X	(166)
Zoom 9010	(167)

a Mac II as a controller for its Synclavier systems for a while, and the company showed a new product for its many customers who use the workstation in conjunction with MIDI equipment. MIDInet is a switchable 8x8 MIDI patchbay, combined with processing hardware and controlling software, providing a network capable of running 128 simultaneous MIDI channels. The software, which runs on the Macintosh along with the standard Synclavier software, provides all sorts of routing and filtering algorithms, including mapping, scaling, transposition, echo and merging, using an intuitive graphic environment.

The Macintosh was not the only computer on display with hard-disk audio capabilities: **Hybrid Arts**, whose ADAP system has been running on the Atari ST family for several years, showed a much-improved ADAP II, with digital (AES/EBU or S/P DIF) I/O, crossfade editing, SMPTE lock and an optional, erasable optical disk. The software is still not as graphically oriented as on comparable Macintosh systems, but the system appears to be quite fast and is reasonably priced.

Finally, there was the DSE-7000 from **AKG Digital**. This workstation, aimed at the broadcast and commercial production



market, is based on an IBM AT-compatible computer, and instead of using hard-disk storage, it manipulates all of the data in RAM, which makes it extremely fast. It comes equipped with 4.4 minutes of memory, expandable to 17.5 minutes. It includes a color monitor, a control desk with 10 faders and scrub wheel, and even speakers. Eight tracks are handled simultaneously, with unlimited bouncing, as well as time-slipping, auto-locating and automated mixing. The system will interface directly with a digital equalizer made by **Orban** (now part of AKG), for effects automation. Shipment is scheduled for spring.

New recording formats

Certainly among the biggest attractions at the convention were the high-end digital tape recorders. **Studer** showed its new 48-track DASH machine, and **Tascam** jumped on the DASH bandwagon as well with a 24-track machine. But there were plenty of other digital recording formats to be seen.

For example, **Alpha Audio's** DR-2 brings up the question: When is a digital hard-disk recorder not a workstation? Answer: When all it does is record. For about \$12,000, the unit provides 30 minutes of



The AKG DSE-7000 workstation is aimed at the broadcast and commercial production market.

stereo audio, at any of the standard sampling rates, along with time code. No editing, just record and playback. Digital outputs in AES/EBU, S/P DIF and PCM-1630

formats are provided, and a SCSI port is provided for archiving. Designed for the post-production studio, the device will follow Sony's video control protocol. Release is scheduled for December.

Akai showed its relatively inexpensive digital multitrack tape deck, the A-DAM, which uses standard 8mm videocassettes. Besides providing the fidelity advantages of digital recording, the unit offers adjustable track delay and automatic punching, with digital crossfade editing. A 12-track system costs \$25,000, and up to two 12-track slaves can be added, at \$22,500 per unit, for a total of 36 tracks. All can be locked together with accuracy "to the sample," according to a spokesman.

The company also showed a prototype of the DD1000 optical disk read-write machine. It uses standard Sony optical disks, providing 30 minutes of stereo audio per disk. Four-track playback is also available. Units are cascable, and will have ports for video sync, RS-422, AES/EBU and SCSI. The internal software will allow time compression and expansion. Delivery is expected in March, and the price will be about \$13,000.

At the **Yamaha** Communication Center a few blocks away from where the convention was held, attendees were invited

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Circle (22) on Rapid Facts Card

January 1990 Recording Engineer/Producer • 47



Tascam showed a final software version of the MIDIiZER, a 2-machine transport synchronizer.

to come over and look around. Among what they saw was an all-in-one digital recorder and automated mixer known, tentatively, as the DMR8X. The basic 8-track unit resembles a DMP-7 on steroids, using similar multi-purpose moving sliders, and a whole lot of function buttons. Three internal effects generators are provided, each equivalent to an SPX-1000, and effects inserts and 3-band parametric EQ are provided for each channel. Internal processing is all 24-bit, and tape storage is 20-bit.

The built-in tape deck (which also provides two analog tracks and a time code track) uses a proprietary 8mm-style format, running the tape past a stationary head at 5ips, providing 20 minutes of recording on each cassette. One or two slave recorders can be linked to the main unit, providing up to 24 tracks, and the same eight faders on the console are used to access all tracks, using various "shift" buttons. Automation data is stored on the same tape with the audio as a digital header—when the tape is loaded, the data is dumped into RAM, and it then follows the time code.

Interestingly, the unit contains no analog inputs—just Yamaha-format digital. According to a spokesman, this is so customers don't have to buy converters for formats they're not going to use. An 8-channel A/D box will cost about \$5,000, and converters for other digital formats will probably be about the same. The system price is about \$25,000 for the first eight tracks, and \$18,000 for each additional group of eight.

Small studio control

Tascam showed the "final software revision" of its to-be-released-any-day-now MIDIiZER. Representing a serious attempt to integrate MIDI and studio control, the unit is a 2-machine transport synchronizer that will work with any deck that allows serial control, including the company's cassette decks (which is no small trick). It converts SMPTE time code to MIDI Time Code, and will generate MTC "wild." It can also generate MIDI Clocks and Pointers from SMPTE, using an inter-

nal tempo map that can be "learned" in real time from a sequencer, entered by hand or tapped in.

Fostex showed its new 4020 SMPTE/MIDI Event Controller, which is now shipping. It has eight relay contacts that can be opened or closed on cue from SMPTE times or MIDI commands, as well as a 20-pin remote connector for direct control of Fostex's (or, with appropriate interfaces, other manufacturers') tape machines. Up to 999 events can be stored in memory. The unit can also respond to tach and direction information, and has an internal clock. It reads and writes SMPTE and MIDI time codes, and converts SMPTE to MIDI.

Synthesis

Back at the Yamaha center, the company demonstrated the SY77. Yamaha is still using FM technology, but in this model has made it much more flexible and combined it with ROM-based PCM samples to create what it calls "Real-time Convolution and Modulation." The model has 32 voices, dynamically allocatable, with 16-MIDI channel polytimbral capability. Delivery



Studer EdiTech is the new name of Integrated Media Systems, which showed the latest version of the Dyaxis workstation.

is set for spring, and the price will be about \$3,000.

A remarkable demonstration of resynthesis technology went on in the suite occupied by a new Canadian company called Technos. Resynthesis is a process of breaking down sounds into individual harmonics, and reconstructing them one at a time. It has long been known that this is the ultimate way to sample, but it requires a tremendous amount of computing power. The company's Excel system stores samples as 32 partials, each with a multi-segment pitch and volume envelope. Each envelope has a resolution as low as 5ms.

Not only does this mean that a sound can be saved in (the company claims) 90% to 95% less space than a comparable sampler, but it also means that sounds can be

altered in real time, as you play them back. The large control panel contains a touch-sensitive 64x32 LED grid, which both displays parameters such as envelopes and spectra, and lets you fool with them as the sound is playing—so you can, for example, speed up a sample (without changing its pitch) halfway through it.

The system will allow MIDI control, including the capability to interpolate between timbres using continuous controllers. A standard 8-voice system will cost about \$12,000. Initial deliveries are expected by the end of the year.

Processing

Among the myriad of processing and effects units there were plenty of good-sounding, less-than-\$1,000, Swiss Army knife-type multi-effects boxes, doing things that you wouldn't have dreamed possible at any price just a couple of years ago. A few devices were especially notable, however, for various reasons.

Zoom Corporation is a Japanese company that has since 1983 been an OEM supplier for several synthesizer and processor manufacturers. It is now introducing products under its own name. Among these is the 9010, a rack-mount multi-effects box with a difference: It has four independent inputs and four outputs. The software provides a number of possible signal routings, so that effects can be used independently or in combinations.

The 9010 will come equipped with all the standard effects, but new ones may be provided in the future by the manufacturer on ROM cards. There are 60 factory and 30 user-definable patches, and additional patches can be stored on RAM cards. The price will be \$1,500, and delivery is expected in the first quarter of 1990.

Ariel Corporation had an eclectic display showing a number of products that interface with various computers. The DM-N Digital Microphone is a stereo microphone with built-in A/D converters, designed to interface directly with the NeXT computer, which has an on-board Motorola 56001 DSP chip. The price is \$595. The company plans to introduce a model of the microphone with AES/EBU outputs, as well as outboard hardware products to expand the processing capabilities of the NeXT. Also shown were cards for IBM PCs and compatibles providing high-quality signal recording and processing using Motorola and AT&T chips, along with a comprehensive library of software.

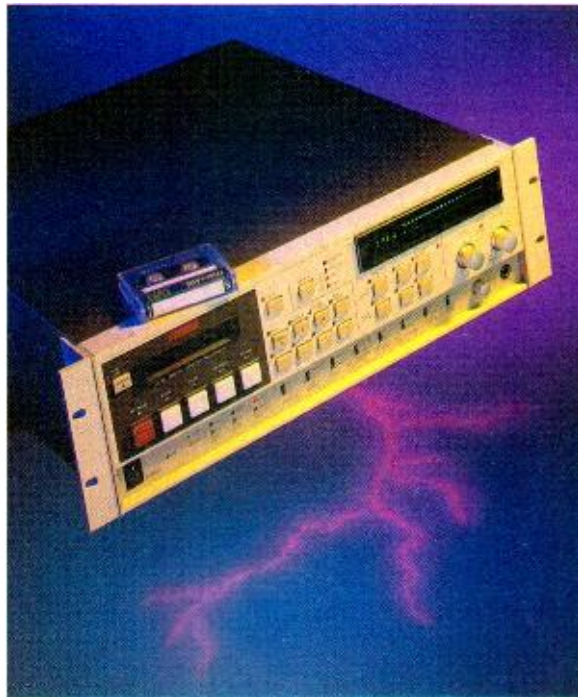
Toa showed the Saori, a modular processing system for sound-reinforcement applications. Using 32-bit digital technology, the system includes a zero-phase-shift equalizer module with 30 bands of parametric EQ, a 4-band notch filter, and 1/6-octave selectable high- and

NOW YOU CAN LEASE DIGITAL BY THE MONTH FOR THE PRICE OF RENTING ANALOG BY THE DAY.*

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With the D-20 professional digital audio master recorder, you can post-stripe time code on an existing DAT tape (recorded on any DAT machine), or you can record time code and stereo audio on the D-20 and play that tape back on any other DAT machine with complete compatibility.

The 20-pin **synchronizer port** allows interface with all the popular synchronizer systems (ours included) and there's an RS-422 port for control which requires serial communication. There's an external sync input for composite video, plus Word Sync Input and Output capability - all standard on the D-20.



Because of our 4-head recording system the D-20 features **off-the-tape monitoring** so that you'll always know exactly what you have on tape - a very important feature considering the DAT's ability to record for two straight hours (no more multiple reels and alignment hassles).

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even a **pitch control** complete with digital read-out.

Most important of all, the D-20 sounds great. It records and reproduces all the music completely, faithfully, and better than analog alternatives. So plug into the digital master recorder that has the professional features you need now at a price you can afford now.

* The analog recorder referenced is the Studer A-80 1/2" with 3-track head nest; the price comparison is based on option (A) below and an average of published rates of major audio rental companies for the Studer.

Details of the D-20 Lease Program:

* A simple one page application is all that's required. • Maximum 48 hour turnaround approval. • Two attractive payment schedules: (A) **\$199.70 per month, 60 months, first and last payments in advance: 10% purchase option.** (B) \$287.20 per month, 36 months, first and last payments in advance; 10% purchase option. • Please note that this lease with option to purchase is not offered through Fostex Corporation. All documents and associated paperwork will be completed by **Signet Lease Group**. Call them directly at **(215) 783-6666**. • High approval rating in the audio industry.

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Circle (15) on Rapid Facts Card

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Discontent

By Dan Torchia

Aside from technology, this AES was notable for the level of dissen- sion among exhibitors concerning the show and some AES policies. AES is not a unique target; the entire trade show schedule has come under scrutiny, and organizations such as NAMM have been discuss- ing policies with manufacturer groups.

Still, several points that boiled under the surface during past shows were openly discussed on and off the show floor. Some of the major ones:

- The venue. As in past New York shows, exhibitors were split between the Hilton and Sheraton hotels. Unlike two years ago with Sony, there was no large exhibitor to anchor the Sheraton. As a result, floor traffic could at best be described as light. Positioning the magazine bins and offering free t-shirts the last two days of the show did not seem to alleviate the problem.

- Equipment theft. There are reports of after-hours equipment theft at every show, but this year seemed much worse. At least six companies reported major losses,

even in locked demo rooms. And it wasn't small stuff either; Soundcraft lost a console in a 4' x8' crate. That some companies hire their own security at New York shows underscores the point that security is a major problem at a hotel venue.

- The conflict with SMPTE. The last day of the AES show was the first day of the SMPTE convention in Los Angeles. Although floor traffic did not seem to be affected on the last day, the conflict caused major headaches for companies that needed to be at both shows. There was major grumbling that next year's show also conflicted, although this has since been resolved. (AES is now in late September; SMPTE is in mid October.)

- The formation of a manufacturer's advisory group. RE/P, along with sister publication Sound & Video Contractor, sponsored a manufacturer's breakfast to listen to members of the Pro Audio Exhibitors Group. Representatives from more than 50 companies attended. The U.K. group was formed this past summer to represent exhibitor groups to exhibition organizers, and the group wanted to familiarize it-

self to American manufacturers.

Rather than have American companies join a British organization, the PAEG suggested that a U.S. organization be formed and that the two regularly interface. In addition to joining in on the efforts to reduce the international trade show schedule, it was suggested that the American group could try to eliminate the Los Angeles/New York staggering of AES shows, and to try and locate another New York venue besides the Hilton.

Because it was an exploratory meeting, it is too early to tell if American attempts at an organization will succeed. AES representatives at the meeting, including executive director Don Plunkett, were lukewarm at best at suggested changes.

But the new AES dates were a heartening first step. It is impossible to say if manufacturer complaints were responsible for AES moving the show earlier, but officials did give their word that the overlap would be worked out. That's a good indication as any that progress may be possible.

low-pass filters; a stereo 4-way crossover module with selectable filter types and slopes up to 24db/octave, along with time alignment calibrated in microseconds, millimeters or inches; a 16-bit A/D converter; an 18-bit D/D converter; and white and pink noise generators. The company says



The TOA Saori is a modular processing system for sound-reinforcement applications.

the system is already in use, although the official release date is next April.

Finally, a little something that made this correspondent smile. Off to the side of the mega-mixing consoles and multitrack digital decks at the **Sony** booth was a rack of processing gear which was made, according to a spokesman, by the company's Soundtech division. Among these was the MU-R201 Reverberator, a true stereo device with 100 factory presets and 100 user registers.

The technology is not new, I was told, in that this division has been making OEM products for some time, and this particular engine has been previously available under the Ibanez name. The price—\$1,050—is not particularly startling considering what other manufacturers are doing for half that much, although true stereo processing is rare at this level.

What caught my eye, however, were the MIDI jacks. The device can respond to MIDI program changes to change presets, as well as MIDI controller changes to adjust one parameter within each preset. This may be old stuff, but I believe this is the first time a product has been shown with the Sony name on the front and a MIDI jack on the back.

Given MIDI's ongoing struggle to be accepted as a valid standard among high-end manufacturers (particularly the Japanese ones), this can't help but make feel hopeful.

RE/P

Bose® ProFiles

"When I went after this job, I looked at several manufacturers. But when I examined cost vs. performance and considered ease of installation, Bose was the clear choice."

*—Phil Thorne
Taft Broadcasting Company*



The Site: Health & Physical Education Building
Texas Southern University, Houston, Texas

The Challenge: Provide a quality sound installation for 12,000 seat enclosed basketball arena with anticipated crowd noise level exceeding 95dB

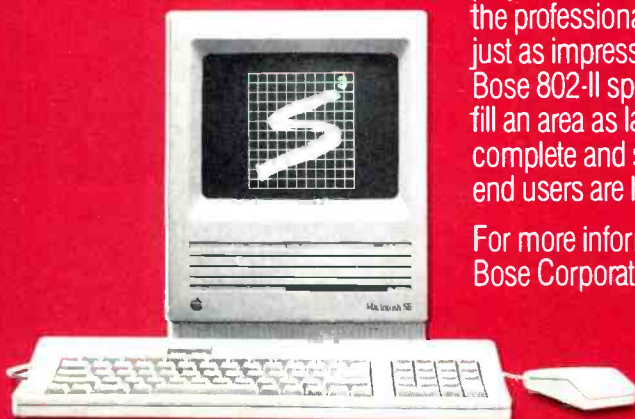
The Contractor: Phil Thorne—Taft Broadcasting Company

The Tools: Bose® Sound System® Software

The Products: Bose 802®-II/Acoustic Wave® Cannon Central Speaker Cluster
Bose 802-II Distributed-Delayed Speaker System

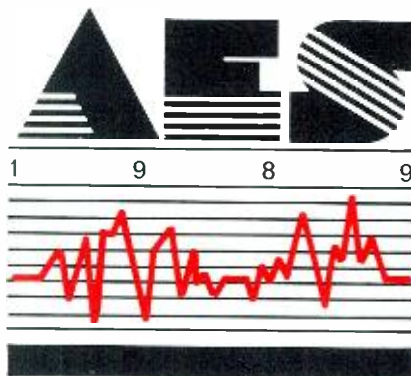
The Result: "Using Bose Sound System Software, I was able to show my customer a graphic representation of what their system would look like, and a computer projection of how it would perform. My customer was very impressed with the professionalism and in-depth analysis of the presentation, and they're just as impressed with the final product. When you first look at the size of the Bose 802-II speakers, you wonder if they'll really produce enough sound to fill an area as large as an arena effectively. When you use them the sound is complete and sound pressure levels are consistent over the whole area. My end users are happy I chose Bose products."

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Product Review

All of the following products were introduced at the AES show in New York, October 1989. Many companies gave us advance information on their products; these previews can be found in the October issue's Product Preview. Other companies chose to wait until the show to announce their new products. Many of those products are included here.

Studer D820-48

The D820 48-channel DASH digital multichannel recorder is compatible with the single-density format of all 24-track DASH recorders; tracks of channels 1 through 24



are normal density format, tracks of channels 25 through 48 are double density format and are added alternately between channels 1 to 24. A multitrack DASH tape of any density can be played back or recorded on the D820-48. Features include

two record heads in thin film technology for all 52 tracks, and one glass-bonded ferrite head for playback. Low-noise passive filters for the A/D converters were developed for the 4x oversampling D/A converters. Digital signal processors in each audio channel are used for crossfading, switching, error connection and concealment.

Circle (170) on Rapid Facts Card

Symetrix DPR-100

The DPR-100 Digital Processing Recorder features 40 channels of recording in blocks of eight, real-time level control, EQ, compression, limiting and gating, and recall of every system parameter. Record and edit functions are locked to SMPTE/EBU time code, VITC, house sync and/or external word clock. Edit resolution is to the digital sample. Five controller screens that let the user integrate and control the entire DPR-100 system are also now included. The screens are: the main controller screen, comprised of the EDL, edit, and mix and transport panels; the equalization screen with an 8-channel, 4-band parametric EQ section; the dynamics screen with an 8-channel compressor, gate/expander and limiter section; the signal-routing screen; and the synchronization screen.

Circle (171) on Rapid Facts Card

Meyer Sound HD-1 monitor

The HD-1 self-powered monitor is optimized to approximate a true point-source radiator and has a frequency response of 32Hz to 22kHz. The monitor has an 8-inch cone low-frequency driver, dome tweeter, active crossover, optimized pole-zero re-

sponse correction filters, SpeakerSense driver-protection circuitry and dual-power amplifiers.

Circle (172) on Rapid Facts Card

Soundcraft 3200 console

The split-configuration 3200 offers up to 36 inputs with full 32-bus routing and incorporates an EQ circuit. The console has identical EQ facilities on the inputs and the group modules. Other features include an integral noise gate available on each in-



put and monitor channel with a 40ms attack time, global multitrack A/B switching, tape machine record/ready switches linked to logic circuits, and central switching of the auxiliaries to either pre- or post-fade, with aux's 5 and 6 remaining locally reversible.

Circle (173) on Rapid Facts Card

Sony SDP-1000 digital audio effector

The SDP-1000 is a signal processor designed for mastering applications. Incorporated is the Sony DSP LS2 LSI chip that permits 32-bit internal signal processing



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with 24-bit (AES/EBU, S/P DIF) and 20-bit (SDIF-2) I/O word lengths. Other features include an equalizer section with digital 4-band parametric equalization, high/low shelving and low/high cut filtering, and a dynamics section with a built-in time code reader that reads SMPTE/EBU time code.

Circle (174) on Rapid Facts Card

JBL Concert Series diffraction monitors

The JBL Concert Series line of loudspeaker systems now includes two Diffraction Stage Monitors: the 4832A 2-way dual 12-inch and the 4835A 2-way 15-inch. Both monitors have Vented Gap Cooling transducers for low frequencies and 2450J neodymium 2-inch exit compression driver coupled to a diffraction horn for high frequencies.

Circle (175) on Rapid Facts Card

Panasonic SV-255 portable DAT recorder

The SV-255 has low distortion, high stability and a 128dB S/N ratio. The pre-amp has a 87dB dynamic range and a true gain control. Other features include a dual-channel mono recording mode and MASH A/D converters.

Circle (176) on Rapid Facts Card



3M 186 low-noise tape

3M 186 is designed for standard bias setting to avoid machine changeover time during duplication. The tape is environmentally stable with a magnetic coating to prevent deposits on or clogging of tape heads. The tape is available in either 2,500- or 5,000-foot hubs, 12 tapes to a carton.

Circle (177) on Rapid Facts Card

3M DAT cassette

3M's Professional DAT cassette uses a high-coercivity metal particle coating on the base film for high output, wide bandwidth and a low error rate. A binder handles the stresses of high-speed rotary head scan-

ning and searching at up to 200x play speed. The cassette is available in standard playing times of 120, 90, 60 and 46 minutes.

Circle (178) on Rapid Facts Card

Beyerdynamic wireless systems upgrade

Beyerdynamic has simplified its wireless systems to include a wide range of receivers and transmitters. The SEM 186 hand-held mic has the EM 81 condenser capsule and operates in the 174MHz to 216MHz VHF range and withstands SPLs of up to 138dB. The TS 190 body-pack transmitter, designed for use with lavalier mics, provides 4-input sensitivity selection



for tuning to any mic. The company is also offering the NE 185.10 non-diversity and NE 185.11 diversity wireless receivers as part of the professional line. Both receivers are available in rack-mount configurations for most wireless applications.

Circle (179) on Rapid Facts Card

Beyerdynamic A/V microphone pack

The Beyer A/V Pack is a set of three microphones designed for A/V use, including a lavalier, a hand-held interview mic and a shotgun mic: the M58, the MCE86 and either an MCE5 or MCE10. The set is available for less than \$900.

Circle (180) on Rapid Facts Card

Soundmaster Syncram

Syncram modules provide two channels of random access digital audio per module. The modules have disk-based recording time from 30 minutes to two hours per module. Key features include modular architecture, fiber optics, flexibility, system integration, and expandability.

Circle (190) on Rapid Facts Card

Paragon Series

The Paragon sound reinforcement console from Audio Teknology is available in both 32- and 40-channel configurations, VCA group mixing, and audio group mixing. The series is based on a large scale bus

structure: 16 sub masters can be operated as eight stereo, 16 aux sends, eight VCA groups with integrated muting, a VCA master, a stereo mix, eight stereo effects returns, four stereo matrix outputs, four mono matrix outputs and the mix bus.

Circle (181) on Rapid Facts Card

Rolls HR11C Mic Processor

The HR11C Mic Processor from Rolls Corporation is an instrument-level pre-amp for individual control of parameters before the main mixing console or as a separate mixing channel for a PA or monitor system. Parameters under control are high/low impedance, phantom power, compression/limiting, anti-feedback notch filter, 10-band ISO EQ and level control. The HR11C also includes signal present, overload and power LEDs.

Circle (182) on Rapid Facts Card

Rolls HR100 power amplifier

The HR100 from Rolls Corporation is a building block for smaller PA systems or a midrange treble driver in higher systems. The HR100 features 100W RMS 4Ω load output, built-in bridging capability, MOSFET drivers, one second turn on delay and LED power output meter. The amp will drive 25V speaker lines directly.

Circle (183) on Rapid Facts Card

Genelec active monitor systems

Available in the U.S. from Quest Marketing are three Genelec active monitor systems: the 1035A, 1034A and 1024C. The 1035A is a control room monitor for large control rooms, with peak acoustic levels



of 144dB SPL with low distortion, two 15-inch low-frequency drivers, two 15-inch midrange drivers and a 1-inch compression driver. The electronics center has three dual-channel power amplifiers and an audio processing unit that consists of crossovers, a starting sequencer and the driver protection processor. The 1034A is

similar but with a lower acoustic output and smaller enclosures. The 1024C has the amplifiers and crossovers built in the driver enclosure.

Circle (185) on Rapid Facts Card

Josephson KA-800 condenser mic capsule

The KA-800 bidirectional figure-eight capsule for the Josephson interchangeable-capsule condenser mic system is symmetrical on both sides of the single 12mm diaphragm. The capsule has a frequency range of 20Hz to 20kHz; front to side rejection is 20dB from 1kHz to 20kHz.

Circle (184) on Rapid Facts Card

Yamaha AD2X A/D converter

The AD2X 2-channel A/D converter features 1-bit Delta-Sigma A/D converters and "digital floating" technology, which provides performance of more than 100dB dynamic range. The 1-bit Delta-Sigma A/D converters give 19-bit resolution and have THD as low as 0.018%. The AD2X offers both 48kHz and 44.1kHz sampling rates with a front-panel indicator and pack-panel selector. Analog inputs are electronically balanced with a 20kΩ input impedance. Digital outputs are in AES/EBU, S/PDIF CD/R-DAT and Yamaha MEL2 formats. Input level is from +4dBm to +23.5dBm.

Circle (188) on Rapid Facts Card

New England Digital Optical Disk Sound Libraries

Three optical disks have been introduced for use with the Synclavier, PostPro and Direct-to-Disk systems. The Prosonus Library, Volume 1 (list price \$3,950), has more than 4,000 sounds and musical effects. The library includes brass and brass choirs, double reeds, electric guitars, pianos and electrical orchestral and exotic percussion. The Sonic Boom, Volume 1: Dynamic Range (list price \$1,750) has more than 630 sound effects, exclusively guns, bullet hits, ricochets, silencers and gun handling. The Universal Library, Volume 1: Rhythm Instruments (list price \$2,575) emphasizes drums, keyboards and guitars.

Circle (189) on Rapid Facts Card

Soundmaster CPU

The Soundmaster CPU system is an Intel 80386-based computer running at 16MHz. It includes a numeric co-processor,

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PM-600
PM-900
PM-1200
PT-1250

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Circle (191) on Rapid Facts Card

Drawmer M 500 dynamics processor

The Drawmer M 500, available from Quest Marketing, is a 2-channel digitally controlled dynamics processor. The M 500 can combine the following functions simultaneously: de-esser, frequency conscious noise gate, expander, compressor, limiter, auto panner and auto fader. Suggested price is \$2,149.

Circle (186) on Rapid Facts Card



Drawmer DF 320 noise filter

The Drawmer DF 320, available from Quest Marketing, is a 2-channel single-ended noise reduction system. The DF 320 has an expander with automatic attack time, variable release, switchable ratio and attenuation with up to 40dB of noise reduction. The dynamic filter has manual and automatic modes of operation. The noise filter can be used on tape, samplers, synthesizers and workstation sources.

Circle (187) on Rapid Facts Card

Soundmaster Syncode

The Soundmaster time code generator, for system timing and time code generation of a desired time format, includes 24- or 30-frame drop/non-drop, referenced to either 60Hz or 59.94Hz. Syncode can be accessed to perform jam sync, load present time code numbers and change time references.

Circle (192) on Rapid Facts Card

Orban 764 parametric equalizer system

AKG's Orban Professional Products division has introduced the 764 programmable parametric equalizer system. The 764A has analog filter design with computer storage, retrieval and editing and is controllable with RS-422, RS-232 and MIDI external controllers. It is available as a mono- or dual-channel master or a 2-channel slave.

Circle (198) on Rapid Facts Card

Systems Development Group A^r Diffuser

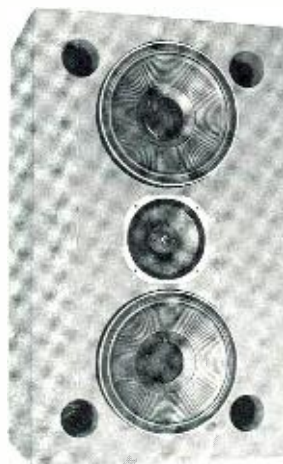
The A^r Diffuser is a broadband acoustic diffuser that will interlock to form diffusion to fit a space. It is sold in two sizes: a 15-inch square and a 15"×30" rectangle, in order to treat small problem areas and complete walls. The diffuser is available in several woodgrains, the standard being poplar.

Circle (193) on Rapid Facts Card

APL DCM-15 control room monitor

The model DCM-15 control room monitor from Acoustical Physics Laboratories has high-efficiency and SPLs from magnetic systems, voice coil construction and a multiple magnetic system with the dome tweeter. Dual 15-inch drivers gives bass reproduction to a -3dB point of 24Hz. The midrange spectrum, 120Hz to 2500Hz, is reproduced by a 9-inch driver with a linear magnetic and mechanical suspension system. A coaxially mounted dome tweeter reproduces treble at 26kHz.

Circle (199) on Rapid Facts Card



EAW DS101

The DS101 multi-purpose compact system from Eastern Acoustic Works provides high-definition coherent output capability. The DS101 becomes a stage monitor for stage choirs, industrial shows and club PA. A 10-inch cone driver with a coaxial high-frequency horn was developed for the system. The system handles 200W, has a flat frequency response from 70Hz to 18kHz, and an on-axis sensitivity of 97dB.

Circle (195) on Rapid Facts Card

EAW DS223

Eastern Acoustic Works' DS223 high-definition wide-dispersion system includes two 12-inch woofers, two 7-inch midrange drivers and a WPG high-frequency device. The system can handle 400W of power, with on-axis sensitivity of 100dB. Frequency response is flat from 40Hz to 18kHz.

Circle (196) on Rapid Facts Card

AKG Acoustics K270S

The K270S monitor headphone automatically shuts off when removed from the head, and uses parabolic pressure zone design with two full-range diaphragms in each ear cup. AKG's self-adjusting headband is included for low wearing fatigue during long sessions.

Circle (197) on Rapid Facts Card

FM Acoustics 801A amp

The FM 801A precision high-power amplifier, an advanced edition of the FM 801, has a maximum output voltage of 180Vpp; the continuous output current capability is more than 40A RMS per channel. Into the resistive loads, the 801A delivers up to 3,000Wp, 1,500W RMS per channel into 1.5Ω.

Circle (194) on Rapid Facts Card

Neumann AK 43

The Neumann KM 100 series of microphones introduces the AK 43 wide cardioid capsule. The capsule's damping factor is 4dB at 90°, 8dB at 135°, and 11dB at 180°. The frequency response is 0° and the frequency curves are parallel to the 0° curve up to 12kHz in the front half space. The AK 43 is best-suited for recording a wide sound field.

Circle (200) on Rapid Facts Card

NED Velocity/Pressure keyboard update

The updated Velocity/Pressure keyboard for the Synclavier 9600 and 6400 digital audio systems offers greater responsiveness and resolution, and a dynamic range that has been doubled. The keyboard incorporates an electro-mechanical design with velocity and pressure sensors.

Circle (213) on Rapid Facts Card

WaveFrame introductions

Three product enhancements for the AudioFrame are now available. The Digital Signal Processing Expansion DSP-X module provides 12 digital inputs and outputs in either PD or SDIF-1 formats, and a pair

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AES NEW PRODUCTS

of inputs and outputs in SDIF-1 or AES/EBU formats. List price is \$7,000. An erasable magneto-optical drive that uses removable disks for session back-up and sound archiving is available as an alternate or supplement to the 8mm tape streaming system used in the AudioFrame. List price is \$6,300. The Storage Expansion Rack accommodates four SCSI devices, increasing disk storage capacity from one to eight hours per rack. List price is \$3,750.

Circle (214) on Rapid Facts Card

Dolby 400 series switchable noise reduction

The Model 400 series features software-controlled automatic alignment and channel grouping; up to eight channels switchable between Dolby SR and Dolby A-type noise reduction are available. Any or all channels can be switched without switching cards. For multitrack and multi-machine use, any number of channels can be allocated to separate groups.

Circle (216) on Rapid Facts Card

3M 41A splicing tape

3M's 41A general purpose splicing tape is designed for quick, temporary editing applications. The tape features an improved, easily tearable 1.50 mil acetate base film. Incorrect splices can easily be lifted and moved. 41A tape is available in 7/32" x 66' length and has a shelf life of one year in roll form.

Circle (222) on Rapid Facts Card

AKG CP426B mic

The C-426B dual large-element condenser mic, designed for digital master recording applications, features flat frequency response, linear capsule impedance vs. frequency matching, and the capability to drive the lowest generally encountered impedances for optimum S/N results. The C-426B features a 14dB noise floor and a dynamic range of 118dB. The dual elements can be independently selected to exhibit nine polar patterns via remote control, rotate up to 270° for MS and XY configurations, and feature LED aiming indicators for easy visual confirmation of positioning. A sensitivity switch allows rolloff of unwanted subsonic signals or roll-off plus 10dB additional attenuation.

Circle (223) on Rapid Facts Card

Drawmer LA 12

Available in the U.S. from Quest Marketing is the Drawmer LA 12 distribution

amp, which features one stereo input with master gain and balance controls; 12 stereo outputs with output level control; an auxiliary stereo output; nominal system levels from -20dB to +10dB; and maximum gain of 20dB. Suggested price is \$749.

Circle (219) on Rapid Facts Card

Soundtracs PCX console

The PCX 24-bus in-line console features computer mute automation of channels and auxiliaries. Mutes may be written in real time as "note on" "note off" alternately; up to 100 muting patches can be stored in memory and can be triggered from a MIDI sequencer, enabling mute playbacks to be locked to time code. Both 32- and 48- frame sizes are available.

Circle (215) on Rapid Facts Card



Josephson 2C

The model 2C 2-channel mic pre-amp features selectable gain from 24dB to 57dB in 3dB steps. Input noise level is less than 1nV per root Hertz; output clipping level is 40V RMS; frequency response is flat from 5Hz to 50kHz; and up to 10mA of phantom power is supplied at each input. The 2C is dc-coupled; a low-offset servo circuit eliminates the requirement for an output capacitor. List price is \$950.

Circle (220) on Rapid Facts Card

AudioControl Industrial AC-10

The AC-10 is a plug-in A- and C-weighting filter designed to be used with the company's SA 3050 real-time analyzer. The unit is built like a plug-in attenuator pad and has a switch to select between and both weighting curves. The AC-10 inserts between the microphone and the RTA.

Circle (224) on Rapid Facts Card

BGW GTB amp

The GTB delivers almost the same power output and has the same features as the company's GTA, but at a lower price. The

unit delivers 800W per channel into 2Ω, and built-in crossover networks enable it to be used as the bottom half of a biamped system, or as the bottom and mid sections of a tri-amped system, without needing a separate crossover unit. A high-pass filter is also included.

Circle (225) on Rapid Facts Card

Connectronics patch bays

The company has introduced two products. The JB8016 is a "splitter" patch bay that gives easy access send and return access to insert points using TRS connectors. Serving 16 channels, the unit avoids the use of Y connectors. The JB8008 is an 8-channel version.

Circle (226) on Rapid Facts Card

Digidesign DAT I/O interface

The DAT I/O Bi-direction Digital Interface, for use with the company's Sound Tools digital recording and editing system, integrates Sound Tools by adding the capability to record and transfer audio data in the digital domain. It features support for both the AES/EBU and S/PDIF formats for compatibility with most professional digital audio devices. Suggested list price is \$995.

Circle (227) on Rapid Facts Card

SoundStation II updates

Digital Audio Research has introduced two updates for the SoundStation II. WordFit is an automatic dialogue synchronization software that can automatically edit one dialogue track to sync with another one. Also, the system is now available in a 16-channel configuration.

Circle (228) on Rapid Facts Card

Duplitronics introductions

Duplitronics has introduced two products. The DM 400 is a digital tapeless bin loop mastering system with a speed capacity of up to 256x real time with 0.05 THD. The MM 100 is an A/D mastering machine for use in tape duplication mastering facilities.

Circle (229) on Rapid Facts Card

EAW FR253 close-field system

Available from Eastern Acoustic Works, the FR253 includes two 15-inch woofers, a pair of 7-inch midrange drivers and a HF horn/compression driver. The total system produces a peak SPL of more than 130dB with full power output down to 45Hz. The newly designed constant-coverage horn

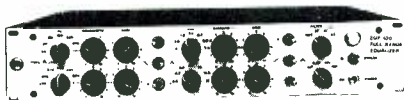
and compression driver extends the upper octave response to 17kHz.

Circle (230) on Rapid Facts Card

Summit Audio EQF-100

The EQF-100 vacuum tube equalizer provides four passive overlapping bands of seven frequencies each, and high and low filter sections. The equalizer features a 105dB dynamic range, switch-selectable frequencies and variable boost or cut up to 16dB. Retail price is \$2,200.

Circle (201) on Rapid Facts Card



BSS AR-416 4-channel DI

Available from Edge Distribution, the unit is a 4-channel active DI that allows users to configure the unit for live and studio applications. By removing the rack ears and reversing the unit and refitting the ears, users can use either XLR or 1/4-inch connectors, depending on the application. The AR-416 has all of the features of the company's AR-116, including two low-pass filters, earth lift, phase reverse and input attenuation. Retail price is \$799.

Circle (231) on Rapid Facts Card

Gefen introductions

Gefen Systems has introduced six products. The Gefen ADR is an automated dialogue replacement software for IBM and Macintosh computers. Trackplanner is an automated cue sheet package for film and video film-style layout. Trackwriter is an automated time code entry package with text writing, music and effects library search, and locate features. The BBC Sound Effects Library is an 18-CD set. The Multi M&E is a music and effects organizer. The AES-006 is an RS-232 interface with AES/EBU digital output for the Sony CDK-006.

Circle (232) on Rapid Facts Card

Ghielmetti introductions

The Swiss company has introduced two products. The GKVA range signal distribution boards can be used for both analog and digital signals and is suitable for use in passive or operating systems. The Ghielmetti jack system combines the advantages of a cross-bar with that of a jack

socket. It is designed to measure, switch and route all signals.

Circle (233) on Rapid Facts Card

Harrison/GLW introductions

The HDA-II is a new automation system for the Series 15n console, based on the Apple Macintosh IIx computer. The AP-100

is a broadcast control console that has user-programmable features.

Circle (234) on Rapid Facts Card

HME RW760 interface unit

The RW760 is a rack-mountable interface unit that allows the HME 700 Series inter-

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AES NEW PRODUCTS

comes to connect to 2-wire, non-compatible 3-wire, 4-wire or telephone intercom systems. In the 2-wire mode, the RW760 connects telephone systems to the standard 3-wire intercom system. A modular phone plug is included, and the unit is capable of capturing and holding the telephone line.

Circle (235) on Rapid Facts Card

Hybrid Arts introductions

SmpteTrack II is a professional MIDI sequencer for Atari ST computers. It includes the company's Smpte Mate Plus SMPTE reader/writer, and works with longitudinal code at all popular frame rates. Retail price is \$495. GenEdit is a universal MIDI editor/librarian for the Atari ST and Apple Macintosh. It will edit any MIDI device that accepts MIDI System Exclusive commands. The Atari version costs \$249; the Macintosh version costs \$349.

Circle (236) on Rapid Facts Card

ISI introductions

Industrial Strength Industries has introduced eight products. The PM160 is a 16-channel powered mixer with two stereo power amps, digital effects processor, two graphic EQs and a 2-way electronic crossover. The PM80 is an 8-channel stereo powered mixer with built-in delay, graphic EQ, and effects and monitor sends. The CN40 is a 3-way stereo/4-way mono electronic crossover, with digital readouts of the exact crossover frequencies. The PE30 is a 4-band, fully adjustable parametric EQ. The PA700 is a stereo power amp, 400W per channel, with a 2-way electronic crossover. The Sideman is a mini mixer-amplifier with cassette, instrument and vocal inputs, built-in distortion, chorus and flange and two stereo outputs. Wendel Jr. is a drum replacement device with a 50kHz sampling rate. The R-16 is a digital effects processor.

Circle (237) on Rapid Facts Card

Intersonics subwoofer introductions

The company has introduced four products. The Contra Bass is an extended range subwoofer, flat to 16Hz. The SDL-5 is a high-power, horn-loaded subwoofer with an output of 135dB at 32Hz. The SDL-4 is a smaller version of the SDL-5, with 134dB at 42Hz. The 2-15 is a compact, direct-radiating subwoofer, flat to 30Hz.

Circle (238) on Rapid Facts Card

Turbosound TXD series

Available domestically from Klark-Teknik U.S. is Turbosound's TXD series of wide-dispersion loudspeaker enclosures. The TXD-520 is designed for filling areas that cannot be reached by a main loudspeaker system, and features a 10-inch driver and a soft-dome tweeter, frequency response of 100Hz to 18kHz, 125W RMS and 96dB 1W/m sensitivity. The TXD-530, designed for under-balcony applications, can handle 250W RMS with two 10-inch drivers and one slot tweeter. Frequency response is 100Hz to 18kHz; system dispersion is rated at 120° nominal. The TXD-580 is a high-power, bi-amplified 3-way system designed for bands and small touring applications.

Circle (217) on Rapid Facts Card



Korg Q1

The Q1 is a 16-track/16-channel MIDI/SMPTE multitrack sequencer that acts as a MIDI production center. Two mergable MIDI Ins can record data onto any channel of the 16 tracks. Two separate MIDI channels and two pairs of parallel MIDI outputs are available, allowing users to address up to 32 channels. Users using only 12 channels can divide them up into six and six, so the MIDI line does not get clogged with data.

Circle (240) on Rapid Facts Card

Korg RE1 remote editor

The RE1 is a dedicated remote editor for the M3R that provides comprehensive editing and control of all parameters. All operations are assigned to six separate editing groups, allowing users to press the function switch that corresponds to the desired action.

Circle (241) on Rapid Facts Card

Korg T Series keyboards

Based on the M1, the T Series adds several new features. The 8MByte ROM incor-

porates new 16-bit sounds, including acoustic instruments, attack transients and analog waveforms. A PCM slot and optional 512K RAM area are provided for loading additional sounds from T Series. The T1 has a weighted keyboard with 88 keys, while the T3 has a non-weighted 61-note keyboard.

Circle (239) on Rapid Facts Card

Lexicon LXP-5

The LXP-5 is capable of creating up to five simultaneous effects as well as three octaves of pitch shifting, wide-range delay sweeps, chorusing, flanging, ambience and reverb. All parameters are accessible through the front panel controls or through the company's Dynamic MIDI. Also included are 64 permanent factory presets and 128 preprogrammed user memories. By using MRC software version 3.0, up to 16 units can be fully controlled.

Circle (242) on Rapid Facts Card

New software for Lexicon MRC

The MIDI Remote Controller's new software version, 3.0, allows up to 16 machines to be controlled. Different program changes can be transmitted on all channels simultaneously. Generic MIDI controls have been increased to two slider pages, and user-definable sysex strings can also be programmed. The upgrade requires a minor hardware change and can be obtained through authorized dealers or through Lexicon's customer service.

Circle (243) on Rapid Facts Card

Marshall EZ 1D series

The line of snake multi-pair mic cables is designed to help reduce the time and cost of writing. Channel numbers are printed and underlined on the jacket to ensure the correct identification, regardless of which end is stripped. The outer jackets of each pair are color-coded by standard resistor color code, allowing for quick identification of conductor pairs. The shield of each pair has a drain wire to simplify soldering or crimping.

Circle (244) on Rapid Facts Card

NED D-D, PostPro enhancements

NED has introduced three enhancements to the Direct-to-Disk/PostPro digital recorders and editors. CMX Autoconform software uses CMX-format EDLs from floppies to automatically create an audio hit

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list. An optical disk sound effects database is now available, as is EditView, a second-generation Macintosh-based graphic audio editing package.

Circle (245) on Rapid Facts Card

Orban introductions

Orban has introduced two products. The 290Rx is a dual-channel adaptive signal enhancer that features harmonic and spectral signal restoration, and dynamic single-ended noise reduction. The 764A is a digitally controlled programmable parametric EQ system, with a full system configuration of 99 channels and 99 preset memories.

Circle (246) on Rapid Facts Card

Panasonic/Ramsa introductions

The company has introduced five products. The SV-255 is a portable R-DAT recorder. The WR-C900 is a sound reinforcement mixing console for theater applications. The WZ-9375 is a digital signal delay. The WS-A500 and WS-A550 are a loudspeaker and a subwoofer system, respectively.

Circle (247) on Rapid Facts Card

Peavey introductions

Peavey's Audio Media Research division has introduced two products. Q-Factor is a dual-channel, single-ended noise reduction processor. SyncLoc is a cost-effective machine synchronization system and is designed to expand the capabilities of the Peavey/AMR SyncController.

Circle (248) on Rapid Facts Card

Penny & Giles introductions

The Endless Belt "Fader" is a 2-channel optical incremental encoder module. Also new is the Motorized Rotary Fader, a 27mm fader with motor control, for automated console systems and other applications.

Circle (249) on Rapid Facts Card

PAS introductions

Professional Audio Systems has introduced four products. The TOC Studio Monitor 3 is a coaxial 3-way system with Time Offset Correction. The TOC SW-2 is a coaxial stage monitor with modular processing. The TOC RS-2 is a coaxial reinforcement system with modular processing. The TOC EB-2 is a subwoofer with modular processing.

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AES NEW PRODUCTS

Roland E-660 EQ, R-880 reverb

The products incorporate the AES digital audio transmission standard, which allows audio signals to be processed entirely in the digital domain. The E-660 digital parametric EQ provides four bands of equalization on each of two channels, or eight bands of equalization on one channel. The center frequency of each band is independently adjustable, covering from 60Hz to 20kHz. The R-880 digital reverb has four independent delay lines that can be used in a variety of ganged, split or cascaded configurations. Two inputs and four outputs provide maximum flexibility.

Circle (251) on Rapid Facts Card

RTS introductions

RTS has introduced the model 2528, a high-performance, 2-channel mic pre-amp with remote gain control, allowing the amp to be placed in close proximity to the originating mics; and the CCD214 crosstalk cancellation device, designed to work

within the TW Intercom System as an ancillary device, reducing crosstalk using special phase-canceling circuitry.

Circle (252) on Rapid Facts Card

JBL 4688

The JBL 4688 sub-bass loudspeaker system features a Triple Chamber Bandpass design with dual 18-inch drivers in a 3-chamber enclosure. Crossover is 80Hz to 150Hz. The system is intended for applications where low distortion and high SPL down to 25Hz are required.

Circle (218) on Rapid Facts Card



Sennheiser introductions

The company has introduced four products. The HD 25 is a sealed monitor headphone featuring high sensitivity and output. The MKH 50 is a digital recording mic featuring a supercardioid pattern. The WM 1 is a portable wireless mixer, the first, according to the company. A series of active noise-compensation headsets was also introduced.

Circle (253) on Rapid Facts Card

Stewart introductions

Stewart Electronics has introduced five products, all in the half-rack format. The MM4-S is a 4x2 balanced mic/line mixer, 48V phantom, with the power supply included. The PA50U is a 2x25W power amp, unbalanced input only. The PA50B is a 2x25W amp with balanced and unbalanced inputs, input level controls, headphone output and overload indicators. The PA100U is a 2x50W power amp, unbalanced input only. The PA100B is a 2x50W amp with balanced and un-

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balanced inputs, input level controls, headphone output and overload indicators.

Circle (254) on Rapid Facts Card

3M introductions

The company has introduced two tape products. AUD 80+ is the latest addition to 3M's U-matic tape line, and is designed in response to the growing need to have setup and other recording information on the master copy. The 186 low-noise open-reel tape is a general-purpose tape available on a 1/4-inch hub in 2,500-foot and 5,000-foot lengths.

Circle (257) on Rapid Facts Card

Beyerdynamic TG-X mics

The TG-X line of microphones, designed for live performance applications, uses EM-Field neodymium magnets for high output levels and accurate transient response. The TG-X 80 is a high-output mic with a Macrolon diaphragm for accurate sound at high SPLs. The 180 is designed as an entry-level vocal mic. The 280 fea-

tures Beyerdynamic's Hostaphan diaphragm for wide frequency response. The 480 is a large Macrolon diaphragm mic that provides pronounced mid-range punch.

Circle (221) on Rapid Facts Card



Studer recorders

Studer has introduced three tape machines. Based on the A820-24 transport, the A827 is designed to provide superior performance and reliability in a cost-

effective package. The A807 2/2 VUK is a center-track time code version of the A807, with three tape speeds. The C270 is a 2-channel recorder with center track time code with two speeds, Dolby HX Pro and phase compensated electronics.

Circle (255) on Rapid Facts Card

Studer controllers

The A729 is a CD system controller that allows up to four A727 and/or A730 CD players in any combination. They can also be controlled as an integrated system via the machines' ES interfaces. The C270 autolocator/channel remote is a universal remote control for all units in the C270 Series.

Circle (256) on Rapid Facts Card

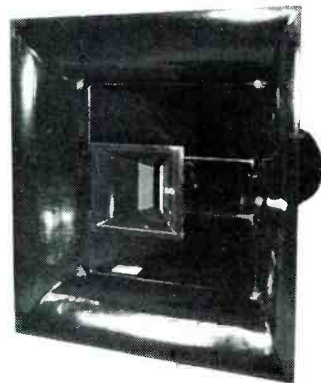
Yamaha MT3X mixer/recorder

The MT3X is a 6-input mixer with console-like features and a 4-track cassette recorder. Included are six input channels, each with two aux sends, L/R pan/channel as-

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AES NEW PRODUCTS

sign switch and a 2-band linear-fader EQ. The recorder has two speeds, dbx noise reduction and programmable auto punch-in/out. The unit's price is \$995.

Circle (258) on Rapid Facts Card

Yamaha FX500 processor

The half-rack FX500 provides up to five effects simultaneously and has extensive programming capability. A total of 60 present effects are included, each with changing parameters; 30 additional RAM locations are available where users can store modified effects. Comprehensive MIDI implementation is included, including the ability to control up to two different effect parameters simultaneously in real time.

Circle (259) on Rapid Facts Card

Yamaha DDL3 delay

Intended for permanent and portable sound reinforcement applications. Each of the three outputs includes an independent 3-band digital parametric EQ and a "digital pad," calibrated in 1dB steps. Level, EQ and delay parameters can be stored in eight memory locations, which can be recalled by remote contact closure or via MIDI. Internal software allows the unit to function as a 3-way crossover, with independently programmable level, filter slope, crossover point and delay settings for each output.

Circle (260) on Rapid Facts Card

Publications

Agfa's "Restoring Old Masters"

Agfa has released a book that examines various processes for restoring old master tapes. The book is based on the transcripts from the Agfa Forum Information Seminar. "Restoring Old Masters." The seminar explored both computer and mechanical techniques for restoring tapes to their original sonic quality.

Circle (211) on Rapid Facts Card

Neve Flying Faders Operator's Handbook

Operator's handbooks on Neve's Flying Faders Console Automation System is now available. In addition, comprehensive hands-on training is available on the Neve VR series console at Full Sail Center for the Recording Arts in Florida, and on-site with the Neve Flying Faders specialty team.

Circle (212) on Rapid Facts Card

Hardware and software updates

Josephson C-640

An improved version of the Josephson C-640 capsule condenser microphone includes an internal power supply, operated by a 5.6V mercury battery. It generates 48V power for diaphragm polarization and operation of the class-A pre-amp electronics. More than 15 interchangeable capsules are available for the C-640. The new version, including a standard omni, cardioid or hypercardioid capsule, is priced at \$560.

Circle (202) on Rapid Facts Card

Sony APR-24 firmware

The second generation of firmware for the APR-24 analog multitrack recorder is now available. The firmware will support Sony's 9-pin ATR dialect (SNPAD), which enables the APR-24 to serially control the player functions of the Sony VTR. The enhancement also allows many of the APR-24's functions to be accessed via audio production consoles, synchronizers and audio editors.

Circle (203) on Rapid Facts Card

DAR WordFit

WordFit automatic dialogue synchronization and replacement software is an option for Digital Audio Research's SoundStation II audio editing and production system. WordFit automatically achieves dialogue replacement by using the location dialogue as a guide track. Once the replacement dialogue is recorded, both tracks are fed to identical digital filtering banks that produce time-varying spectral patterns.

Circle (204) on Rapid Facts Card

Integrated automation for Soundcraft 6000

Soundcraft's fader and mute automation system offers up to 64 channels of audio control for the Series 6000 recording console. The system incorporates real-time noise gates and VU meter displays on every channel. Other features include software groups, snapshots, cue list, fader jobs, VCA editing, audio triggers, help windows and mix processing.

Circle (205) on Rapid Facts Card

Studer Revox autolocator

Studer Revox has introduced its universal remote controller for the recorders in the

Revox C270 series. The autolocator is a channel remote, tape transport remote and full-function autolocator that is directly connectable to all C270 recorders. It features 18 storable start and stop addresses with switchable, programmable rollback time, real-time display and LED tallies on all functions.

Circle (206) on Rapid Facts Card

JBL SB-1 and SB-5

The Control Series loudspeaker line now includes the SB-1 and SB-5 Triple-Chamber-Bandpass Sub-Bass Systems. The systems have 3-chamber, 4-woofer configurations. The four low-frequency transducers are mounted in pairs and wired in opposing polarities to create a push-pull system.

Circle (209) on Rapid Facts Card



NED Release 2.2

Release 2.2 is a Macintosh-based post-production software package for New England Digital's PostPro and Direct-to-Disk digital recorder/editors. The package has three components: EditView, CMX Autoconform and Optical for Direct-to-Disk. Machine control, sample rate conversion and D2 digital compatibility are featured.

Circle (207) on Rapid Facts Card

TimeLine Lynx software

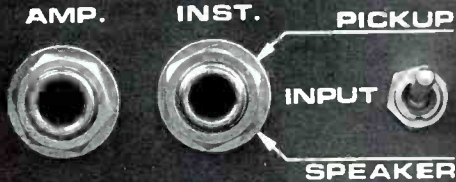
TimeLine's updated software for its Lynx Time Code Module increases the number of audio and video tape machine models supported in software. Additional operating features of the time code module now include: voltage-controlled search modes for the Otari MTR-100A and MTR-90; variable speed synchronization settings for the Sony PCM-3348 and PCM-3324 DASH format digital multitracks; and acceptance of either high- or low-rate tachometer outputs from the Studer A820 multitrack.

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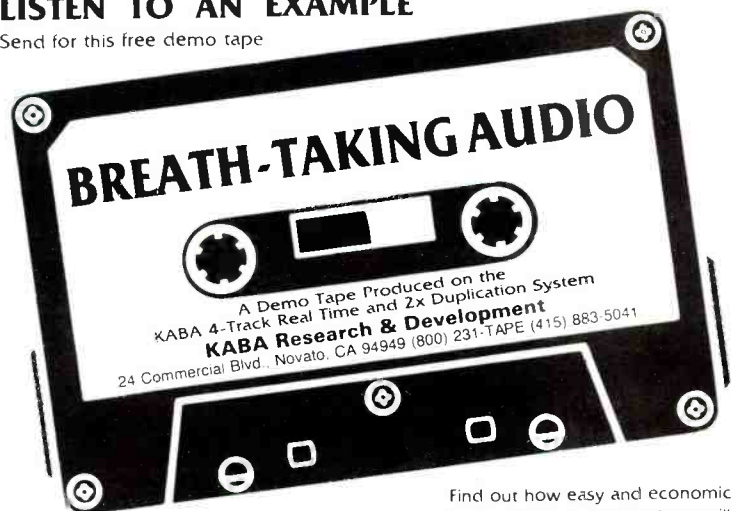
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I originally wanted to start this review with an essay on how the U.S. record industry has shot itself in the foot by stalling the domestic introduction of DAT. But as I was writing it, lo and behold, the RIAA and several of the major Japanese equipment manufacturers finally came to agreement on the future of the format.

Like everything else the RIAA has done during DAT's brief but turbulent history, this agreement is probably going to prove to be a pain to most of us in the recording industry, but at least it's progress. (See the "Managing MIDI" column in the November issue.)

The RIAA's efforts notwithstanding, DAT has already proved itself an extremely valuable asset to the professional studio. The result of the new agreement, which requires the inclusion of a digital copy-prevention circuit called "SCMS" in every consumer deck, will be that the gap between domestic DATs and professional ones (which presumably won't have to bother with this nonsense), a gap which has almost disappeared with analog cassette decks, will widen considerably over the next couple of years.

Now Fostex has introduced the D-20, a DAT deck that is indisputably designed for the professional. It is a substantial machine (33 pounds) with serious features and a serious price tag to match: \$8,000. Because it is available only direct from the manufacturer, don't expect your customary dealer discounts.

The unit paves the way for future development in the DAT format, and any other manufacturer interested in getting into professional DAT equipment is going to have to give the D-20 a good look.

Among the unique features the D-20 boasts are true digital inputs and outputs; balanced analog ins and outs; multiple-memory auto-locating; variable speed recording and playback; 4-head design, allowing off-tape monitoring and smooth punch-in and -out; synchronized operation with other studio equipment; and SMPTE time code record and play.

The deck is designed to be free-standing or mounted in a 19-inch rack. It stands 5 1/4 inches high (three units), and requires a decent amount of ventilation space above and below.

Inputs and outputs

The rear panel has balanced XLR-3 analog inputs and outputs for each channel, as well as a pair of unbalanced outputs, marked "Monitor." Time code has its own set of balanced input and output connectors. Digital signals are also accommodated with XLR-3 connectors. However, as per the AES/EBU spec, both channels are served by a single connector, so there is only one input and one output.

The digital inputs can accommodate AES/EBU signals in either the Professional (also known as CP-340 Type I) or Consumer modes (CP-340 Type II). The unit automatically senses which format you're using and adjusts itself accordingly.

It can also output digital signals in either mode, and the output mode is selected with a DIP switch on the back panel. A front-panel switch chooses between the analog and digital inputs, but if there is no digital input present, the analog input will be ac-

By Paul D. Lehrman

HANDS ON:

FOSTEX D-20 DAT RECORDER

Paul Lehrman is *RE/P*'s electronic music consulting editor and a Boston-based producer, electronic musician and freelance writer.

tive regardless of the switch position. (Unfortunately, there is no way to use both sets of inputs and mix them.)

Transport and controls

The D-20's transport resembles a VCR more than an analog cassette deck. Insertion and ejection of the tape are totally motorized. Like a VCR, the relationship of the tape to the heads falls into two categories: "flashing," in which the tape is engaged against the heads, and "stationary," in which the tape is disengaged. When the Stop button is pressed once during playback or recording, the button starts to flash, and the deck goes into a Pause mode, in which the tape remains on the heads, and will start again immediately the next time you press Play.

If you press Stop a second time, the tape moves away from the heads, and the button stops flashing. If you leave the tape in flashing Stop mode for more than a couple of minutes, it will disengage the tape and go into stationary mode, just like a VCR. (If you turn off the power while a tape is engaged, it is not automatically disengaged, so it's a good idea to eject the tape, or at least make sure you're in full-stop mode before shutting down the machine.)

Similarly, if you press the Fast-Forward or Rewind buttons once while playing a tape, the button you've pressed will flash, and the tape will move forward or backward at 5x normal speed, remaining in contact with the heads. You can choose to hear the audio at this fast speed, just like a conventional deck in Cue mode. The deck will also continue to generate time code.

Press the Fast-Forward or Rewind button a second time, and the tape speed goes to 100x normal. The audio shuts off, but the time code continues to be sent in bursts. You can toggle between the two fast-wind modes by repeatedly pressing the fast-wind buttons.

Next to the transport controls are a set of buttons for transport-related functions. Many of the buttons have two functions, which are toggled using a Shift button at the top of the panel. Among these buttons' functions are setting up, moving to, and initiating multiple repeats between various locate points: a settable zero point, two programmable locations and a "last play" location. They are also used to adjust and turn on the variable transport speed function, which allows $\pm 10\%$ variation in 0.1% increments, in both play and analog record modes (trying to do variable-speed recording with digital inputs would require fancier hardware because of the sample-rate conversions involved), and to search for a blank spot on the tape.

There are separate buttons for record-enabling the audio tracks and the time code track, and buttons that switch between input and "repro" monitoring for both audio and time code. The four heads are configured so that there is no time delay at all when monitoring off tape.

A black LED window appears at the top of the panel, which contains horizontal segment displays for the input levels, and a numerical display showing the current tape location in hours, minutes and seconds. The latter doubles as a readout for the variable-speed mode and a program number display. (The deck cannot record program numbers, only read them.) At the far right are the input controls, which operate only on the analog inputs. One is for level and the other is for left/right balance. They can be disabled by turning on an Input Level Cal switch at the bottom.

Other switches along the bottom of the front panel are used to enable digital pre-emphasis: enable "copy guard," which is *not* the RIAA's "SCMS" system, but something else; and to select the sampling rate: 44.1kHz or 48kHz. This switch is not unique, but whereas other manufacturers hide it for fear of harassment from the

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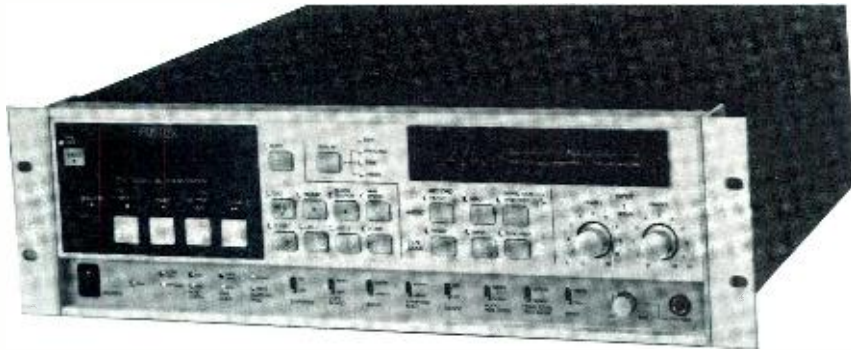
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RIAA, who would love to accuse them of abetting illegal digital copying of CDs (which play at the lower sampling rate), the D-20 has it right out front.

If the emphasis switch is set wrong relative to the incoming digital signal, a red light will blink rapidly until you change it. Another light will blink if you play back a tape with the sampling rate switch in the wrong position. However, it seems you *can* record a tape at a sampling rate different from that of the incoming digital signal. If audio at the input is at 44.1kHz, you can record it without leaving the digital domain at 48kHz, and vice versa, although the transport speed will change to compensate for the difference. More switches select internal or external digital-audio synchronization; enable the off-tape monitoring function for the time code (doubling the function of the monitoring switches above it); and enable a special Edit mode, which reverses the normal functions of the heads, thereby allowing punching.

Editing and time code features

The D-20's unusual design means that it can perform some tricks that other DATs, and even other conventional decks, both analog and digital, cannot. First, there's punching. Because there is no erase head per se, and the record and playback heads are positioned so they are in essentially identical places on the tape at all times, punch-in and -out could be instantaneous. However, this might cause digital glitches, so Fostex has built in an automatic digital crossfade that lasts approximately 15ms. With any signal other than a pure sine wave, this crossfade is essentially inaudible.

Because there is no room on a DAT for an extra audio track (either longitudinal or helical), Fostex had to devise a new way of recording SMPTE time code. The D-20 puts the time code numbers into the digi-

Specifications

Error correction: Double-encoded Reed Solomon Code.

Tape speed: 8.15mm/s.

Recording time: Maximum 120 minutes (with 120-minute cassette).

Rewind and fast-forward time: Approx. 80s (with 120-minute cassette).

Sampling frequency: 48kHz and 44.1kHz (switchable).

Quantization: 16-bit linear.

Dynamic range: More than 90dB (emphasis at 1kHz).

Frequency response: 20Hz-20kHz.

THD: Less than 0.05%.

Wow and flutter: Below measurable limit.

Crosstalk: More than 80dB (20Hz-20kHz).

Emphasis: I/O switchable.

Price: \$8,000.

Specifications are taken from the manufacturer's literature and are subject to change without notice.

Circle (125) on Rapid Facts Card

tal subcode, which means it's not really *recording* the incoming time code signal as much as it is *interpreting* it and storing the numbers in the subcode. On playback, it takes those numbers and uses them to regenerate fresh time code.

Therefore, the time code that comes out of the D-20 is completely clean. Because SMPTE time code works at a different frame rate than DAT (24, 25, 29.97 or 30 frames/second, as opposed to 33.3), some fancy arithmetic has to be done to keep everything together. A set of DIP switches on the rear panel must be set to the incoming time code rate. If the switch settings don't match the incoming code, an

error LED lights. The deck allows you to record the time code before or after the audio is recorded.

Even when you record the time code last, it should match the audio perfectly, because the digital sampling rate and the time code are presumably derived from the same crystal clock. In the Edit mode, you can punch in new time code in the middle of a track without glitches, or even—and this is a first—extract time code from a tape, run it through some kind of processing (jam syncing, offsetting or editing user-bits), and at the same time record it back onto the tape *in exactly the same spot* from which it came.

In the unit I received, there was an occasional glitch in the code that was generated. Every few seconds, a frame number would be sent that was wildly off. This would not normally be a problem in a system designed to watch out for and ignore anomalies, but I found that when the code was fed to a SMPTE-to-MIDI Time Code converter, the converter would slavishly spit out the bad numbers as MIDI Time Code commands, and the sequencer trying to follow them would throw a fit.

Apparently I was the first to discover this problem, but Fostex was able to fix it in a few weeks, sending me a new operating-system chip that I installed in a few minutes. Fostex designed the D-20's time code capabilities on its own. Unfortunately, the deck's format does not match the format recently agreed upon by other Japanese DAT manufacturers. When those companies bring out their time code-capable decks in the next few months, they will not be able to play back time code from tapes recorded on a D-20.

Fostex recognizes this potentially serious problem, and has stated that it will offer a modification for the D-20, probably field-installable, either for free or at its own factory cost, which will make it compatible with other DAT decks when they are released.



Also, the company is planning to provide a dubbing service for anyone who has recorded tapes with the original D-20 time code format and needs them restriped with the new format.

External control

Fostex makes sure that everything in its product line can talk to everything else. The D-20 is no exception. At least five separate ports for external synchronization and control are located on the rear panel.

The deck can be synchronized to a composite video signal, or to frame, field or word sync signals. The type of sync it will accept is determined by a DIP switch. If the incoming clock signal is not good, a Clock Lock LED on the front panel will flash. It will also output word sync from its internal clock.

Also, the deck can slave to Fostex's 4030 synchronizer through a 20-pin accessory port. A second accessory port is provided for future system updates. An RS-422 port, labeled Data Com, is available for transport control and time code input and output on the digital level.

Fostex says that the port someday may be used for Sony "BVU"-style remote control, or for MIDI remote control. The port also, apparently, gives you access to the crossfade time used in the punching function, although no mention of this is made in the manual.

Performance

The audio performance is about what you would expect from a good digital deck. Separate D/A and A/D converters are used on each channel (there are four total), so there is no phase error. There are no apparent anti-aliasing filter artifacts. As mentioned earlier, sound coming off the playback head in the Repro mode is identical to the sound appearing at the record head in the Input mode. In both modes, the signal travels through all of the A/D and D/A converters.

In brief lab tests, wideband S/N ratio was 85dB, which is not spectacular, but certainly adequate. However, as analog input levels approach the clipping point, the noise floor rises as well, topping off at about -65dB below clipping. Another oddity is that when the analog signal going into one channel exceeds the clip point, the audio spills over into the other channel. No one in his right mind would actually use the deck this way, so it's no catastrophe, but it's still strange. Harmonic distortion, at 0.01%, was well below the 0.05% spec.

SMPTE time code performance (once the initial problem was fixed) was flawless. The deck accepts incoming time code levels well, and the code produced on playback is exceptionally clean.

The deck takes some getting used to in operation, and a few functions—mainly the locate and cue operations—are quite confusing. Sometimes the deck seems to have a mind of its own: On several occasions it fell into a kind of zero-length constant-repeat mode that I had to turn the power off to get out of. If you should change sampling rates in the middle of a tape, the counter resets itself to zero, and having multiple zero points on a tape can be very confusing.

The procedures for overdubbing, punching and laying time code are a bit fussy, and it is often unclear when to use the various edit and monitoring modes. The distinctions between when a tape has no time code, no audio or no signal at all seem to be important to the deck, but it's hard to get a handle on how to deal with them. The cue function is difficult to listen to, with lots of nasty pops, but it serves its purpose.

These are minor problems, and most of them would probably be improved with a half-decent manual. Unfortunately, the manual that comes with the deck (as of this writing) is easily the worst of its kind I have ever seen. It consists of 40 single-

sided Xerox pages of extremely bad Japlo-Saxon in a 39-cent binder. It is so awful that when you try to learn something from it, you find yourself giving up halfway through the first paragraph, and deciding it would be easier to figure it out yourself. It's insulting, especially considering the unit's price tag. Fostex has promised that a new manual is forthcoming, but has been unable to say exactly when.

Conclusions

The D-20 is a remarkable machine, and clearly defines the next generation of professional DAT decks. Its unique approaches to the problems of time code recording, monitoring, punching, digital and analog I/O, and external synchronization are all quite clever and work well. Sonically, it also performs well, and the unit has an overall feeling of solidity and good construction.

At its price, it is a significant departure for a company that has been tagged as a "semi-pro" manufacturer. It is truly a professional piece of equipment, and is apparently already gaining much acceptance in high-end studios. But even as a high-end deck, it could be argued that the price tag of the D-20 is a little steep.

For those who need a DAT mastering deck with all of its features—punching, time code, and extensive remote and syncing capabilities—it is certainly a worthwhile investment, but it's overkill for a studio that just needs a good 2-track digital recorder.

If you need a digital deck with SMPTE time code, the D-20 won't be the only one available much longer. Other manufacturers will be coming along with their models in the next few months. Although it's too early to say what kind of prices they will command, they may well be significantly lower than the D-20. If money is an issue, it might be worth waiting a bit to see what happens.

REP

STUDIO UPDATE

Northeast

Soundwave (Washington, DC) has installed a satellite system that links it with 29 studios nationwide and in Great Britain. The system is in addition to Soundwave's existing link with NPR's Westar IV satellite. *2000 P St. N.W., Washington, DC 20036; 202-861-0560; fax 202-466-2377.*

Taylor-Made Productions (Caldwell, NJ) has added the following to its inventory: an Otari MX-55, an Eventide H3000 harmonizer, sound effects and library music, a 64-input modification for its Harrison Raven console and Dolby SR noise reduction on its mix machines. *Box 309, Caldwell, NJ 07006; 201-226-1461.*

Foothill Productions (New York) has taken delivery of a Sonic Solutions hard disk digital editing and processing system, an Audio+Design PRODAT with Apogee filters and Rogers Studio 1 monitors. *70 W. 83rd St., New York, NY 10024; 212-877-0973.*

Southeast

Flood Zone Studios (Richmond, VA) has purchased a Trident 80B console, a Steinway Model D concert grand piano, an RCA model 77 ribbon mic, AKG C12A and Schoeps 221 tube condensers mics, Neve 2254A limiter/compressors and two Neve 1079 mic pre-amp EQs. *Box 7105, Richmond, VA 23221; 804-644-0935.*

Cue Recording Studios (Falls Church, VA) has opened Studio B, a 24-track audio post-production room. *109 Park Ave., Suite E, Falls Church, VA 22046; 703-532-9033.*

Southern California

Encore Studios (Burbank), 10 years after buying the first Solid State Logic automated console in the United States, has purchased an SSL SL 4000 G Series with G Series Computer and Total Recall. *721 S. Glenwood Place, Burbank, CA 91506; 818-842-8300.*

Roger Nichols has been named chief recording engineer of **Soundworks West Ltd.** (Los Angeles).

Northern California

Different Fur Recording (San Francisco) has become the Northern California beta site for Sonic Solutions' Digital Audio System. Sonic Solutions' NoNoise system was installed in November. *3470 19th St., San Francisco, CA 94110; 415-864-1967.*

The Plant Studios (Sausalito) has opened its Boomtown 24-track media production studio. The room is a joint venture between The Plant and one of its clients, Mark and Jeff's Jingle Company, who will be Boomtown's full-time tenants. *2200 Bridgeway, Sausalito, CA 94965; 415-332-6100; Fax 415-332-5738.*

Music Annex Duplication (Fremont) has moved to a larger facility located at 42650 Christy St., Fremont, CA 94538; 415-226-0800. Music Annex's music recording stu-

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dios remain in Menlo Park; the audio post-production studios remain in San Francisco.

Hawaii

Audio Resource Honolulu (Honolulu) has installed a digital audio editing system based on the Apple Mac Ix and Digidesign Sound Tools. The system offers 16-bit hard disk recording with CD quality. 1750 Kalakaua, Honolulu, HI 96826; 808-944-9400.

Manufacturer and dealer announcements

Studer Revox has delivered the first group of A827-24s into six studios: Great Immediately (New York); Windmark Recording (Virginia Beach, VA); QCA (Cincinnati); Chicago Recording Corp. (Chicago); Zomba/Battery Studios (New York); and Music Animals (Los Angeles).

Solid State Logic equipment has been in-

stalled or ordered for the following facilities: Larrabee Sound (Los Angeles), SL 4000 G Series; Pinewood Studios (Iver, England), SL 5000 M Series; Paisley Park (Chanhassen, MN), G Series EQ Modules.

Sony Professional Audio has sold its 600th digital multitrack recorder, a PCM-3324A. The recorder was installed at EFX Systems, Burbank, CA.

Neve has accepted 26 orders in the United States for its Flying Faders systems; **Neve International** reports 14 systems sold.

The following studios have recently taken delivery of Neve equipment: BMG/RCA Recording Studios, Manhattan, NY, a VR console with Flying Faders automation; Chicago Recording Company (CRC), a VR console with Flying Faders automation and Mitsubishi X-850 32-track and X-86 2-track digital tape machines; L.A. Sound, Port-of-Spain, Trinidad, a VR console with Flying Faders automation and Mitsubishi X-880 32-track and X-86HS 2-track digital tape recorders.

WaveFrame has sold two digital audio production systems to Real to Reel Studios, Dallas, TX.

TVI Sound (London) has purchased a **Soundmaster** Integrated Audio Editing System. Other facilities that have purchased Soundmaster equipment: Inter-Session, Montreal; Le Tube, Montreal; Woodholly Productions, Hollywood; Sonolab, Montreal; Mix Magic, Hollywood; NBC TV, New York; A&R Sound, New York; and Film House, Toronto.

Trident Audio USA has received an order for three Vector consoles from The Nashville Network (TNN), a division of Opryland USA. The order includes two 48-input Vector 432 consoles and a 64-input Vector 432.

Turner Broadcasting, Atlanta, has taken delivery of an **AMS Industries** 48-channel digitally controlled Virtual Console System.

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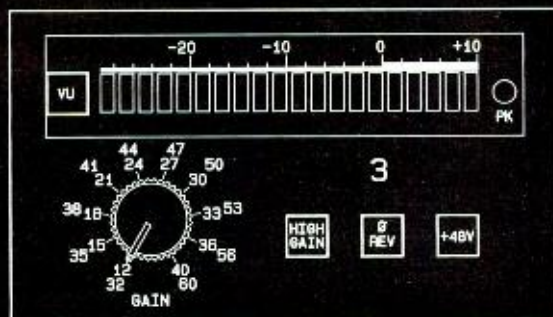
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THE CUTTING EDGE

By Laurel Cash-Jones

The Optical Future

As this is the first of a new year and a new decade, and almost everyone is thinking about the future, I thought I'd put my two cents in, too.

Like everyone else, I am wondering where our industry will be at the turn of the century. And like everyone, I have some ideas for this budding new decade. However, I will offer no predictions or even premonitions. Jean Dixon I'm not, and at the rate of change this industry has seen, such predictions could be wrong.

In order to look forward to see where this decade will take us, I think it is necessary to look back at the 1980s and the changes that occurred in technology, the economy and the public's taste.

"History will teach us nothing," Sting's line was prophetic. It's almost as if the audio industry thought it was immune to the evolution of the radio and television industry, and the format wars of the video business. The '80s brought us remarkable changes in the technology that surrounds us in the studio today, as well as our *own* format wars. Look around and note all of the things that are now required equipment in a modern recording studio. Ask yourself how many are compatible with each other or with the rest of the world.

With that in mind, it should really be of no surprise that manufacturers have developed no less than three professional digital multitrack tape standards, and numerous digital workstations that have no way to share data. I sincerely hope that someone will take note of this fact and deal with the problem of data transfer standards of this new product category.

On a more positive note, Dolby introduced SR, breathing new life into analog recording. And how about all of those new digital signal processing devices, the advent of digital reverb, digital controlled analog consoles, and totally digital, resettable consoles.

We weren't immune from the startling changes in the musical instrument world: digital resynthesis synthesizers, FM syn-

thesizers, digitally controlled synthesizers, drum machines, digital samplers and, of course, MIDI. Who in the '70s would have guessed that engineers might become as important as artists (thanks in part to MI developments) and that artists would become engineers?

In the consumer universe, all has not been silent. How about the almost total elimination of vinyl? How do you think the consumer is affected by the proliferation of CD-only stores? And what of the coming introduction of DAT? Will all of the emerging technologies that have yet to be introduced become just another marketing buzzword, like "digital ready"?

As for the economy, we began the decade with a recording industry depression. Yuppies became a new and very important member of the consuming public. Perhaps no other generation in the 20th Century has been the target of so much advertising. It has had a tremendous impact on our industry.

As the public became bored with the music that was being offered by the record companies, and radio stations that played the same garbage three times an hour, the yuppies lead the new generation of consumers that turned to buying (or renting) video hardware and software. Video games and computer software further eroded the money that was once spent so freely on music. In response, the record labels tightened their budgets. Many labels, artists and studios felt the pressure or went out of business.

Those studios that didn't go under expanded their horizons into other fields of endeavors such as audio-for-video and scoring. The motto of the '80s recording studio was "Diversify or Die."

Another interesting development was the proliferation of recording schools, which are training a lot of engineers who will compete in a shrinking job market. I recently read that only 15% of studios will even consider applicants from recording schools. Although collectively recording schools have had an image problem, some individual schools are outstanding. There is no reason that these schools cannot improve their standing in the recording industry, as long as they all turn out qualified graduates.

Many facilities have jumped on the post-production bandwagon. One of the best things to come out of this is that we once again have first engineers on staff, as opposed to being free-lance. This gives security to many and provides a great deal

more opportunities for second engineers to become first engineers.

And we felt an impact from the buying and selling of record companies. All of a sudden, labels were bought left and right by major overseas conglomerates. In turn, these same labels have either bought or are rebuilding in-house facilities. It's like the '60s again, with label-owned studios being more of a norm, only with no unionization.

It wasn't just record companies on the block. Many of the pioneering American manufacturers have been gobbled up by foreign manufacturers or gone out of business due to superior quality in foreign manufacturing and the dollar's extreme fluctuations over the decade. We also saw numerous manufacturers that designed a product and then searched for an application, instead of listening to the users and responding accordingly.

So, were the '80s a decade of transition? You bet. What do the '90s have in store for us? In a word (like in "The Graduate"): optical. I know, you're thinking that's not news. But what is news is how it will affect you and your studio. Optical will be a buzzword in the '90s. As in optical ready. Or totally optical. Or totally optical digital ready.

Seriously, we need to get ready for the optical revolution. It will come in many forms. First, it will probably show up as a backup medium for all of those digital workstations that you will eventually have to buy. (By the way, workstation manufacturers, this would be a great time to think about a data transfer standard.)

Soon, it will appear as a recordable CD that you will use to make artists refs (better sell that old Scully lathe while you can). Another place will be the synthesizer. How about a digital optical output on your DX-7? Don't laugh, there is a digital optical output on the new CD player I just bought. What about your console? Do you think it will be immune?

Then there is good old copper wire. The phone company has been busy tearing up its old wiring to put fiber-optic cable across the country, so what makes you think you won't have to do the same thing in your studio?

And here's one last buzzword for the '90s: music. Let's not forget why we're in this business. With great technology and great creativity, we can create great music. Let's get to it.

Laurel Cash-Jones is RE/P's executive consultant and a Los Angeles-based free-lance writer.

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continued from page 14

Hartley Peavey, founder and president of Peavey Electronics, has been selected for induction into Hollywood's Rock Walk of Fame, a sidewalk gallery of handprints and signatures of performers, innovators and manufacturers in the music industry.

Tom Lippel has joined Biamp Systems as senior design engineer in charge of mixing console design.

Joseph Grega has been appointed product manager of digital videotape at Ampex Recording Media Corporation. **Fred Layn** has been named product manager of professional audio tape.

Fred Ginsburg, CAS, has joined Alan Gordon Enterprises as sales manager. His responsibilities include the marketing and developing of motion picture and video support equipment.

Heitaro Nakajima, executive technology adviser at Sony Corporation, was presented the AES Gold Medal at the AES convention in New York in recognition of his contributions to the development of the compact disc.

Robert R. Dougherty has replaced Bob Carver as president and CEO of Carver Corporation. Carver will remain as chairman of the board.

Michael Ingalls has been named Sunkyong Magnetic/America Inc.'s national marketing manager.

Tom Semmes, Neve's southeast regional sales manager, has been named Salesman of the Year by Neve.

John Palleschi has been named to general counsel and vice president, administration at Telex Communications Inc.

Ampex Recording Media Corporation has named **Ronald Lambert** vice president, engineering, and **John Ostertag** product manager, industrial audio tape.

Ted Pine has been named marketing manager at New England Digital Corporation.

Mark Lentzner, former manager of Apple Music Products Engineering, has joined Opcode as director of research and development.

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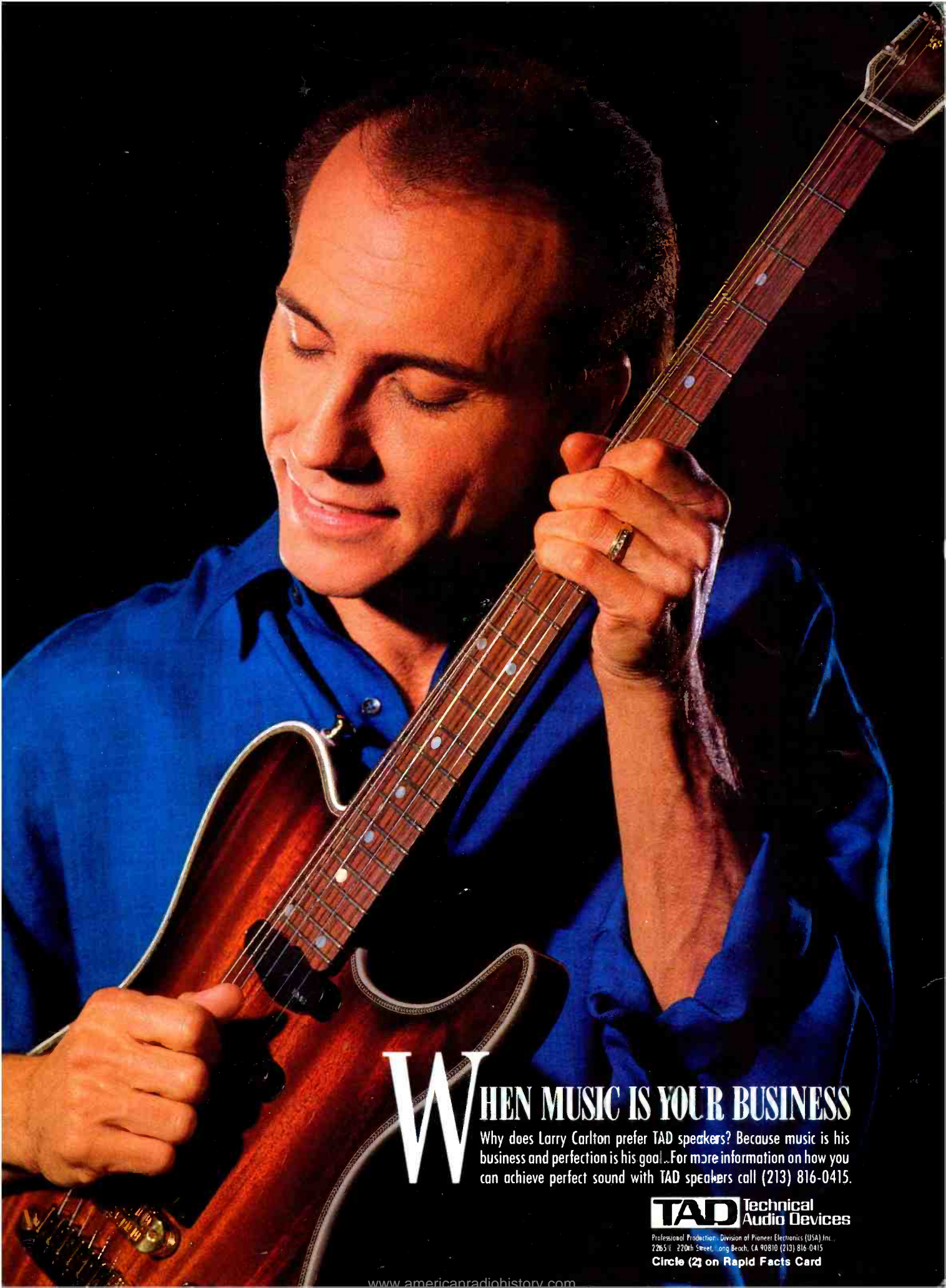
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OR
CONSEQUENCES.

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

TRUTH: A lot of monitors "color" their sound. They don't deliver truly flat response. Their technology is full of compromises. Their components are from a variety of sources, and not designed to precisely integrate with each other.

CONSEQUENCES: Bad mixes. Re-mixes. Having to "trash" an entire session. Or worst of all, no mixes because clients simply don't come back.

TRUTH: JBL eliminates these consequences by achieving a new "truth" in sound: JBL's remarkable new 4400 Series. The design, size, and materials have been specifically tailored to each monitor's function. For example, the 2-way 4406 6" Monitor is ideally designed for console or close-in listening. While the 2-way 8" 4408 is ideal for broadcast applications. The 3-way 10" 4410 Monitor captures maximum spatial detail at greater listening distances. And the 3-way 12" 4412 Monitor is mounted with a tight-cluster arrangement for close-in monitoring.

CONSEQUENCES: "Universal" monitors, those not specifically designed for a precise application or environment, invariably compromise technology, with inferior sound the result.

TRUTH: JBL's 4400 Series Studio Monitors achieve a new "truth" in sound with

an extended high frequency response that remains effortlessly smooth through the critical 3,000 to 20,000 Hz range. And even extends beyond audibility to 27 kHz, reducing phase shift within the audible band for a more open and natural sound. The 4400 Series' incomparable high end clarity is the result of JBL's use of pure titanium for its unique ribbed-dome tweeter and diamond surround, capable of withstanding forces surpassing a phenomenal 1000 G's.

CONSEQUENCES: When pushed hard, most tweeters simply fail. Transient detail blurs, and the material itself deforms and breaks down. Other materials can't take the stress, and crack under pressure.

TRUTH: The Frequency Dividing Network in each 4400 Series monitor allows optimum transitions between drivers in both amplitude and phase. The precisely calibrated reference controls let you adjust for personal preferences, room variations, and specific equalization.

CONSEQUENCES: When the interaction between driver is not carefully orchestrated, the results can be edgy, indistinctive, or simply "false" sound.

TRUTH: All 4400 Studio Monitors feature JBL's exclusive Symmetrical Field Geometry magnetic structure, which dramatically reduces second harmonic

distortion, and is key in producing the 4400's deep, powerful, clean bass.

CONSEQUENCES: Conventional magnetic structures utilize non-symmetrical magnetic fields, which add significantly to distortion due to a nonlinear pull on the voice coil.

TRUTH: 4400 Series monitors also feature special low diffraction grill frame designs, which reduce time delay distortion. Extra-large voice coils and ultra-rigid cast frames result in both mechanical and thermal stability under heavy professional use.

CONSEQUENCES: For reasons of economics, monitors will often use stamped rather than cast frames, resulting in both mechanical distortion and power compression.

TRUTH: The JBL 4400 Studio Monitor Series captures the full dynamic range, extended high frequency, and precise character of your sound as no other monitors in the business. Experience the 4400 Series Studio Monitors at your JBL dealer's today.

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THE IEQ WITH Smartcurve™

Not Just Another Programmable Equalizer With MIDI™

The IEQ with Smartcurve™ is a programmable, high performance graphic equalizer that includes a video output. For those who wish to enjoy the video output of the IEQ, ART makes the IEQ Video Monitor.* Smartcurve™, proprietary software developed by ART gives you instant actual frequency response as easy as the push of a button. The IEQ Family consists of both the 2/3 octave and the 1/3 octave graphic equalizers. Both types come in two varieties, Controllers and Satellites. A Controller is a self-contained programmable intelligent graphic equalizer capable of controlling 15 satellites at once. IEQ Satellites are exactly the same unit except the front panel controls are eliminated.

IEQ Model Specifications:

Controller & Satellite

- 128 battery backed presets
- MIDI
- Frequency Response
20Hz-20kHz \pm 0.5dB
- THD \leq .005% @ 1kHz, 0dBm typical
- Dynamic Range \geq 100dB typical
- Balanced inputs and outputs

IEQ Video Monitor Features

- 19" rack mountable
- NTSC compatible monochrome monitor
- 4 Selectable inputs
- Standard RCA jacks for easy connections

It Has To Be A Work Of . . .

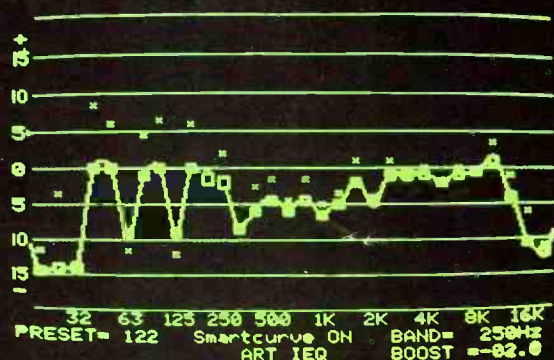
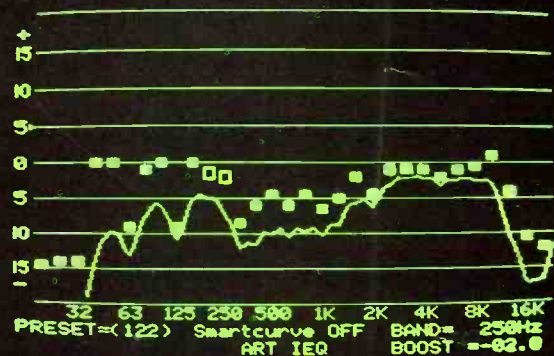
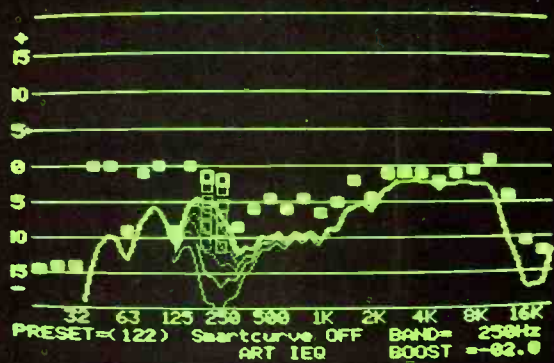
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For more information see your local dealer.

Circle (2) on Rapid Facts Card



1 See the Sound

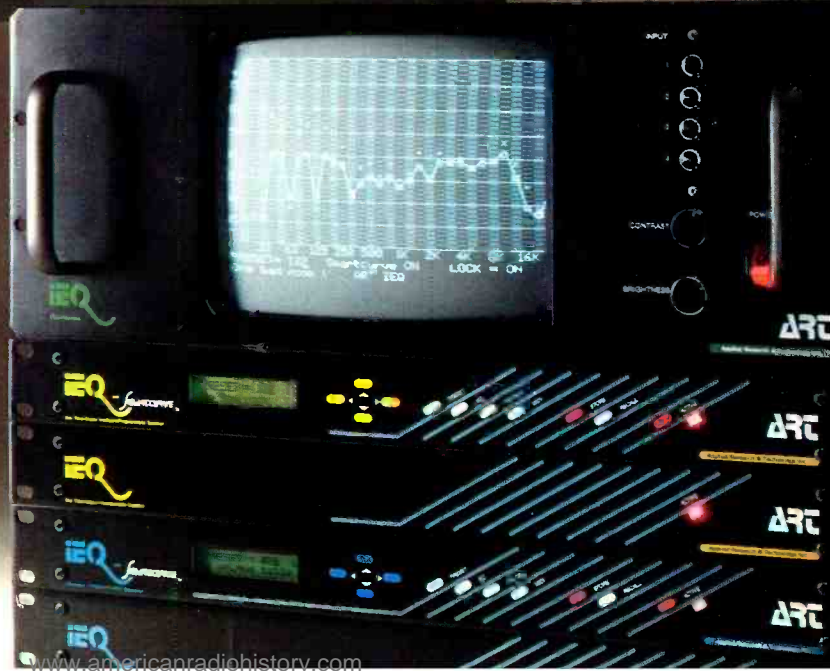
This is a video output of the IEQ as the unit is being adjusted. The sliders can be moved \pm 15dB in 1/2dB steps to get the exact response you need. With the simple push of a button, complex equalization can be done in seconds with incredible accuracy.

2 Hear the Sound

The power of the IEQ readily becomes apparent as the video display plots the frequency response due to the slider settings. The IEQ offers high quality constant "Q" equalization. The video graphic display shows the correlation between the sliders and the frequency response.

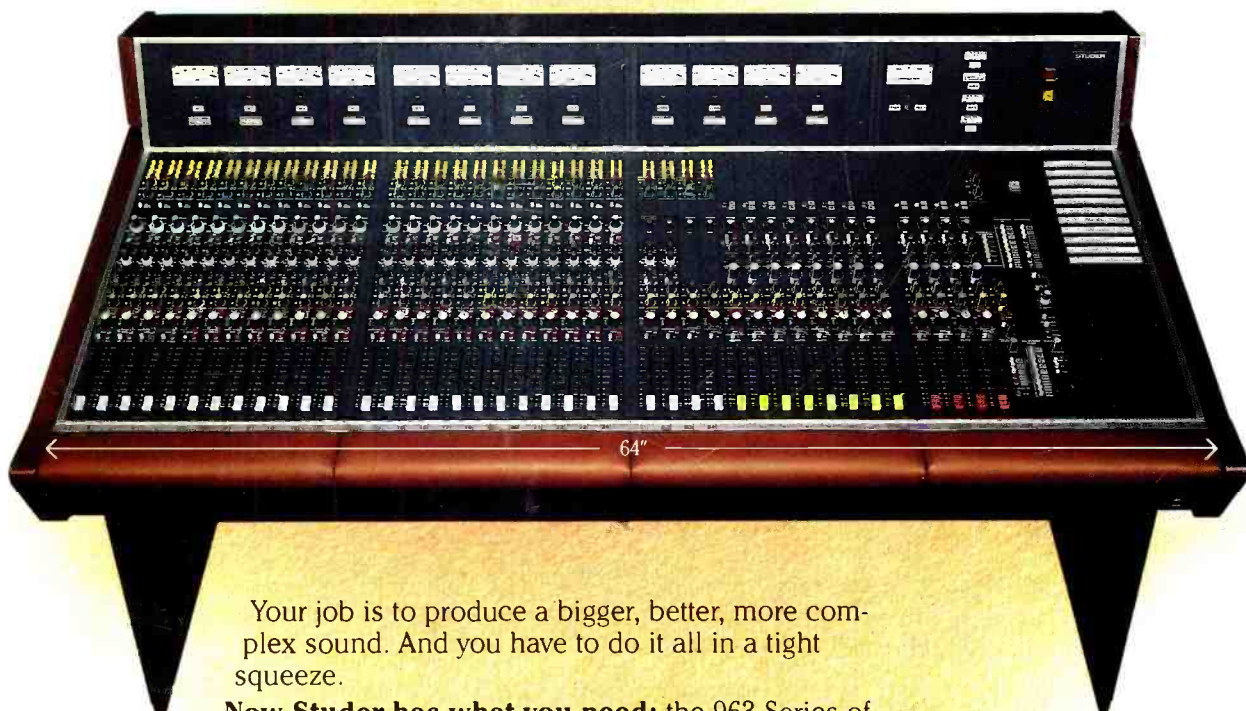
3 Perfect Sound

Turn Smartcurve™ on and perfect equalization is at your fingertips. Note the difference between the second frame, (Smartcurve™ OFF) and this frame. The position of the sliders represent the actual frequency response of the EQ. Interaction between bands is virtually eliminated. Incredible! Just think, now when you adjust the EQ you get exactly what you need. The "perfect" EQ? Let your eyes and ears decide.



Not-So-Big News

The news is out. Studer's new 963 is big on features, performance and reliability. And not-so-big on size.



Your job is to produce a bigger, better, more complex sound. And you have to do it all in a tight squeeze.

Now Studer has what you need: the 963 Series of compact production consoles. A 963 is ideal for video post-production, video editing, broadcast production, EFP vehicles, smaller recording studios—anyplace where quality and reliability are critical but space is at a premium.

Based on a standard 30 mm module width, the 963 is available in configurations from 16 to 40 inputs. A 28 input console, with 28 direct outputs plus 4 stereo subgroups and 2 stereo masters, is barely more than 5 feet long. A 40 input console, is barely more than 6 feet long.

Standard features on the 963 include balanced insert points, direct outputs, a bantam jack patch bay, and external mute interface for video switchers. A wide variety of module options lets you custom configure your 963 for practically any specialized application.

When it comes to audio performance, the 963 goes head-to-head with the bulkiest of the big-name boards. Noise levels are digital compatible in "real world" conditions with many open faders. Studer engineers gave special attention to mix bus design and reference grounding to assure consistently superior specifications regardless of frame size. For extra reliability, solid state switching is used in all critical audio paths.

As with all Studer products, the 963 is manufactured and assembled to the highest standards of Swiss craftsmanship.

For more information, call your nearest Studer representative. Find out how the 963 can give you big console capabilities in a not-so-big package.

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