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The Pro Audio Applications Magazine

ODERN ECHNOLOGY

NTERVIEW: JACK RENNER

XPANDED SR COVERAGE

AN INTERTEC PUBLICATION

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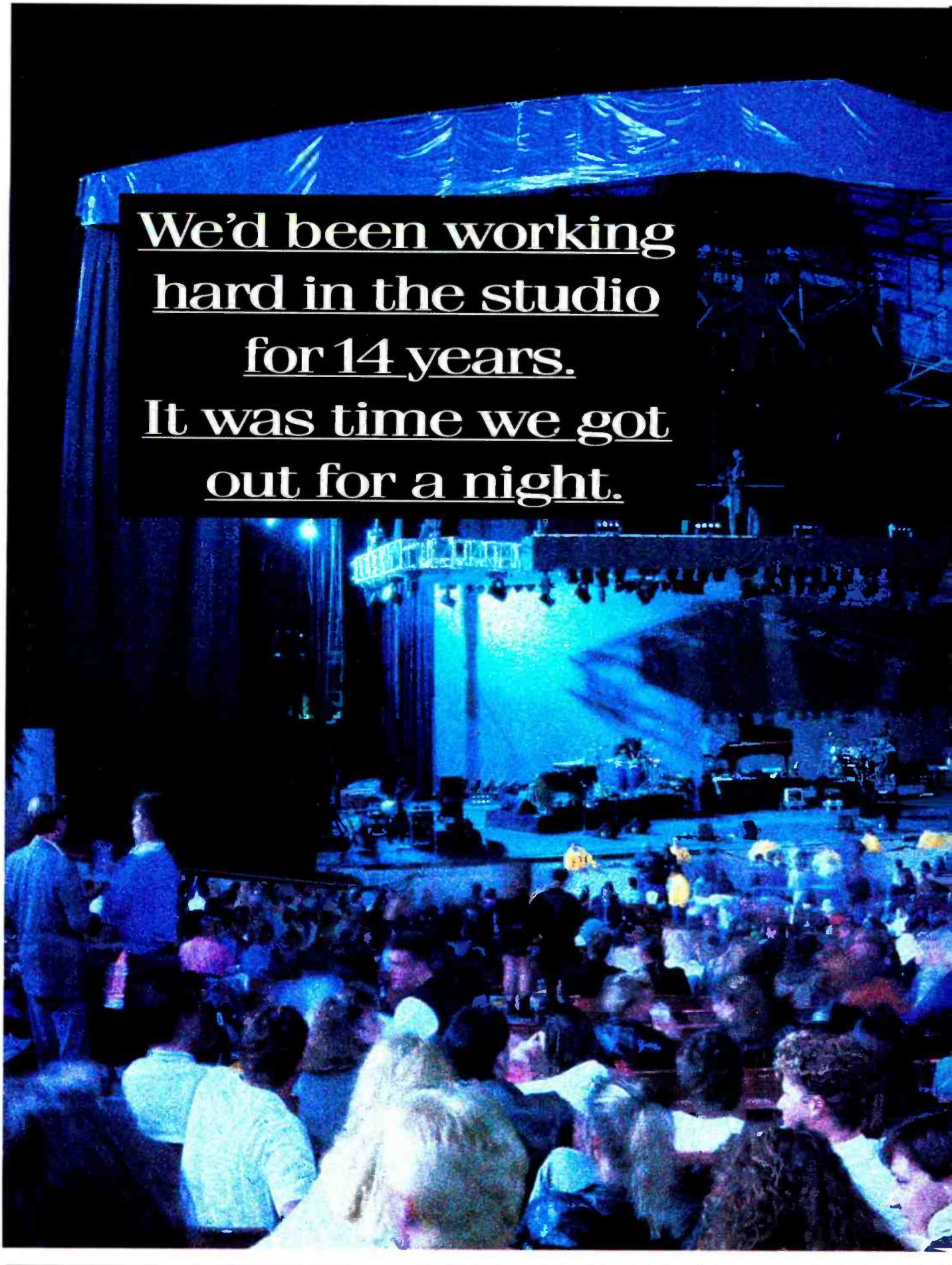
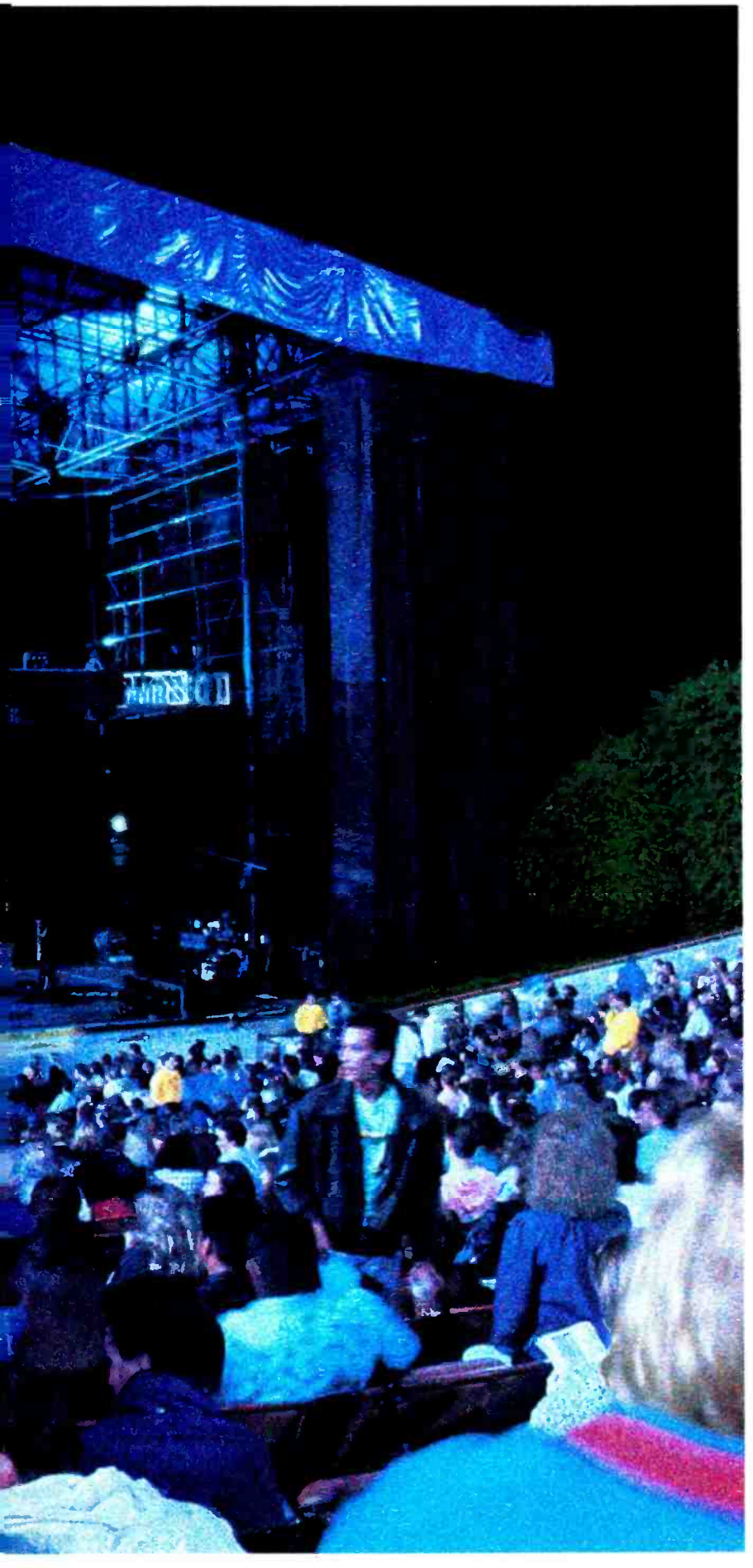

We'd been working
hard in the studio
for 14 years.
It was time we got
out for a night.



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

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Pioneer Professional Products Division

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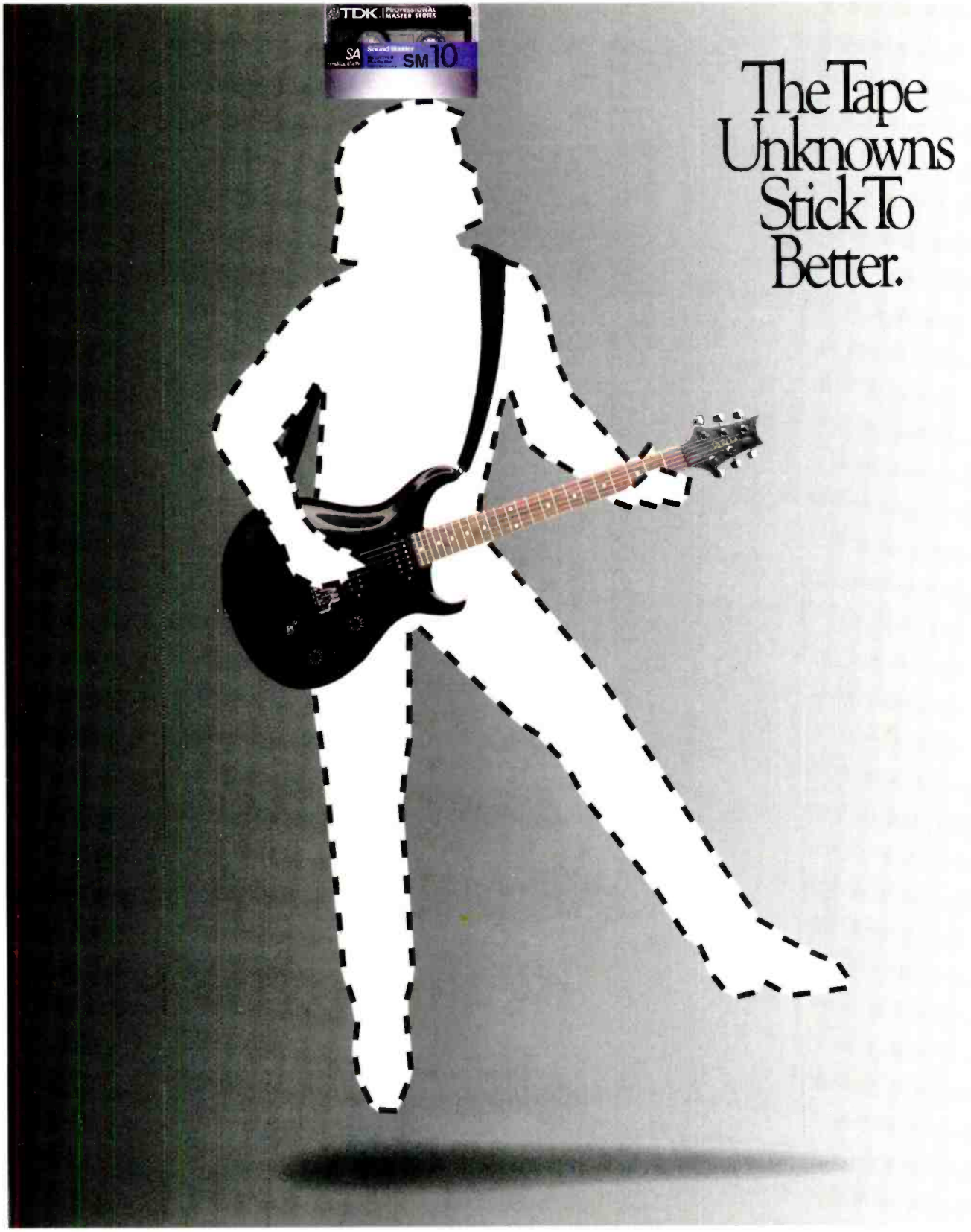

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R•E•P is an applications-based publication targeted at professional individuals and companies active in the commercial business of studio and field recording, audio for video, live sound production and related fields. Editorial content includes descriptions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

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From the Top

Lessons We Should Know

Not a dull moment out here on the jagged edge, overlooking the upcoming 1991 pro audio landscape.

To recap briefly, 1990 left us with Audio Wars, Part 3: Is it Live or is it Vanilli? Only the Grammy committee knew for sure. Not to be confused with Part 2 — 2 Live Crew's legal battle over the right to perform questionable material on stage to a private, paying, *adult* audience (and the accompanying arrest and conviction of a small-time record shop owner busted for selling their legally manufactured, nationally distributed program material) — or even Part 1: the very sad Judas Priest subliminal trial in Reno, NV.

By all appearances, we seem to be a country that can't make up its mind whether we want to be free to explore our musical tastes, good or bad, or be protected from the same. As producers, engineers and program providers, the questions and issues raised throughout these events cut to the very center of our working world.

What we are allowed to create through our work in the future is being determined right now on the national media and legal stage. If you haven't been following along closely, we suggest you tune in right now.

On an equally affective note, last year saw many big fish audio manufacturers gobble up little fish quicker than you could say "Pink Slip Termination." Handfuls of respected and successful audio equipment suppliers were absorbed, with more to come.

On the plus side, the greater resources that a large corporation can provide often means a shot in the arm for a small shop's R&D. Additionally, a great product from a small company can explode in sales once exposed via a larger, coordinated distribution network.

On the down side, large organizations are not generally known for their wild-eyed innovation and market sensitivity for anything but the largest common-denominator products or support for the small user in any area other than warranty repair. Customize a product to your application? Not likely. Info on what's inside the epoxy-potted module? Not today, sorry. An off-the-shelf replacement chip for the X-coded version on the circuit board? It's proprietary. Here's our service department number if you want to order one ...

Any corporate tendencies toward a myopic attentiveness to the bottom line (only) would bode ill for all of us. With this in mind, we should all fear the arrival of a true recession, which would dictate the shrinkage of many product lines down to items that sold in quantity last year.

We hope the corporations that have purchased smaller manufacturers in our industry have the foresight to recognize what it was that made the companies and their products great in the first place: the people, the sensitivity to the needs and requests of the buyer, the design of the right devices for the right job, and the quality of the merchandise that provided a high value for the cost.

Finally, it is worth taking a moment to consider the ongoing issue of DAT copy-protection. The record companies, ostensibly to protect profits, are acting like hungry dogs with raw meat on the subject of DAT consumer machine copy-protection codes and blank tape taxation. Market research information shows that the vast majority of home taping is the copying of material previously purchased, for application in the individual's own car or portable player. They don't buy one CD and shop copies to their friends and neighbors. Why then the fear?

The act of continually raising CD and prerecorded cassette prices, as well as levying a tax or applying a surcharge on blank digital audio tapes, is illogical, at best, and damaging to the production industry, at the least, both directly for our raw material and indirectly by decreasing consumer purchasing desire. The net effect can decrease development and production dollars spent by the record companies themselves because of a reduced cash flow. Is it too obvious to suggest that lower CD or cassette prices would make it easier to simply purchase additional copies for the consumer's multiple environments? It would also increase total sales and improve the manufacturing economy of scale.

Short-term profits at the expense of our industry's long-term health should not be taken lightly. They are playing with our life blood. Write your congressman, if he or she is still in office. Then let us know what you think. ■

Mike Joseph
Editor

Letters

Audio to VTRs

From: Tony Kremer, technical producer, Aquarian Productions, Las Vegas, NV.

In the article "Interfacing Audio to VTRs" in the October issue, author Eric Wenocur makes some vary valid points concerning the myriad of formats video professionals must deal with. However, there are a few points I'd like to clarify.

1. Betacam SP or MII: While it is true that the FM audio tracks (channels 3 and 4) are married to the video and that you cannot "overdub" these tracks once the video is completed, they can be manipulated somewhat during post-production. For instance, when video inserts are made, FM audio is also inserted, so inputting external audio to channels 3 and 4 is fair game during video inserts. This may be useful for adding ambient sound or sound effects that correspond to the picture. You may also use FM channels 3 and 4 for dialogue, but the dialogue must cut when the video cuts, thus prohibiting split audio edits.

2. Betacam audio noise reduction: The author states, "All Betacams and MIIs have Dolby, so there is no risk of incompatibility between decks." This is not entirely true. All Betacams have Dolby C circuitry, but only the newer Betacam SP decks have automatic detection and automatic turn on of this circuit. Older Betacam machines (BVW 10, 15, 40, etc.) do not have auto detection or auto on, so you *must* use the Dolby on/off switch if you intend to record with or properly decode Dolby C. As mentioned, Betacam SP will automatically turn on encode/decode circuitry whenever a metal particle "SP" tape is used. If you use standard oxide tape, you must decide to switch the Dolby on or off. If a metal SP tape (or Dolby-encoded oxide tape) is inserted into an older Betacam deck, you must be sure to switch Dolby on in order to properly decode the Dolby audio.

3. The table listing various VTRs and their audio features is a little confusing and contains certain inaccuracies. For instance, the first row indicates that the Sony BVU-150 (a portable U-matic SP) has transformer-balanced inputs, no noise reduction and a limiter switch. Sony tells me the BVU-150, VO-8800 and all of its portable recorders (including Betacam) have electronically differential balanced inputs. Also, the 150 has Dolby C noise reduction and an auto gain switch (*not* a limiter switch). The listing for the VO-8800 (also a portable U-matic SP that I happen to own) indicates that there is no facility for audio monitor. There is a headphone jack and XLR ouput (channel 1), which may be switched to monitor channel 1, channel 2, a mono mix or both channels. As a point of interest, the VO-8800 is the first portable U-matic from Sony that has a true stereo-type 1/4-inch jack for the headphones, instead of the horrible, mono 1/8-inch jack used in all previous models.

4. Concerning limiters/AGCs: The author states, "virtually all VTRs suitable for field use have some sort of built-in limiter or AGC circuit. Most can be switched in and out on the front panel." This is not entirely true. While most portables have limiters and AGCs, it has been my experience that only the AGC can be switched off. The peak limiter circuitry incorporated into most portables cannot be switched off at all, and is designed that way to prevent internal clipping. Try it yourself: Input a continuous audio source to a portable VTR (a CD player works great), and open the input pots wide. You'll notice the meters hover in the red zone, but never slam. The audio will probably not be clipped but will sound severely limited. This non-switchable peak limiting seems to work well when recording audio that has unpredictable levels (i.e., talent microphones), but caution should be exercised to avoid over-limiting a signal (especially with music). A good rule of thumb is to use headphones and carefully listen as you adjust your input levels. Set them so that limiting occurs only with strong peaks so your audio still has some dynamic range and is not "squashed." Watching the VU meters helps, too.

5. Balanced/unbalanced schemes: The author states, "If using an unbalanced source or load with the VTR, be sure to ground the transformer's low side." This may work, but it can also lead to other problems such as ground loops when interfacing with other gear. My personal preference is not to ground the low side of a transformer or differential circuit. I simply connect the unbalanced center conductor to Pin 2 and the shield to Pin 3 and leave Pin 1 unconnected. This avoids tying the two grounds together. However, no method can be a sure solution, so at times you may need to tie an unbalanced shield to both Pins 1 and 3, etc.

In conclusion, I'd like to say that it's refreshing to see R•E•P address the needs of video professionals, as well as recording engineers. Keep up the good work and kudos to the author for an informative article. ■

Judas Priest Trial

From: Helmut Vles, Rockland, ME.

The fuss over Judas Priest ["Subliminal Secrets: Justice and Judas Priest," October] aroused my curiosity. I had to listen!

Somehow, nothing as drastic as suicide crossed my mind. To listen was, however, my choice. To listen was also their choice, the young men who died. The band was responsible for loud rock music. The young men were responsible for their own suicides.

The shifting of responsibility of one person's actions to another has become a pervasive malaise. Ultimately, no one will be responsible for anything! We're almost there! ■

Digital Zero

From: Jay Rose, Brookline, MA.

Regarding the Five Questions piece on "Recording Tech" in the August issue: I record national spots on four different brands of DAT recorders, and edit them on the AKG multitrack workstation.

In *every* case, digital zero is the absolute maximum undistorted level; that is, "all bits on". Levels recorded on one system, track perfectly on every other.

Average peak speech level, and "zero tones" from an analog recorder, are usually lined up to −15dB or−18dB below digital zero (depending on the amount of processing), and this is the operating level highlighted on the meters and recommended by many digital manufacturers. *It might not be the official standard, but it's sure a de facto one.* (Italics added—Ed.)

By the way, most well-designed digital equipment doesn't go sour when you exceed zero. The AKG workstation, for example, is designed for a soft "analog style" distortion when overmodulated.

(Editor's note: Thanks for recognizing the point we were making— standards should be universal, not variable by several decibels or between manufacturers, *de facto* standards included.) ■

Send letters to R•E•P, 9221 Quivira, Overland Park, KS 66215. Letters may be edited for length and clarity.

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We use a 32-track digital recorder — the IL 4832 made the most sense. It provides a 32 buss design in an extremely affordable package. It looks great in the room, too."

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WHO OWNS WHAT: 1991 Update

Mark IV Audio's acquisition of Klark-Teknik caps a year of frenzied acquisition activity. The $22.4 million cash tender deal gives Mark IV the companies Klark-Teknik owns but also Klark-Teknik Electronics, the U.S. distribution company that handles K-T, Midas, DDA and Milab.

With these acquisitions, Mark IV cements its position as one of the audio industry's dominate conglomerates. In terms of size, it may well be the largest; Mark IV Audio owns and distributes the products of 11 companies.

In fact, an informal grouping of companies and what they own shows that we're well on the way to where "five to seven large companies will control 50%-60% of business," as K-T's Jack Kelly was quoted in Billboard. We're not quite there yet; the companies listed below account for 13% of the total number of companies in the industry, if you use 300, approximately the number of companies that attended the AES Convention, as a benchmark. Throw in the five or six giant companies, such as Sony, Yamaha and Peavey, and the percentage increases to about 15%.

But wait: More acquisitions are rumored, and if the economy tightens up, it's a sure bet that the consolidation is going to continue.

MARK IV AUDIO

- ALTEC LANSING
- DDA
- DYNACORD
- EDEN
- ELECTRO-SOUND
- ELECTRO-VOICE
- GAUSS
- KLARK-TEKNIK
- MIDAS
- UNIVERSITY SOUND
- VEGA

AKG ACOUSTICS

- BSS
- DBX
- ORBAN
- PRECISION DEVICES
- QUESTED MONITORING SYSTEMS
- TURBOSOUND

MATSUSHITA

- PANASONIC/RAMSA
- TECHNICS

SAEG REFINDUS

- STUDER REVOX
- STUDER EDITECH*

BASF

- AGFA

*FORMERLY DYAXIS

HARMON INTERNATIONAL

- AUDIO LOGIC
- DIGITECH
- DOD ELECTRONICS
- INFINITY
- JBL PROFESSIONAL
- SECK
- SOUNDCRAFT
- UREI

TGI

- AUDIX
- MARTIN AMERICA
- TANNOY

OTARI

- KING INSTURMENT
- SOUND WORKSHOP

SIEMENS

- AMS INDUSTRIES
- NEVE

LINEAR TECHNOLOGY

- SOUNDMASTER INTERNATIONAL

SENNHEISER

- NEUMANN

VANILLI FALLOUT CONTINUES

As of early December, here's the fallout from the revelations that the hairstyles hired to pose as the pop group Milli Vanilli — surprise — never sang a note on their album and that — surprise again — they lip-synched in concert:

- Two class action lawsuits.
- One lawsuit by an Ohio radio station that sponsored a Vanilli concert filed under the state's consumer fraud statutes.
- Two more proposed lip-synching disclosure bills.
- One returned Grammy.
- Another mark against an industry that must appear to the public that it is driven by nothing but greed. Look at the year the recording industry had: an obscenity conviction for "As Nasty As They Wanna Be," numerous obscenity investigations over other albums, a trial concerning subliminal messages, lip-synching legislation. Wasn't a great year. ■

People

Neil Wilburn, who designed some of Nashville's best-known studios, died Oct. 21. Wilburn's designs included the old CBS Quonset Hut and the Castle. He was also an engineer and producer; his credits included Waylon Jennings, Johnny Rodriguez, the Whites and the Family Brown ... **Sidney C. Sterchele** has been appointed by JVC Service and Engineering as national service manager ... SMPTE members elected **Blaine Baker** president of the society ... **John Schofield** has been named senior vice president for sales and marketing of Telex Communications ... Meridian Data announced that **Jean-Louis Gasse,** former president of Apple products, has joined its board of directors ... Synergistic Technologies has added **Mark Valenti,** former president of Highland Studios, to its staff ... Studer Revox and Studer Editech have named **Anita Giacalone Martino** sales assistance/office manager, **Thorsteinn Thorsteinsson** northeastern region technical support engineer, **Tom Knox** senior test engineer, **Gail Bush** secretary/administrative assistant, **Kerwin Yuen** director of manufacturing, **Al Wegener** senior DSP engineer, **Bill Woods** technical support department, **Synthia Petroka** software engineer, **Deanna Moore** office manager and **Andreas Koch** director of product planning. ■

SR Coverage Expands

With this issue, we are pleased to announce the addition of Mark Herman as a regular contributor. Mark is the president of Hi-Tech Audio, a sound reinforcement equipment rental company located in Half Moon Bay, CA. He first contributed to R•E•P in the September issue with his article on Clair Bros. programmable EQ system. Mark will be contributing two items: Roadwork, a roundup of SR news among manufacturers and end-users; and All Access, a detailed look at equipment and people working on specific tours.

Mark's contributions will augment the considerable contributions of David Scheirman, R•E•P's live sound consulting editor, who will continue with Live & Direct and feature articles. We are proud to have the most comprehensive and authoritative sound reinforcement coverage of the pro audio magazines. Enjoy. ■

TWATCH

QSound: Archer Communications, the developer of the QSound three-dimensional recording process, has announced that 12 recording artists have used or are going to use the process on upcoming releases. The list includes Paula Abdul, Bon Jovi, Wilson Phillips, Janet Jackson and Sting. Madonna's "The Immaculate Collection" is the first QSound recording, according to the company. However, word in the engineering grapevine is that the use of QSound on Madonna's album is interesting but not overly dramatic. The album to listen to, it is said, will be Jackson's.

DAT bill: The Digital Audio Tape Recorder Act, which would have required all consumer DAT machines to be equipped with the Serial Copy Management System, died when the 101st Congress adjourned in October. According to Pat Dogato, an aide to Rep. Henry Waxman, the bill's sponsor, there are no plans to reintroduce it next session, and it is unlikely that related legislation will be introduced. Since Sony introduced consumer DAT this past summer, music publishers filed suit. When an issue hits the courts, Dogato said, Congress often drops related legislation, preferring that controversies work their way through the court system. — Sarah Coleman, Washington Correspondent

Lip-synching: In the wake of the Milli Vanilli debacle, lip-synching disclosure bills have been filed in Massachusetts and California. The bills are similar in scope to bills introduced this past summer in New York and New Jersey. However, California's is unique in that it stipulates a prison term of up to one year; the others propose only fines. One of the co-sponsors of the Massachusetts bill, quoted by the Associated Press, said, "It's time to stop the phony road shows." Similar bills have been introduced in New York and New Jersey; no action has been taken on either bill.

Sound-alikes: A sound-alikes suit filed by singer Mitch Ryder has been dismissed. Ryder claimed that a Molson Breweries' TV commercial appropriated his vocal style without his permission. The suit was similar to successful ones brought by Bette Midler and Tom Waites. A suit by Carlos Santana over his guitar sound is still pending.

Compact discs: First it was stabilizing rings. Then, drawing magic marker lines around the edges. Now comes the latest in the quest for improved CD sound: freezing your discs. Not just in the freezer. We're talking heavy-duty cold. Cryogenic freezing. According to an article in Stereophile, placing a CD in a cryogenic freezing chamber with liquid nitrogen relaxes the lattice structure of the disc's polycarbonate. The result: better sounding discs, whatever that means. ■

"Seven million albums? Embarrassing? I don't mean the end justifies the means. But we sold 7 million albums."

— Roy Lott, vice president of operations for Arista, which released Milli Vanilli's "Girl You Know It's True"

Random Access

STUDIO UPDATE

Facility/Location	Details
MANUFACTURERS	
Alpha Audio	Cintel (Knoxville, TN), purchased the BOSS/2 automated audio editor.
Apogee Electronics	Filters fitted in Mitsubishi digital recorders: Howard Jones (UK); Hilton Sound (London).
Digital Audio Research	Soundtracks Studio Ltd. (London), installed Sound-Station II.
Mitsubishi Pro Audio	The Mill Studios (Berkshire, UK), installed an X-880 32-track digital recorder and an X-86 mastering machine.
Neve	Installations of VR consoles: NEP's Super Shooter 8, Manhattan Center Studios (New York), Sound-On-Sound (New York), The Hit Factory (New York), Angel Recording Studios (Islington, UK), Studio 306 (Toronto), 525 Productions (Hollywood), Complete Post (Hollywood) and Compact Video (Burbank, CA). Installations of V consoles: Photo-Magnetic Sound Studios (New York), Sound One (New York) and Group IV (Hollywood).
New England Digital	Sales of PostPro SD: Post Effects (Chicago); Editel (New York); and National Recording Studios (New York). Other sales: Video London, 8-track PostPro; ImagiTrek, Synclavier with Direct-to-Disk; NFL Films, PostPro; Century III (Orlando), PostPro; Chicago Recording Studios, Synclavier 3200; Innovation (Montreal), PostPro; and Blanchard & Healy (Philadelphia), Synclavier 3200 and a PostPro.
Otari	Deliveries taken: Saul Zaentz Film Center, Premier console; and Advantage Audio (Los Angeles), Sound Workshop Series 54 Console.
Shure HTS	The Power Station (New York), purchased Stereosurround encoding and decoding equipment.
Solid State Logic	Installations: Howard Schwartz Recording (New York), ScreenSound; Soundtrack Recording Studios (New York), second ScreenSound; CBS (Hollywood), two SL 6000 G Series consoles.
Soundmaster USA	Warner Bros. Studios installed two Integrated Audio Editing Systems.
Soundtracs	Installed: Quartz production console at EMI'S new London recording complex.
Studer Revox	Dyaxis system installed at JC Penney's video production facility (Dallas). Purchased: D820-48 48-track DASH digital recorder, Conway Recording Studios (Hollywood).
Tannoy	Soundtrek Plaza (Kansas City, MO), took delivery on first pair of System 15 DMT monitors available in US.
TimeLine	TRA Productions (New York), installed two Lynx SAL Time Code Modules.
Versadyne	Installations: Lion Recording Services (Washington, DC), the 4-slave 1500 series high-speed duplication system; and Miami Tape, 6-slave 1500 series high speed duplication system.
WaveFrame	Sales: Paul Clay & Associates (Los Angeles), two CyberFrames; West Productions (Los Angeles), four AudioFrames; Pacific Sound Services (Los Angeles), 10 CyberFrames; and Audio Outpost (London), one AudioFrame.

NEWS NOTES

Correction: In October's First Look column, Audio Animation's Paragon digital processor was described as being appropriate for compact disc mastering, in addition to its capabilities for the broadcast market. According to the company, the statement was incorrect. The company's Muse digital console is for mastering; the Paragon is designed only for broadcast transmission use. R•E•P apologizes for the error.

The **Society of Professional Audio Recording Services** (SPARS) has discontinued its National Studio Exam as part of an overhaul of its educational programs. The exam was begun in 1984. In its place will be an expanded internship program and a lecture network, whereby SPARS manufacturer members will speak at educational institutions.

Five **Lone Wolf** MidiTaps and more than 500 feet of fiber optic cable were used during the recent INXS world tour. The list of artists and facilities using Lone Wolf systems numbers more than 12. Also, the company has chosen New West Audio as its West Coast sales representative.

Here are the attendance figures for the fall conventions. The 89th Audio Engineering Society Convention, held in Los Angeles in September, had an attendance of 14,752. For the 132nd SMPTE Convention, held in New York in October, attendance was 12,000.

DEALS

The German government has approved **BASF's** acquisition of the magnetic tape business of Agfa-Geveart. The acquisition will include sites in Munich, Berlin and Avranches, France.

Clair Brothers Audio and t.c. electronic A/S have signed an agreement concerning their joint development of the TC 6032 EQ motor fader remote control.

Meridian Data has signed a three-year non-exclusive distribution agreement with Merisel. Macamerica, Merisel's Macintosh division, will distribute Meridian Data's full line of CD ROM-related products and publishing systems. ■

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Circle (9) on Rapid Facts Card

Roadwork

By Mark Herman

dB Sound (Des Plaines, IL) has had extensive activity this past fall. dB provided a complete monitor system with a Ramsa WR-S840 stage console, house electronics and a Gamble EX56 house console for the final leg of Aerosmith's world tour, which just ended in Australia. Toby Francis engineered the house mix and Bill Head handled the stage ... The Allman Brothers Band was out on tour with a 40-box dB Sound HD (JBL-loaded) system. Bud Snider (FOH) and Jeff Nelson (stage) handled mixing chores ... World Party played in the U.S. before heading to Europe with a Meyer 12 MSL-3 and four 650 sub main systems. Consoles are a Yamaha PM3000 and a TAC Scorpion 40×12 ... Rapper M.C. Hammer traveled across the U.S. with Electro-Voice MT-4 cabinets. Tim Colvert worked the house mix on a Yamaha PM3000 ... AC/DC is on tour with house mixer Robbie McGrath using a TAC SR9000 40-channel console with 24-channel extender unit. (This same console was just previously out with the Phil Collins world tour) ... the Smithereens fall tour carried a small E-V MT-4 system with a Yamaha PM3000 in the house and a Midas 30×10 onstage. Engineering was by Andy Meyer (FOH) and Don Dome (stage) ... During the Christian group Stryper's recent fall tour, monitor engineer Mike McNeil used the new 11:30 CPM monitor wedges ... dB also has a 40-box system in Europe out with Birmingham, U.K., sound hire company, SSE.

The Big Get Bigger: The latest in manufacturer acquisitions has Klark-Teknik being sold to Mark IV Industries, parent company of Electro-Voice, Altec Lansing and Dynacord, among others. With this acquisition, Mark IV has emerged as one of the primary players in the pro audio manufacturing industry. As far as KT is concerned, it should remain business as usual with only slight changes ahead, for the time being. All the main directors of KT, including president Jack Kelly, have three-year contracts and will remain with the operation. Kelly recently said, "We don't believe any major changes are planned for KT because of the sale. We're looking forward to it and it is something I currently support. We should be good for Mark IV because we fit into certain industry segments that they don't currently operate in."

Audio Teknology reported recent sales of its Paragon live mixing console. Maryland Sound Industries took delivery of a standard 40-channel Paragon for immediate touring service and Nashville's Opryland purchased a custom 64-channel model ... ATI just released version 4.0 of the LEAP (Loudspeaker Enclosure Analysis Program) speaker cabinet CAD software program. The powerful LEAP 4.0 is capable of very accurate non-linear modeling of driver response and complete passive and active crossover design, as well as much more. The program will operate with the Audio Precision System for automated measurement of driver parameters and also contains a new parameter measurement module that helps with manual measurements. Entire program cost is $795.

The 1990 Knobbie Award goes to Crest's new Gamble EX-48 monitor console — with a total of 2,104 knobs! ATI's Paragon console came in a close second with 2,054. (Take note that the Paragon also has 75 faders and 143 meters.)

Next Generation Sound and Lighting (Indian Rocks Beach, FL) is located on the Gulf coast in the Tampa Bay area. This young company was started in August 1990 by Jeff Heiler, formerly part owner of Turn-of-the-Century Productions. Heiler said, "The emphasis will primarily be on touring and serving the local/regional market." Next Generation has been averaging about eight shows a month over the past several months, mainly working national one-offs and occasional large local events. Heiler's main FOH system includes a Soundcraft 800B 32×8×2 house console, Klark-Teknik DN300 equalizers and 16 flyable JBL-loaded full-range Overture main cabinets, which are powered by Crest 8001 and 4001 amps. The monitor system consists of a Soundcraft 500 40×12, Klark-Teknik DN300 equalizers and bi-amped JBL-loaded (15-inch JBL 2225 and 1-inch JBL 2425) proprietary stage wedges which are powered by Crown MA1200s.

Odds and Ends: TC Electronic has acquired the rights from Clair Bros. to market and sell the 6032 remote control equalization system worldwide. (See R•E•P's September 1990 issue.) TC Electronic's U.S. distributor, Virtual Designs, has moved to larger facilities in Westlake, CA ... QSC is shipping its newest amplifier, the 3U EX4000. This powerful, cost-effective amplifier features 1,125W/channel into 4Ω(!), versatile modular input architecture and a sophisticated, thermal management system. Retail price is $1,998 ... Adamson Acoustic Design has shipped 20 of its new MH121 cabinets to C.V. Lloyde (Champaign, IL) and a small system to SPL Production AB (Sweden) ... Clair Bros. recently purchased a fully loaded Crest-manufactured Gamble EX-56 house console for use on the current Paul Simon tour. Crest also sold a Gamble EX-56 house console to Gavay Sound (Sao Paulo, Brazil). ■

Mark Herman is the president of Hi-Tech Audio Systems, a sound reinforcement equipment rental company based in Half Moon Bay, CA.

STUDIO UPDATE

Facility/Location	Details
DESIGNERS	
Munro Associates/London	Design and installation complete on three major European post production facilities: MG Sound, Vienna; Logic West, Milan; Videaudio, Brussels.
Walters-Storyk Design Group/ New York	Construction of a new facility for Admusic in Burbank, CA, including a MIDI/sound design/composing room equipped with an Akai ADAM 12-track digital recorder; a main control room with Tannoy System 15 DMT studio monitors; and a common sound lock between the two rooms, serving as a shared isolation space.
REMOTE RECORDING	
Remote Recording Services' Silver Studio	Installation of API 4848 console in mobile recording facility.

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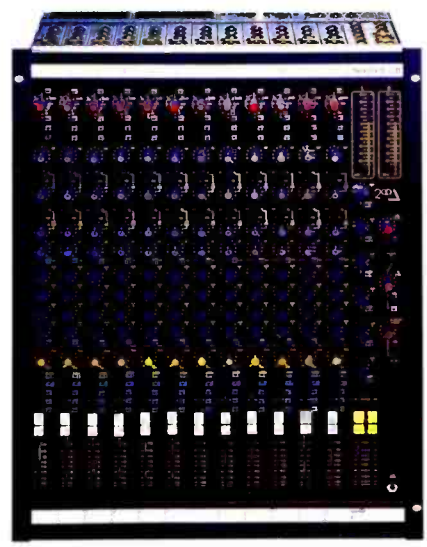
New Deluxe Input Module includes expanded 4-band EQ with two mid-sweeps, high pass filter and post-fader direct output. The rackmount Delta, shown below in a 12x2 version using Deluxe Inputs, can be expanded to 24x2 using Dual Line Inputs. Both the streamlined consoles and rackmount models are built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



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Fresh Tracks

Frank Sinatra: "The Reprise Collection"

Label: Reprise
Collection produced by: Mo Ostin, Joe McEwen, James Isaacs
Digital mastering and remixes: Lee Herschberg

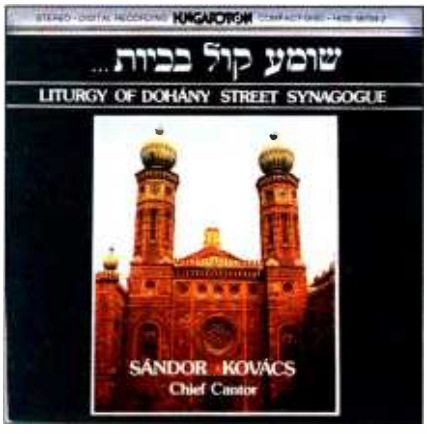
Comments: If you buy only one record in the next year, it should be this one. If you *listen* to only one record in the next 10 years, it should be this one.

Of special interest: Sinatra is a brilliant vocalist. The arrangements of Quincy Jones, Don Costa, Nelson Riddle and Torrie Zito, Johhny Mandel, Neal Hefti, Sy Oliver (and others) are genius. This collection is entrancing and mesmerizing, from the downbeat of "Let's Fall In Love" to the last note of "Mack the Knife," 81 songs later. Every major rock and jazz artist has singled Sinatra out as one of the most important vocalists ever. This collection shows why. ■

Sandor Kovacs and Chorus of Shany Street Synagogue: "Liturgy of Dohany Street Synagogue"

Label: Hungaroton
Produced by: Zoltan Hezser
Recording by: Endre Radanyi
Studio: Recorded live at Dohany Street Synagogue
Mastered by: N/A
SPARS Code: DDD

Comments: If the confines of today's modern studio have you yearning for the natural acoustic depth of yesteryear's large recital halls, this recording may spark the creative engineer inside of you to create realistic environs when utilizing digital effects to create an ambient environment.



Of special interest: The environment, which is realistically aided and abetted by the digital format, lends a clarity to the performance, which at first listening seems out of focus when compared to modern DSP. It is this blurring, rather than discrete filtering of sounds, that DSP has yet to tackle, and as such, appears only in the raw, natural acoustic state. ■

Toy Matinee: "Toy Matinee"

Label: Reprise
Produced by: Bill Bottrell
Engineered by: Bill Bottrell, Kevin Gilbert, Michael Vail Blum, Bob Salcedo, Elaine Anderson, Micajah Ryan
Recorded at: Johnny Yuma Recording, Smoketree Ranch, The Grey Room
Mastered by: Steve Hall at Future Disc, Hollywood
SPARS Code: AAD

Comments: Not since Peter Gabriel's "So" has such a well-crafted collection of fresh modern rock 'n' roll emerged from the depths of today's modern recording studios. The superb craft evident in this writing is equally matched by superior recording production and engineering feats.

Of special interest: For the digital purists, listen very carefully: The warmth of analog, and dare we say, clarity, might just make you reconsider bashing the old medium. ■

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Fresh Tracks

Mark Whitfield: "The Marksman"

Label: Warner Bros.
Produced by: Tommy LiPuma
Engineered by: Al Schmitt
Mixed by: Al Schmitt
Recorded at: The Power Station, New York; Bill Schnee Studios, Los Angeles; 321 Studios, Los Angeles
Mastered by: Doug Sax, the Mastering Lab, Los Angeles
SPARS Code: AAD

Comments: Maybe we should start devoting a special section just to albums recorded by Al Schmitt. Like this one, they are consistently beautiful recordings, well balanced and easy to listen to. "The Marksman's" modern sound is achieved with subtlety; there is no particular "sound" or device that jumps out and screams "modern!" The recording sounds fresh in an easy and understated way. Whitfield is a new, young jazz guitarist, discovered by George Benson. His playing is slightly Benson-like (early Benson, before he started singing), yet Whitfield maintains a unique voice on his instrument.

Of special interest: The drums are brilliantly recorded. In headphones, it sounds as though you are sitting right behind the drum kit; the kit surrounds and envelopes you. Similarly, the guitar, acoustic bass and piano sound like you are standing right next to them, yet none of the instruments crowd one another. The combination of the performance and engineering is vibrant. [For an interview with Schmitt on his mic technique, see September's Fresh Tracks.] ■

Candyman: "Ain't No Shame in My Game"

Label: Epic
Produced by: Candyman, Johnny "J" and the Candyland Band
Engineered by: Tony Cannella, Donovan Sound
Recorded at: Formula 1 Studios, Audio Achievements Recording Studios
Mastered by: Brian Gardner, Bernie Grundman Mastering
SPARS Code: AAD

Comments: This is one of the top rap albums in the country, and it is very musical and well-recorded. The kick is practically subsonic — almost entirely below 60Hz. Candyman uses his sources just enough to be interesting, but not so much that you get confused about what song you're listening to. The album contains the obligatory song about safe sex ("Don't Leave Home Without It") and Candy's sense of humor and groove are top-notch.

Of special interest: One of our favorite lyrics: "My name is Candy and I'm so sweet/You'll get a cavity the first time we meet." On "Melt In Your Mouth" and "Playin' On Me," the Candyman sounds almost like he's trying to do make-out music — the rap equivalent to Johnny Mathis? ■

An Emotional Fish: "An Emotional Fish"

Label: Atlantic
Produced by: Tim Palmer
Engineered by: Chris Sheldon
Mixed by: Tim Palmer and Wimon Vinestock
Recorded at: Windmill Lane, Dublin
Mixed at: The Mill, Cookham

Comments: AEF may be the most interesting new band to come along in some time. Reminiscent of Velvet Underground and U2, the rock press has also compared them to The Doors. They're considered "alternative," which means they may be difficult to find on radio, but this release is worth owning.

Of special interest: Palmer captures the moody ambience of the performances in a recording that itself seems moody, particularly on "Colours." Like U2's recordings, the instruments are often recorded darkly, and the voice gets all the top end, helping it to cut through and sit on top. The bass guitar has that full and rich sound that can only be achieved by miking a loud, live cabinet. ■

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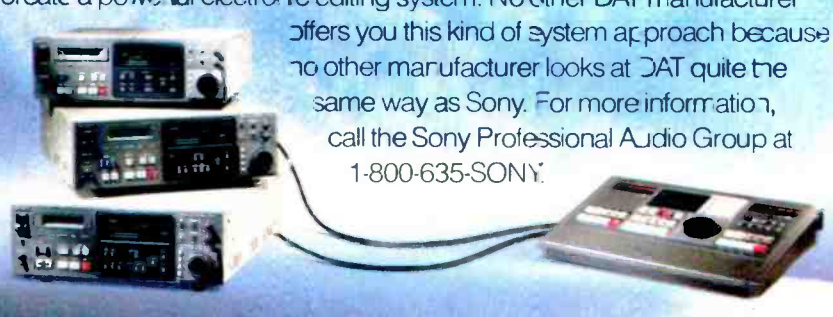
Instant Start. If you need "On-the-Air" or "On-the-Fly" cueing, you can equip our new DAT recorders with Instant Start. It's simple to use. Just mark and trim the starting point, then press PLAY. You'll get instantaneous audio output with absolutely no start-up "wow." To make it even more convenient, you can initiate Instant Start with a fader-start or GPI.

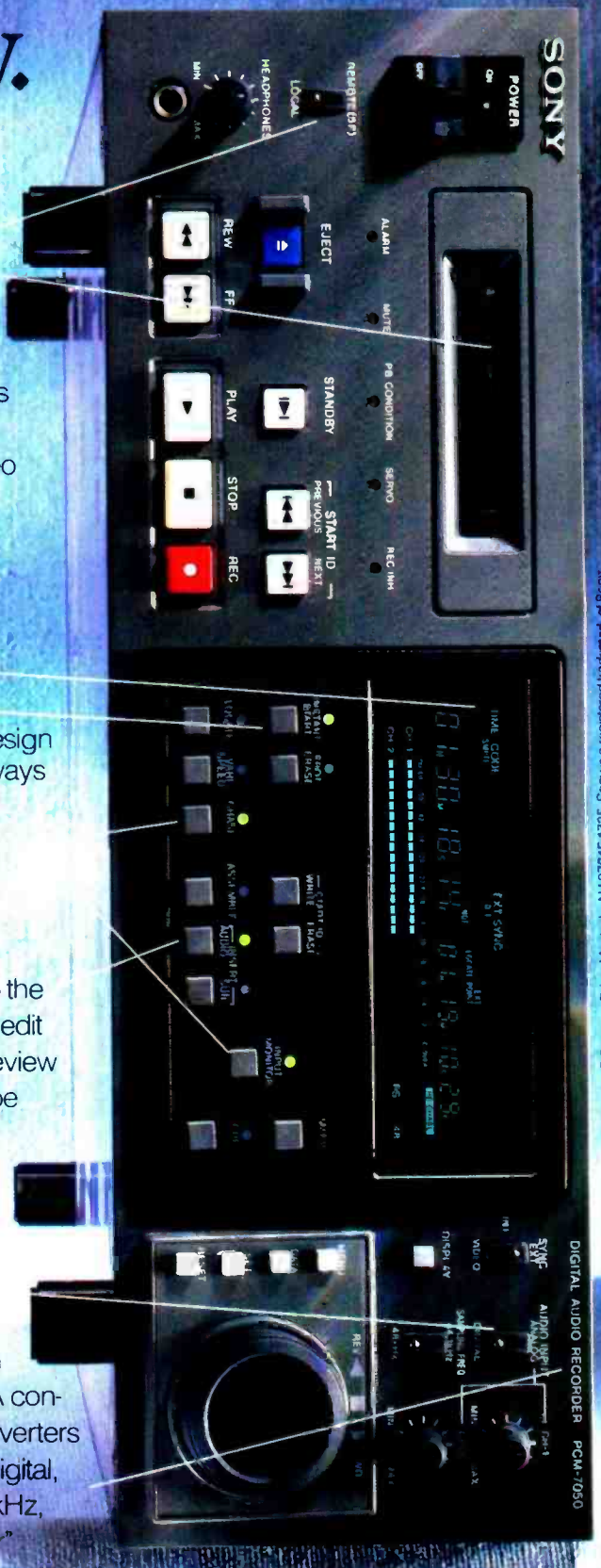
Chase Synchronization. With the internal Chase Synchronization option of the PCM-7050 and 7030, you can press a single button to lock to any time code based equipment—whether it's a VTR, ATR or a second Sony PCM-7000. You can also enter or capture an offset instantly and maintain synchronization with the time code data or from an external reference.

The System. The PCM-7050, 7030 and 7010 time code DAT recorders are all designed and constructed for professional use. They each offer clear advantages in sound quality and operating economy over conventional analog recorders. They're smaller and faster than analog recorders. And when you add the RM-D7300 edit controller to the PCM-7050 and 7030, they create a powerful electronic editing system. No other DAT manufacturer offers you this kind of system approach because no other manufacturer looks at DAT quite the same way as Sony. For more information, call the Sony Professional Audio Group at 1-800-635-SONY.



Professional Inputs and Outputs. It goes without saying that you can connect these DAT recorders with a variety of I/O's—like balanced XLR analog I/O's or optional digital I/O's, including AES/EBU. This enables you to transfer audio to digital VTR's and just about any other professional audio equipment you desire.

corders have so many features, whole new way.



External Control. Our new DAT recorders offer you several external control options—an RS-232C port for computers, parallel connectors for external synchronizers and a 9-pin serial port on the PCM-7050 and 7030 for compatible video editors. So you can control our DAT recorders from just about any source you choose.

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Audio Quality. We've minimized phase distortion in our new DAT recorders by giving them 18-bit D-to-A converters with 8 times oversampling—and A-to-D converters with 64 times oversampling. And because they're digital, frequency response is extremely flat from 20Hz-20kHz, dynamic range exceeds 90dB and "wow and flutter" levels are so low they can't be measured. Which sounds pretty good here, but sounds even better on DAT.

SONY

BUSINESS AND PROFESSIONAL GROUP

Fresh Tracks

Steve Winwood: "Refugees of the Heart"

Label: Virgin
Produced by: Steve Winwood
Engineered by: Tom Lord-Alge, Mick Dolan
Mixed by: Tom Lord-Alge
Recorded at: Netherturkdonic, United Kingdom; Emerald Sound, Nashville
Mastered by: Ted Jensen, Sterling Sound, New York
SPARS Code: DDD

Comments: A superb followup to 1988's "Roll With It"; Winwood's singing is as good as ever. The mixes all have a lot going on in them, but everything comes through. The vocals show good use of subtle pitch shifting/chorusing effects and multiple delays. "Come Out And Dance" has a "Roll With It"-type groove and horns.

Of special interest: The snare reverb on "Keep on Searching" starts out with a very long, interestingly tailed sound and then changes seamlessly at 0:50 to a clean and tight room. Three of the best drummers in the world play here: Russ Kunkel, Eddie Bayers and Jim Capaldi. Winwood's Fairlight bass playing is solid as usual. The reverb sounds are all unique and fresh.■

FOCUS:

STEVE WINWOOD, Producer, TOM LORD-ALGE, Engineer "Refugees of the Heart"

R•E•P: As a producer, how involved do you get with the engineering?
SW: I am kind of a tech-head. I operate the SSL and in some instances, make my own composites. I do a certain amount of my own recording, particularly in the control room. I like to be involved with the equipment.

R•E•P: What drew you to Tom Lord-Alge in the first place?
SW: Tom was fresh and unbiased. He was quick and worked to a considerable extent without any set rules, and I found this to be exactly what I wanted at the time.

R•E•P: Do you approach recording with a particular production philosophy?
SW: Yes: A record should not be overproduced. Also, Tom and I are great believers in keeping the machine in Record because we've found many times that good takes can escape. We don't allow anyone to play anything in Input. I also think that sounds should be distinctive and that balance is very important.

R•E•P: How did the tracks begin?
TLA: When I came into the project, Steve had already spent four months at home putting stuff down. There were Fairlight drums, one or two basic keyboard parts and the vocals. One of the great things he did for this record was he recorded the vocals right after these basics were done. We might have gone back and punched an odd line here and there, but we basically kept those first takes through the whole project. The performances were great — they were right off the cuff, they were the first times he sang it, and they had a nice spark to them.

So we went to Nashville and recorded the drums first — the drum room at Emerald sounds great. Russ Kunkel came in and I used an Electro-Voice RE20 on the kick, Shure 57 on the snare top and bottom, Sennheiser 451 on the hat, Sennheiser 421s across the three toms, and a pair of AKG 414s on the overheads. Another pair of 414s close in for the room, and Neumann U87s in the back of the room. I hired in a set of double 18 bass bins and an amplifier, and I set them up into the room, as well, to make it bark more.

R•E•P: What kind of board did you mix on?
TLA: We mixed the record at Steve's house; he has an SSL 64-channel, and two Mitsubishi 32-track digitals. For monitors, we just put in a set of the big Tannoys; we also have the standard NS-10s with tissue paper.

R•E•P: What reverbs did you use?
TLA: The main one I used on the drums was the Sony DRE-2000 — it's one of my faves. On the vocals, he's got one of the original Lexicon 224s, which I think is the only Lexicon product that's worth a f—. Lex started doing something to its reverbs after the 224, which made them sound really unnatural to me. I think the Yamaha SPX-1000s are absolutely brilliant; they're reasonably priced and they sound very realistic. Another of my faves are the Ursa Major Space Station, Yamaha REV 5 and Steve's EMT 250. — By Dan Levitin ■

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Circle (12) on Rapid Facts Card

DIVERSIFYING YOUR FUTURE

By Jon Dressel

As we face the beginning of what may be a recessionary period, I keep reminding myself and those who work with me that the entertainment business, specifically the recording industry, is recession-proof. Everybody needs entertainment, especially music, right?

We might all like to believe that, but in truth, an economic slowdown is going to impact us all.

It seems that in this day of the specialist, the general practitioner has all but disappeared. If we are going to weather this economic storm on the horizon, it might be a good 'dea for us to examine diversification, both in the type of work we do and the markets we aim to capture.

There are really only two major categories of diversification open to our service-oriented businesses. One is to add additional services to our existing operation; the other is to expand our current marketplace penetration to attract additional clientele. Let's take a closer look at adding services and expanding our position in the marketplace.

It surprises me how often a recording facility has a great service to offer and yet doesn't have the volume of business that it deserves. It's all too common that there is an inadequate understanding of who the clientele actually is. Before making any kind of move, it is imperative to understand who makes up the current client base so that you can determine the best ways in which to expand.

The next step is to examine the potential for new work. What percentage of prospective new clients do you work with already? Perhaps you are only handling their recording needs and could offer duplication, packaging and other related services.

Is it possible to move into other marketplaces? Does your business have the ability and resources to market itself locally, nationally and internationally? If so, can you expand your client base using your existing services? With the help of the technology that you already base your business on, and the ease of communication and travel available these days, it's not unreasonable to consider clientele that may reach well beyond your local market. In fact, there are many non-location specific services that can be offered.

Let's further analyze current and future clients, and the services that could be provided. For example, if your business is primarily commercial jingles on weekdays, does it make sense to pursue record work at night? Take a close look at your existing resources, competition and current clients.

In examining your resources, do you have the necessary equipment and personnel to offer clients the ability to make a record? If not, does your projected income justify purchasing additional gear or hiring additional employees to help secure this new business? What about your competition? How many studios are there in your marketplace that already have established clients in the new area that you want to provide services in? What about the clients that you already have — will any of them be potential clients for this new service?

These are the types of questions you must answer before you can make a proper decision regarding new directions for your business. Although most of us would like to be innovators, it usually doesn't make sense to reinvent the wheel. If you don't have existing clients that can use a service, maybe you should re-examine what kind of service you are planning to offer. If your existing clients are primarily doing jingles, maybe it would make more sense to look at post-production audio scoring for video. It seems that most of your existing clients and resources would fit into this new service area.

But are you absolutely sure that it is appropriate to add more comprehensive and additional services? That answer may be no; it may be more strategic to continue providing the same services that you already have in place. The answer may be to provide these services to a larger base of clients. If this is true, then a proper marketing strategy should bring your business the added revenue and traffic you are looking for, without it being necessary to add new technology and expand your staff.

Providing a wider variety of services aimed toward different types of clientele gives you the capability to stay in whatever your current marketplace might be. The options are almost limitless: record work, jingles, industrial projects, film/video scoring, post-production audio, editing, tape duplication, mastering and audio restoration, to name a few.

Some of these services must be primarily based in your local marketplace. For example, most advertising agencies that work on jingles are not willing to fly to another city, let alone drive very far. On the other hand, many recording artists are willing to fly halfway around the world for the right creative vibe or technology. Depending on your location, both situations should be considered.

In addition, there are many types of services that are not dependent on the physical location of your facility. Restoration work is one example. Generally, it is not necessary for the client to be present during most of the restoration work. If it is necessary, it can usually be handled by one person who need not be present at all times. Removing the travel costs from the formula dramatically affects the ability to offer many different services despite your, or your client's, location. Of course, it is still necessary to find your potential clients and introduce them to your business and services.

All of these points of diversification and expansion rely on one very important factor: your employees and the level of service and commitment to your clients that you provide. Even if it isn't necessary for the client to be present for all of the work that must be done, his needs must be met promptly, efficiently, courteously and professionally. Once you have gone to the trouble of attracting new clients, it's important that you maintain their confidence and repeat business.

In closing, I'd like to recommend SPARS as an organization that provides all of its members with the ability to begin networking beyond their existing markets. I've found SPARS members to be very open and willing to share valuable business and technical insights. You'll find the hard facts and camaraderie to help explore new areas of business from those who have survived and succeeded. SPARS itself is very diverse in its membership and capabilities, reflecting the growing diversity of our industry. ■

Jon Dressel is studio operations manager of Paisley Park Studios in Minneapolis and a member of the SPARS board of directors.

The Society of Professional Audio Recording Services is the industry's best source of business information. For information on activities and membership, contact SPARS at 4300 10th Ave. N., Suite 2, Lake Worth, FL 33461; 407-641-6648; fax 407-642-8263.

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Circle (13) on Rapid Facts Card

Talk is Cheap

By Rick Schwartz

A lot of people are talking about the standardization of digital audio workstations, but few seem to be doing anything about it. There are really two issues here: sound file compatibility and playlist compatibility.

Let's start with sound file compatibility. Sound files are stored on very large hard disks. Most systems use Winchester-style magnetic drives, which comply more or less to the SCSI standard. Because of this fact, many drives could be interchangeable, but here is where the trouble begins.

Not all disks are formatted using the same disk operating system. As a result, one system cannot read another's disk directory to find out what is on the disk. However, there is hope, especially among manufacturers on the same platform. Macintosh users can easily interchange media whether it be an optical platter, SyQuest cartridge or a streamer tape. Although few companies seem to be using it, there is a standard for sound file exchange.

A STANDARD EXISTS

The Audio Interchange File Format (AIFF) provides a standard for storing sound. The format is quite flexible, allowing for the storage of single or multichannel sounds at a variety of different sample rates. AIFF conforms to an earlier standard developed by Electronic Arts and is the result of meetings held with music developers over a 10-month period in 1987-88.

In order to fully understand the AIFF standard, you need to learn a new word: chunk. It represents a type of data. A simple AIFF file consists of a common chunk and a sound data chunk. The common chunk describes basic parameters of the sound, like the number of channels, its length and sample rate. Any number of channels may be supported, even 6-channel film sound. For multichannel use, the sound is interleaved.

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

The second part of an AIFF file is the sound data chunk, which contains the actual audio samples. The standard supports up to 32-bit resolution. One nice thing about AIFF is that a 12-bit device can read 16-bit files, by ignoring the last four bits.

AIFF is mainly an interchange format, although programmers should find it flexible enough to use as a data storage format as well. There are several optional chunks like the instrument chunk, which is ideal for use with digital samplers. It contains special parameters for looping, keyboard mapping, pitch range and more. If an application wishes to continue using its existing format, it should be able to convert to and from the AIFF format.

Everything is getting smaller, faster and cheaper except hard disks, which are getting larger, faster and cheaper.

One example of this compatibility is Sound Designer II from Digidesign. Sound Designer supports the AIFF format for mono sound files, but converts to other formats as well. By storing data in the AIFF format, it is easy to go back and forth between Passport's Alchemy, Digidesign's Sound Designer, Opcode's Studio Vision and even to a Studer Editech Dyaxis digital editing system. Even if AIFF files are not supported, it is not difficult to open sound files from another manufacturer, if it chooses to make its file formats public.

A SIMPLE SOLUTION

The next obstacle to DAW standardization is playlist compatibility. Fortunately, there is a popular format for edit decision lists (EDLs) from a company called CMX. Although most video editing equipment conforms to this standard, very few audio manufacturers support it. It is unlikely that you will be able to directly open a playlist from another workstation. This is not a problem if programmers add simple conversion utilities to their products.

The DAW manufacturers need to get together and work out a standard like the MIDI manufacturers did two years ago for MIDI song files. It can be done. Most likely, each company will need to convert its EDLs to a text file, so that it can be read by any type of computer system. A playlist is small compared to a sound file and will most likely fit on a high density floppy disk. There are floppy disk drives that can read both IBM and Macintosh disks.

WHY BOTHER?

In case you're wondering why interplatform sound file exchange is so important, consider the fact that it is easy to fill up a 300Mbyte, or even a 600Mbyte, hard disk with audio. You can think of 300Mbytes as the equivalent of a 10-inch reel of tape. If a client could simply bring in a universal format removable disk, it would eliminate the time required to upload and download sound files into the system. This is a problem, however, because who pays for this transfer time, the client or the studio? This dilemma was never an issue with multitrack, because of the popularity of 2-inch tape machines.

For some reason, DAW manufacturers do not seem to be highly motivated to adopt a universal file format, possibly because of the fear that they could lose market share. If such a universal standard existed, companies that had previously shied away (i.e., the Japanese manufacturers), might be more inclined to produce a digital workstation. They could then sell enough devices to make such an endeavor profitable by taking advantage of an already existing user base. But regardless of these risks, you can't stop progress. DAW users will demand more exchangeability in future products.

COMDEX EXPLODES

I had a dream. I was in the middle of a giant hall with the two great superpowers — Apple and IBM — but it wasn't a dream. It was COMDEX, the giant computer show. This year, Apple seemed ready to go head-to-head with IBM feature for feature, dollar for dollar. Held at the Las Vegas Convention Center, COMDEX was out of control. To see everything at this megashow, you would need to walk more than 22 miles of aisles. We're talkin' 40-plus football fields of exhibit space. Not bad in a recession year. Try to get a hotel room with 120,000+ conventioneers in town.

SMALLER, FASTER, CHEAPER

So what's new? In a nutshell, it seems everything is getting smaller, faster and cheaper. Except, of course, hard disks, which are getting larger, faster and cheaper. Hard disk manufacturers are increasing performance by increasing rotational

speeds or by using two disks that are spliced into one volume. This greatly reduces some types of seek times.

Another way to improve performance is by using third-party SCSI cards with greatly improved transfer rates. Rodime introduced a 3.5-inch hard disk with a formatted capacity of 540Mbytes. If that's not enough storage space, Seagate showed a (5.25-inch) 1.6Gbyte drive.

The DAW manufacturers need to get together and work out a standard like the MIDI manufacturers did.

SUPER FLOPPIES?

Sony is developing a 4Mbyte 3.5-inch floppy disk that is scheduled to ship this month. Eventually, the company expects to have a 20Mbyte floppy. It wasn't that long ago when 20Mbytes were the largest hard disks available — period.

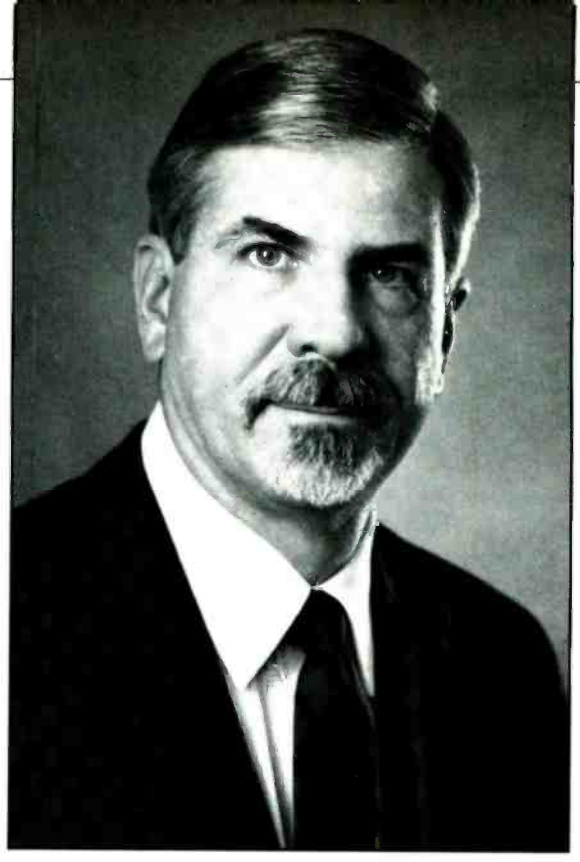
One of the biggest problems with digital audio workstations has been where to put all of the data. There are really only two serious choices: removable optical media and tape streamers. MicroNet announced a 4mm DAT backup system capable of 3.3Gbytes, blowing the lid off the previous 1.3Gbyte limit. By using thinner tape, up to 5Gbytes is possible, the company said. That's equal to more than 6,000 double-density floppy disks.

Best of all, tape streamers are becoming faster because of hardware data compression techniques, which should make backups several times faster than "real time" in the future.

THIS YEAR'S BUZZWORD

Intel is making available special video processor chips, based on DVI (Digital Video Interactive) compression technology that will bring expanded multimedia applications into personal computers for less than $1,000. Desktop video is sure to be one of the next great buzzwords. ■

THE R•E•P INTERVIEW



Jack Renner

By Dan Levitin

As the chairman and chief recording engineer at Telarc, Jack Renner is the head of what is arguably the world's most respected label for sound quality. While other labels produce classical recordings of high quality, Telarc stands apart for its consistency. Each one of its roughly 200 titles reaches higher and higher standards for recording quality and performance.

Renner has recorded many of the finest orchestras and conductors in the world. A partial list includes the Berlin Philharmonic, Vienna Philharmonic, Boston Symphony, Cleveland Orchestra, Philadelphia Orchestra, Los Angeles Philharmonic, Seiji Ozawa, Edo de Waart, Lorin Maazel, Eugene Ormandy, Zubin Mehta and Sir Charles Mackerras.

Dan Levitin is a contributing editor to R•E•P and a producer based in Stanford, CA.

Less is more: The Grammy-winning chairman of Telarc talks about miking and recording for classical music.

Renner has received the Best Engineered Classical Recording Grammy four times, and been nominated for it an additional seven times. He made the first U.S. symphonic digital recording in April 1978, and the first worldwide digital recording of a world-class orchestra in October of that year.

A master of microphone technique, Renner subscribes to the "less is more" theory. Rarely using more than five microphones on an entire symphony orchestra, his mic technique has been praised widely, most notably by the performers themselves, who describe his recordings as the most realistic they've ever heard.

Additionally, Telarc compact discs are exquisitely packaged, with extensive liner notes. And get this: Each recording includes specific information about which mics were used, and about the console, monitor speakers, and D/A converters — a practice that we would like to see adopted by all labels.

R•E•P: How many microphones do you use to record a symphony?
JR: That depends on the room, the piece being performed ... normally three and quite often as many as five.

R•E•P: What kind of mics?
JR: The three would normally be small diaphragm, omnidirectional microphones: B&K 4006, Schoeps MK2 or MK2-S, Sennheiser MKH-20. Again, depending on the acoustics and the orchestra, they would probably be anywhere from 10 to 11 feet off of the main floor, and somewhere from four to six feet away from the front row of the orchestra. The center one would be behind the conductor, and the other two would be spread 12 to 15 feet on either side, depending on how the orchestra's laid out.

R•E•P: Do you ever suspend mics from the ceiling? I'm thinking of the recent recording you did at Davies Symphony Hall in San Francisco [Michael Murray, "The Ruffatti Organ in Davies Symphony Hall"] where they have mics already placed and suspended, and which I believe they use for many of their recordings ...
JR: No, I use my own mics. I try not to hang from the ceiling. When you're in a closed recording situation, there's no reason to hang. The only reason you might hang is so that there are no mic stands obscuring the view of audience members.

R•E•P: You were telling me the other day about how much it costs to keep an orchestra waiting ...
JR: Right. Of course, it depends on the orchestra, and if you're in Europe, on the exchange rate and so on. On the average, with a really major, international orchestra, the cost is somewhere between $250 to $300 a minute. So I generally don't like to spend more than 15 minutes getting a sound before I'm ready to roll.

R•E•P: Clearly, you have to do as much setup as possible before the orchestra gets there.
JR: That's true. Typically. I'll go and listen to them first at a concert. It's often difficult to hear an orchestra in a rehearsal. But the mic placement I described to you works fairly well in most halls. We generally don't go into halls that we know are not going to work well for recording. Most of the places we use now are places where I've recorded before, so I know what to expect.

R•E•P: It seems like it would be impossible to get things going in 15 minutes, or even in an hour. There are so many variables: the piece they're going to play, the

orchestra on that particular day, the conductor ...

JR: Before the orchestra gets there, of course, the mics will be set up. They'll be on stands, plugged in, everything will be checked out, and they will be within this area that I've described. I may have spot mics on the winds, for instance, and they'll be set. From what I've learned over the years, I can come within inches of having them where they need to be for the kind of finished sound we want to get, and I can have that before the orchestra walks on stage.

Then they play a bit and I might move the mics around a little — it's really a matter of fine-tuning then. The only time I might take longer is if we have an unusual situation. Say a piano concerto where balance may be a problem. I always try to record orchestras and soloists in what would be a normal concert setup. I don't like moving people all over the place into strange positions just to accommodate the recording.

So if we're doing a piano concerto, the conductor normally has the backs of his legs practically against the rear of the piano. We try to keep it that way, because that's how they are used to playing concerts, so it's more comfortable for everyone involved. But you can see, this can present some balance problems.

R•E•P: How can you ensure that a soloist will come through without spot miking?
JR: I would normally spot mike soloists ...

R•E•P: And mix them in live ...
JR: Yes ...

R•E•P: So you have to have an intimate familiarity with the score.
JR: Right.

R•E•P: Do you record multitrack and mix down later?
JR: No, this is all live to 2-track. The producer is in the control room with me, and he follows the score very carefully. But with the mic placements I use, once the piece begins it's very rare that we have to alter anything, because the conductor and the soloist have worked at getting a balance that is pleasing in the performance and pleasing in the hall. It's just a matter of my preserving that.

When I mic soloists, understand that it's just to touch up or focus that soloist or voice, because most of the sound is coming from the main microphones. And we will not pick up enough from the orchestra on the solo mics that you would hear any difference in the mix at all. The orchestra is being heard on the recording pretty much the way it would be heard if you were in the concert hall.

R•E•P: Do you record a piece all the way through, or do you edit sections together?
JR: There are two approaches. We try to get either complete movements, or where circumstances are right, we will have an orchestra run a complete symphony for us, just as if they were doing a concert. That gets the musical flow going; it just gives you much more of a finished performance. Once we've got at least two full performances of an entire work in the can, then we might go back in spots to record little sections where we have to. Normally we start our editing process with long, long chunks of tape.

R•E•P: What is your 2-track machine?
JR: We're typically recording to Sony 1630s, but we are only using that as a storage medium. We have outboard A/Ds.

R•E•P: And you do all of your editing from one 1630 to another?
JR: Right. And we never have to deal with Sony electronics at all, nor with the other digital formats. The A/D that we're using — the UltraAnalog — is a 20-bit, 128-times oversampling chip. Now we have our own R&D department here, and a fellow we're working with, Tom Stockham, developed the SoundStream digital system in the mid-1970s, which most of the American companies used. So we're using him as a consultant to help us develop our own proprietary A/Ds.

By going to 1630, we eliminate the need for mastering. We can just send our finished product directly to the CD manufacturer without having to ever relinquish control.

R•E•P: Who do you use for manufacturing?
JR: We use Digital Audio Disc Corp. in Terre Haute, IN, which does all of our Western Hemisphere and Far East product. Its sister plant in Austria manufactures our European product.

R•E•P: There's a recording that is interesting because it is so awful. It's not one of yours — it was one of the last Beethoven series that Herbert von Karajan did in the mid-1980s. It was a digital recording, and he close-miked everything ...
JR: That's right ...

R•E•P: Whenever a featured or solo instrument plays, it's right in your face. It is really annoying and you don't get any sense of natural ambience. And the story is that the Deutsche Grammophon people were hounding him to let them remix it, but he refused because he loved the way it sounded. I think he said something to the effect that it was how he had always heard it in his head.

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JR: Von Karajan was a great techno freak; he loved to fiddle with balances and he loved to fiddle with all of the new things. I would not lay the blame for the inappropriate balances totally at his feet; it may have been a product of what I think is general overmiking.

When I started working with the Vienna Philharmonic with my 5-mic setup — because the hall there is excessively reverberant and I needed two extra mics to get the detail I wanted — several members of the orchestra told me that they appreciate what they hear on my recordings more than any other label, because it sounds like the Vienna Philharmonic playing in its own hall. What they said was that when other companies come in, there are microphones everywhere and the result is that the Vienna Philharmonic ends up sounding like every other orchestra in every other hall.

R•E•P: That's a very good articulation of it. I think the reason you are a hero in the industry is because you are doing what everyone says they want to do, but hasn't figured out yet how to do it: You give every orchestra its own identity.
JR: Yes, that is what I've tried the hardest to do.

R•E•P: And within a given orchestra, each recording has a subtle identity that distinguishes it from the others. When you record performances of say, Mozart and Haydn, they sound as different as they should.
JR: I think part of that is in the miking, because I'm not sitting there mixing the whole performance and constantly overriding the balance decisions that the conductor has so carefully worked out with the orchestra.

R•E•P: Yes. Because ultimately one thing which distinguishes one composer from another, certainly apart from the music, is their choice of orchestration and balance, and that is what you preserve so well.
JR: Well, I am lucky, because I was trained as a musician rather than as an engineer, and I approach what I do from the musical aspect.

R•E•P: The economics of classical music are very different than pop, aren't they?
JR: Yes. If a major label sells 10,000 copies of a particular title, I think they're happy.

R•E•P: So at $250 a minute, it seems they can barely afford to record the entire piece and break even. As chairman of the company, how do you decide the balance between your artistic preferences and your business obligation? How do you decide whether to spend the extra few hundred or a thousand bucks to get something just a little bit better?
JR: That's a very easy decision: We are always going to make it as good as we can. And if it's going to take a few hundred extra dollars, we'll do it.

R•E•P: There must be some recordings you've lost money on. Especially by some of the lesser-known composers — Poulenc, Franck ...
JR: Actually, no. I can't think of one. Now it is true that some of our recordings sell better than others, but we don't pay the same for every recording; we try to match our expenses with what we think the sales will be.

R•E•P: What is a typical sales figure at Telarc, say for the Mozart Symphonies?
JR: I'd say 20,000 to 30,000 in the first couple of years, and then they just keep on going. We're past 50,000 with the first one we did there in Prague. And our jazz titles are doing incredibly well.

R•E•P: What's your overall philosophy of recording? How do you see your role?
JR: I see my job to try to re-creative. I feel it is my job to try to re-create what the soloist and the group and the conductor have worked so hard to achieve, and not to intrude between the intention of the performers and what finally reaches the audience. I really think that the Telarc sound should represent the perception of the music that you would have if you were sitting in the concert hall. ■

Recommended Telarc Discography

Selecting a few representative titles from the vast Telarc discography is exceedingly difficult. All Telarc CDs are impeccably recorded and represent the standard in recording quality. The performances also meet the highest standards of quality. It is hard to go wrong with any Telarc release, but the following are our favorites:

- Cleveland Quartet: "Schubert: Trout Quintet/Quartet in A Minor." The members of the quartet perform on a matched set of Stradivarius instruments made between 1696 and 1736. Renner captured the sound on Schoeps M221B tube mics.

- The Cleveland Orchestra and Chorus, Christopher von Dohnnyi: "Beethoven Symphony Series." Available as a boxed set or individually. Highly recommended, even for those who already have a collection of these. You can't own too many versions of Beethoven symphonies.

- Sir Charles Mackerras, Prague Chamber Orchestra: "Mozart Symphony Series." Vibrant, particularly the "Jupiter." Available across a series of eight CDs.

- Jess Lpez-Cobos, Cincinnati Symphony Orchestra: "Franck Symphony in D Minor/Le Chasseur Maudit." A beautiful performance of a hard-to-find work.

- London Symphony Orchestra, Sir Charles Mackerras: "Tchaikovsky Nutcracker Complete Ballet Score." This recording comprised the soundtrack of the 1986 motion picture. The label warns: "CAUTION! Digital Cannons." A two-CD set.

- The Oscar Peterson Trio: "Live at the Blue Note" (with Bobby Durham). Renner said, "I used what is really a classical approach for recording this." The legendary jazz group captured at the famous Blue Note nightclub.

- Yoel Levi, Atlanta Symphony Orchestra: "Sibelius Symphonies No. 1 and 5." The opening clarinet solo in the first symphony has a natural ambience that is haunting. Renner used only Sennheiser MKH-20s.

- John O'Conner: "Beethoven Piano Sonatas series." By one of the brightest young pianists. Two of the more popular — the "Moonlight" and the "Pathetique" — are on the same disc.

- "Telarc Samplers 1-4." An introduction to the diversity available on Telarc — a good way to find out what you like.

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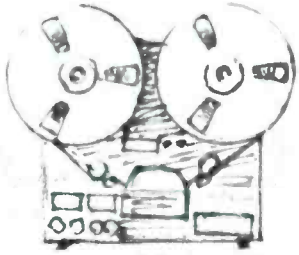

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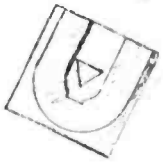

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By Peter Gotcher

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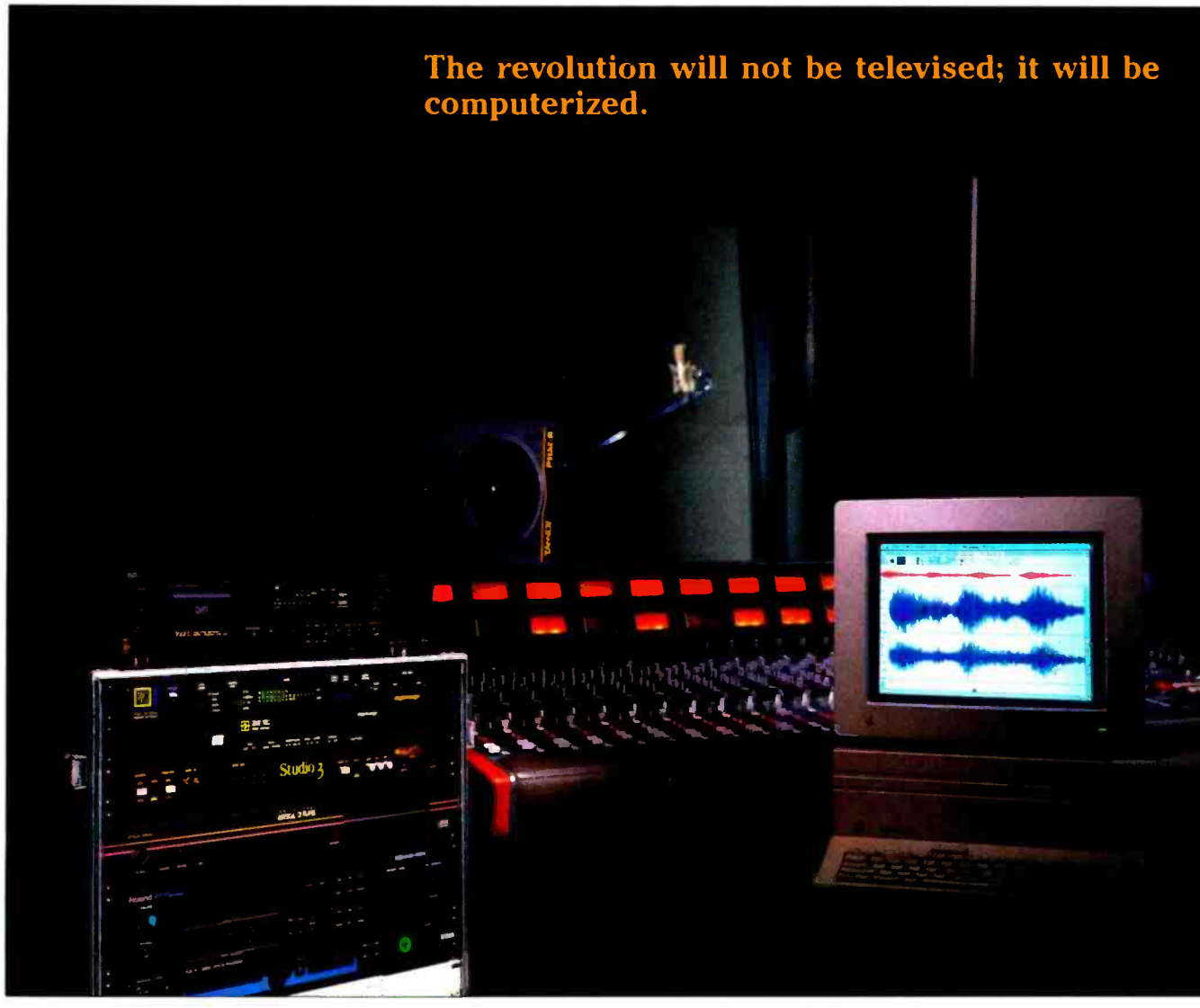
The microprocessor is probably the most significant technological innovation of the 20th century. These "computers on a chip" have influenced virtually every aspect of our lives, and we rely on computers to carry out many tasks we now take for granted. Word processors have replaced typewriters, Nintendo has superseded Monopoly, and even our coffee makers are computerized. I can't remember the last time I set foot in a bank, now that automated teller machines exist on every corner. As accustomed as I have become to the omnipresence of computers, I was surprised recently when an auto mechanic told me that my car needed a software update to correct a problem. Well, that's one computer that I hope never crashes!

Peter Gotcher is president of Digidesign, Menlo Park, CA.



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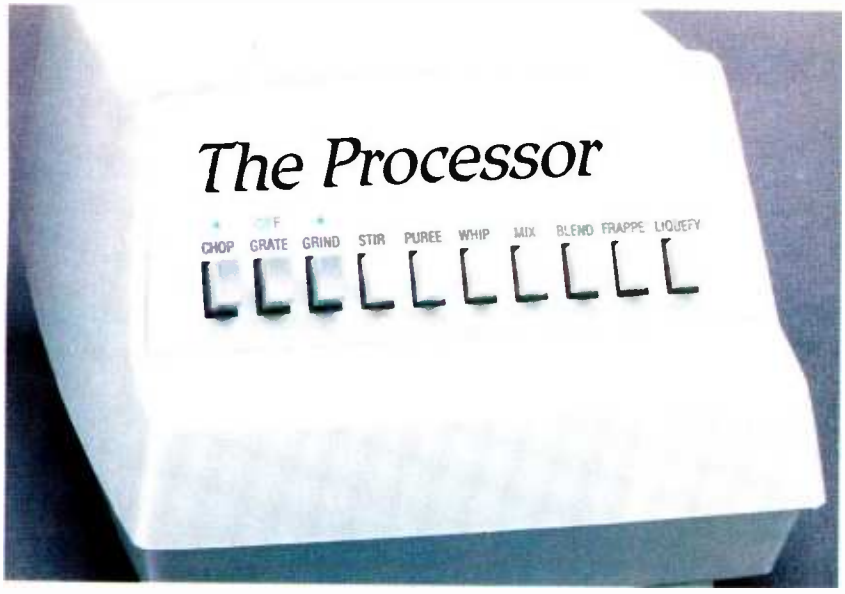


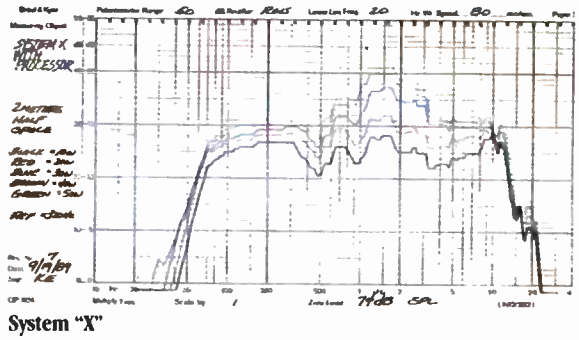
Processed?

Processed speaker systems use a dedicated line-level electronics control unit ahead of the power amps. Typical signal processing senses the power amp outputs, and includes band pass filters, EQ, delay for offset transducers, and limiting for speaker protection.

Let's examine half space axial response recordings of a typical processed system at various input levels, beginning at 10 watts output at 300 Hz from the LF amp, increasing in 3,5,6 and 7 dB increments, equal to 20, 30, 40 and 50 watts in a linear system.

At 10 watts, the response was ± 4 dB from 65 Hz to 14 kHz. At +3 dB, the limiters reduce the low and high EQ. Above +3 dB, limiting has flattened the EQ and is gain-reducing the LF and HF bands independently, raising the low pass, and lowering the high pass frequencies.

At these modest levels, the LF and HF overlap, rather than cross-over. Because the LF and HF sum coherently where they overlap, dynamic expansion results. For a 7 dB increase in input level, the lows increase 4 dB, highs only 2 dB, but the mids increase 13 dB.



System "X"

This non-linearity is the result of conflicting design objectives. High SPLs need high efficiency, but high efficiency needs lots of EQ for extended response in compact systems. The EQ improves response at low levels, but jeopardizes speaker survival at high levels. Limiting doesn't provide use protection for the speakers – limiting actually operates the components closer to thermal damage risk limits.

Here, limiting sacrifices dynamic linearity and consistency of sound quality to protect the speakers by defeating the EQ needed to make the system sound acceptable in the first place.

Slice, Dice, Mince, Chop, Grate or Puree?

If you're a musician, recording engineer or producer, you know that the next computer revolution is taking place now in the recording studio. Although analog recording technology is still holding on (thanks in large part to Ray Dolby's brilliant work), the future is clearly digital. The transition is inevitable, but when will it be complete?

Sure, computer technology has been infiltrating the studio for many years now. First, with mixing automation systems, then programmable synthesizers, effects devices and MIDI sequencers. Just as a secretary would never go back to a typewriter, carbons and white-out, we can't imagine making a record these days without such modern conveniences. However, the real computer revolution in the audio industry is right around the corner: computer-based, complete digital audio production systems that provide random access recording, editing and mixing, all in the digital domain from mic pre-amp to consumer playback. No more tape, no more patch bays.

Many studio pros are investing in digital audio workstations simply because they recognize the creative power and efficiency of these systems. (That's the first and last time I'll use the "W" word; let's just call them digital audio editing systems.) If you are still cutting tape with a razor blade, I highly recommend that you check out the technology available today for digital audio editing. I know very few engineers who still prefer traditional editing methods after they have used a good digital audio editing system. The main reason to join the digital audio "revolution" is simple—it works.

What role will you play in this revolution? Will you use these new tools to your advantage, or will technology leave you behind? Studio owners, producers, engineers and artists alike must consider the impact of the digital audio revolution on their professional careers.

If you are a commercial studio owner, you probably already fear lost business to sophisticated home, or "project," studios. Although most existing home studios cannot really compete with commercial studios because of the current technology/cost gap (how many home studio owners can afford a 2-inch, 24-track or large console?), new developments in computer-based home studio recording equipment show signs of bridging this gap. Within the next two years, the cost of a multitrack digital audio/MIDI studio will drop well below $20,000 — well within the affordability range of many small or home studio owners.

Commercial studio owners must ask themselves some tough questions: What capabilities will these systems have? What

advantage can my commercial studio offer over a sophisticated digital home studio? How can I continue to survive as a profitable service business? My answer is simple, and is based on precedents from other industries that have undergone widespread computerization: Don't fight it, be compatible and look for "value added" in new services that complement the smaller studios.

Let's consider the example of an industry that went through a similar evolutionary stage several years ago. Typesetting used to be a pure service bureau business. If you needed a typeset brochure, book or business card, you went to a typesetting house that owned large, expensive equipment (sound familiar?) to produce quality type. When low-cost laser printers and personal computer word processing/page layout software became available in the mid-1980s, typesetters faced a serious dilemma: Their (former) customers could now produce typeset materials in-house at a fraction of the cost charged by the typesetters.

Some typesetting businesses fought this trend by claiming that "the quality isn't as good" (it wasn't) and "good typesetting is an art" (it is), among other arguments. Many typesetters went out of business. Other typesetters accommodated their clients' desire to use inexpensive, computer-based typesetting by being compatible with their clients' systems and offering augmented services.

Clients could produce layouts in-house, then simply take a disk to the typesetting house when higher quality printouts were needed. These typesetting houses also bought specialized equipment that clients were unlikely to own (such as high-quality scanners and color printers) and offered time and expertise on these systems to their clients.

The moral of this story? The typesetters who resisted the advancing technology lost business, while the more progressive (and successful) typesetters embraced the new technology and found new ways to add value for their clients.

The recording industry is at a similar crossroads. Music studio clients, such as musicians and producers, can do more at home than ever before. Most musicians I know prefer to do as much production as possible at home. Home is comfortable, private, distractions are few (unless, like me, you have a 14-month-old son) and the time clock isn't ticking away at $20 to $200 an hour. In the past, MIDI synths, samplers and sequencers have allowed extensive small room "pre-production" work (particularly if you are a keyboard player).

Many studios have already recognized this trend and have installed MIDI systems

that allow clients to bring MIDI work from home to the studio. However, compatability problems often occur. For example, the client uses one sequencer/computer combination at home, but your studio doesn't own the same setup. You try transferring a "standard" MIDI file between the two systems, but subtle (or not so subtle) differences between the home and studio systems result in music that "doesn't sound right." Frustration ensues. We've all been there.

The situation is worse if you are a singer, guitarist, saxophonist or any other non-keyboard musician. MIDI doesn't do much for you. You need to record audio tracks, not performance data for synthesizers and samplers. Traditionally, this meant setting up a home multitrack tape-based system, which is probably based on a tape format that is not compatible with commercial studios, and suffers from second-rate sound quality.

And heaven help you if you want to combine tape-based audio tracks with MIDI — you then must enter the nightmare realm of synchronization. Problems like these have kept those non-MIDI clients knocking on the commercial studio's door when the time comes to produce their future hit records. They simply can't get the job done at home.

That situation is currently changing on account of digital audio technology. Users who need audio tracks can now benefit from systems that combine the fidelity of 16-bit digital audio with the ease of use of MIDI sequencers. The latest technological breakthrough allows integrated recording and editing of MIDI and digital audio, providing a level of creative power that even most commercial studios do not currently offer. In addition, many home studios now have DAT recorders to mix down to, removing another advantage formerly held by commercial studios: digital mastering.

So what advantages does your commercial studio still have over the digital home studio of the future? What new services can you provide that complement the new home studios?

First, you have one advantage that the home studio is never likely to match: a quality acoustic environment. Few home studios have decent-sounding live recording rooms, and their control room acoustics and monitor speakers are usually inadequate for critical mixing. This issue may be more or less important to various clients — rock guitarists often feel that they can get the sounds they want by plugging directly into a rack of effects boxes. Singers, on the other hand, need the right acoustic environment and expensive antique microphones to get the best possible results. Most home studio owners will probably want to do the majority of tracking at home, and then rent time in commercial studios for tracking and final mixing that requires a good acoustical environment.

The challenge for the professional studio owner is to provide compatible equipment, which allows the home studio user to bring material into the commercial studio with as few problems as possible. This is not an easy matter, however, because few standards exist for digital audio interchange.

Unfortunately, because of the current lack of standards, there are only small "pockets" of compatibility among systems. Although many manufacturers are involved in discussions regarding broad-based standards, a truly universal standard is not likely to appear for at least three to five years, because most digital audio editing systems are based on personal computers with incompatible operating systems and disk formats. This is currently a subject of intense debate among both manufacturers and users of digital audio systems.

Users can't understand why an interchange standard that could allow them to simply remove a disk from one system and connect it to any other has not been developed. Although this problem seems straightforward on the surface, it is, in fact, an extremely difficult proposition. Even large computer companies, such as IBM and Apple, have been trying for many years to develop cross-compatibility between their own systems, as well as each other's, with little success. The problem of universal compatibility is challenging, but manufacturers of digital audio systems must address this problem if disk-based systems are to prevail as the standard for audio production. In the meantime, systems that are based on the same model computer can provide a reasonable level of compatibility. Although this is not an ideal situation, recording studios are accustomed to dealing with many different tape formats (1/4-inch, 1/2-inch, 1/4-track, 1/2-track, 15ips, 30ips, Dolby A, Dolby SR, dbx etc.).

As a studio owner, you probably find the compatibility issue very confusing. It is. Even the manufacturers seem to be somewhat confused at this point. But can you afford to wait for these problems to be resolved before you invest in a digital audio editing system? No, unless you want to suffer the same fate as the typesetting businesses that ignored desktop publishing.

Because it is obviously impractical for a studio to own every system on the market, your best option is to invest in a system that has the greatest level of compatibility with your client base. Survey them to find out what system they are using, and then buy the system that will make it easiest for them to transfer their home pre-production work to your production environment. Although you may suffer some anxiety about investing in a system that may be superseded by next year's model, remember that all computer-based systems have the advantage of being software-upgradeable so you can add features. Look for a system that has a reputation for providing software updates on a regular basis. This will reduce the likelihood of early obsolescence, thus protecting your investment.

Another option is to look for an "open" system that is supported by software from several different companies. The open systems approach has proved very successful in the computer industry because users are not totally dependent on a single company to address all of their software needs. Some manufacturers even have a track record of offering hardware upgrades as technology advances, further protecting your investment.

Once you have a basic system installed

that provides compatibility with your client base, look for additional services you can provide that will tie into the basic system. For example, CD recorders are now available that allow audio CDs to be "pressed" directly from a digital audio system or DAT tape. Providing "instant" CDs would be an attractive (and profitable) addition to any studio's rate card.

I have always felt that it is ironic that studios invest vast sums of money for high-end recording gear, then send their paying clients home with a lowly cassette of their work. Although DAT is becoming popular, there are tens of millions of CD players in the United States alone.

CDs are clearly the best medium for a high-quality reference mix or demo. However, CD recorders are still fairly expensive (complete systems sell for $30,000 and up), so clients are very unlikely to buy their own. This is a capital investment that a studio owner can amortize across many clients' usage requirements, resulting in a profitable use of the commercial studio's capital.

Providing production quantity CDs to your clients can be another profitable addition to your business. Some systems are better suited for CD mastering than others. Be sure to review the entire process (and expense) of creating a CD master when comparing systems. Establish a relationship with a CD mastering/pressing facility, and be sure to negotiate for the lowest possible mastering and replication rates.

Besides client-compatible audio systems, where else should a studio owner invest his/her capital to bring more business in the door? Remember to think about the unique value your studio can add that a typical home studio lacks. Invest in creating an excellent acoustical environment for both tracking and mixing. Quality microphones are still a good investment because they are an essential link in capturing the subtleties of acoustical sound sources. To belabor the desktop publishing/typesetting analogy, microphones are like image scanners — home users are likely to own the basics, but they will go to a commercial operation when they need higher-quality options.

Of course, perhaps the biggest benefit you can offer to your clients is talent. Although many potential customers will be able to afford a sophisticated home studio, few will have the talent to make great-sounding records. Your staff's collective experience and skills relating to mic placement, production and mixing will never lose their value.

The trend toward sophisticated home studios is building momentum. Why waste your time lamenting the loss of business to these studios when you can add a new dimension to your business (and compete more effectively with the studio down the street) by embracing the new computer-based, digital audio technology.

Remember the simple formula for success: Be compatible with home systems, but add value through your facilities, additional equipment and skills. ■

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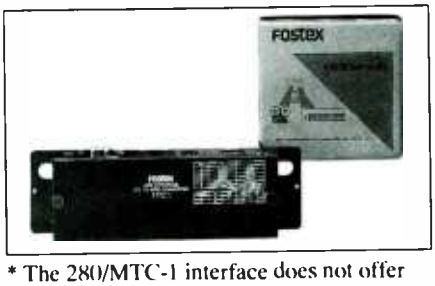

* The 280/MTC-1 interface does not offer all of the functions available with the open reel interface. • Atari and Macintosh are registered trademarks.

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The Future of Audio Test Technology

By Dr. Richard C. Cabot, P.E.

Even in the early days of audio engineering, the need to quantify the performance of equipment was well understood. Testing allowed designers to understand the engineering tradeoffs available to them and to compare their design refinements. Testing permitted manufacturers to specify the performance of their equipment and contrast that with the performance of their competitor's equipment. It also enabled users to verify that the equipment they purchased met the specifications advertised by the manufacturer. If a piece of equipment stopped meeting these specifications it was generally time to service or replace it.

The specifications of audio equipment are continually improving. Analog equipment has improved tremendously, in large part because of the competition provided by digital equipment. A prime example is the development of Dolby SR as a viable interim alternative to digital recorders.

In most cases, this performance improvement has brought an increase in complexity. The increased complexity means a greater chance for misalignment, drift or failure. Because of competition in recording and related audio industries, the costs of down-time are multiplying. Preventive maintenance will assume a greater role in the bottom line.

Digital audio equipment is not only more complicated than its analog counterpart, it introduces new problems into the studio. Analog gear, which can be interconnected with relative ease, suffers mostly in the areas of level mismatch, hum, RFI and line balance. However, digital incompatibilities arise from different sample rates, interface formats, level mismatches, line reflections, RFI and manufacturer's differing interpretations of interface standards.

The prevalence of the compact disc has raised listeners' expectations of sound quality. DAT has allowed people to make recordings of local events, which rival that of many commercial concert recordings. New technologies for direct digital broadcast into homes, already in experimental use in Japan, will likely become common in a few years. To keep competitive in this changing marketplace, the recording sound quality will become much more important in the success of the music.

The future doesn't rest; developing digital technologies make proper equipment testing more important than ever.

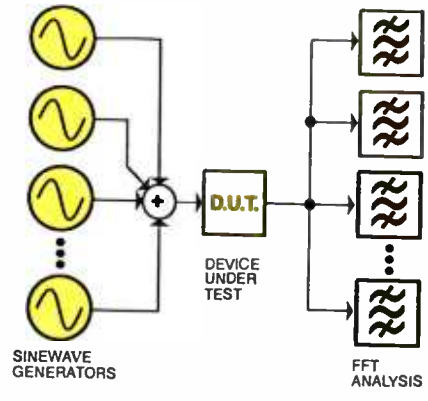


Figure 1. Block diagram of multitone test setup.

Dr. Richard C. Cabot is vice president of Audio Precision, Beaverton, OR.

EARLY APPROACHES TO AUDIO TESTING

Frequency response is undoubtedly the oldest measurement in use today. The original approach was to stimulate the equipment with a sine wave and measure the level at both the input and output. Gain could be computed from the two values. This was repeated for many different frequencies and the results were graphed. The measurements were sequential because they were performed by humans, and humans cannot efficiently process many pieces of information simultaneously.

Most early audio equipment added noise, and techniques were developed to quantify its subjective level. It was recognized early that the voltage or power of noise is not representative of its audibility. The A weighting curve was an attempt, using simple components, to simulate the frequency response of the ear for low-level sounds.

Seeking a way to characterize nonlinearities, the ability of a device to process a signal and not add anything new to it was studied. Harmonic distortion was the earliest approach; it was done by applying a sine wave and measuring what was left in the output when the sine wave was removed. CCIF intermodulation distortion testing uses two closely spaced tones and was developed to allow measurements in limited bandwidth systems. Most other distortion techniques were devised in response to audible effects noted in a given new technology. The "transistor sound" that plagued early transistorized consoles and recorders led to the development of TIM and DIM (transient and

dynamic intermodulation) distortion test.

COMPUTER-BASED MEASUREMENTS

The tremendous rise in popularity of computers has brought new ways of doing most things, including making measurements. By adding computer-interface ports to audio measurement equipment, the computer can be connected as the brain of a complete audio test system. The early attempts at this required the user to write the programs that controlled the equipment. Of course, most users had neither the time nor the skill for such programming. Application of this equipment was limited to large organizations, usually manufacturers, which could hire people for the task.

The Audio Precision System One is a computer-based audio measurement set that includes both hardware and software specifically designed for the needs of professional audio personnel. The user selects test setups from menus and control panels in the software, avoiding any involvement with programming in the classic sense. The synergism of hardware and software allows the system to perform measurements that are impractical with manually operated equipment and are difficult to program with more general-purpose audio measurement hardware. The System One has recently been expanded to perform measurements directly on digital signals in the digital domain.

The System One is personal computer-based but places all of the measurement hardware in a separate chassis outside the computer to avoid the performance compromises inherent in a noisy computer environment. Recent products have been introduced from Ariel, DRA and others, which are plug-in measurement cards for computers. These offer an attractive small size and relatively low cost but are largely limited to acoustic applications where the performance requirements are not as severe.

Computer processing can also be built into test equipment to assist the operator while maintaining the feel of conventional audio measurement equipment. The Audio Precision Portable One provides single-button operation for most audio measurements. All parameters of a measurement mode, such as bandwidth and reading units, are saved independently for each mode. All measurements may be displayed in a digital or analog bar graph readout.

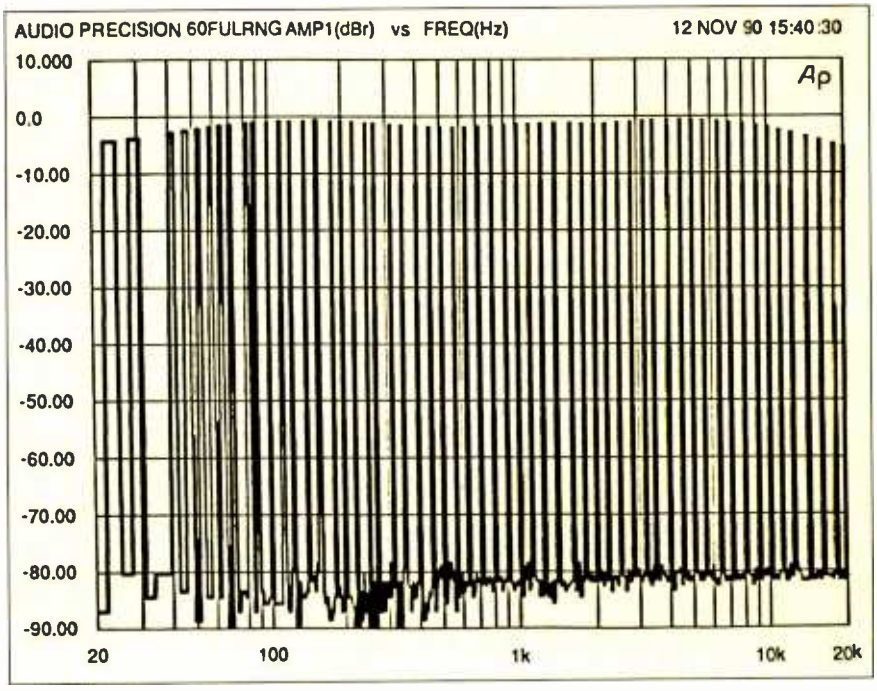


Figure 2. Spectrum of a 60-tone (1/6-octave) test signal.

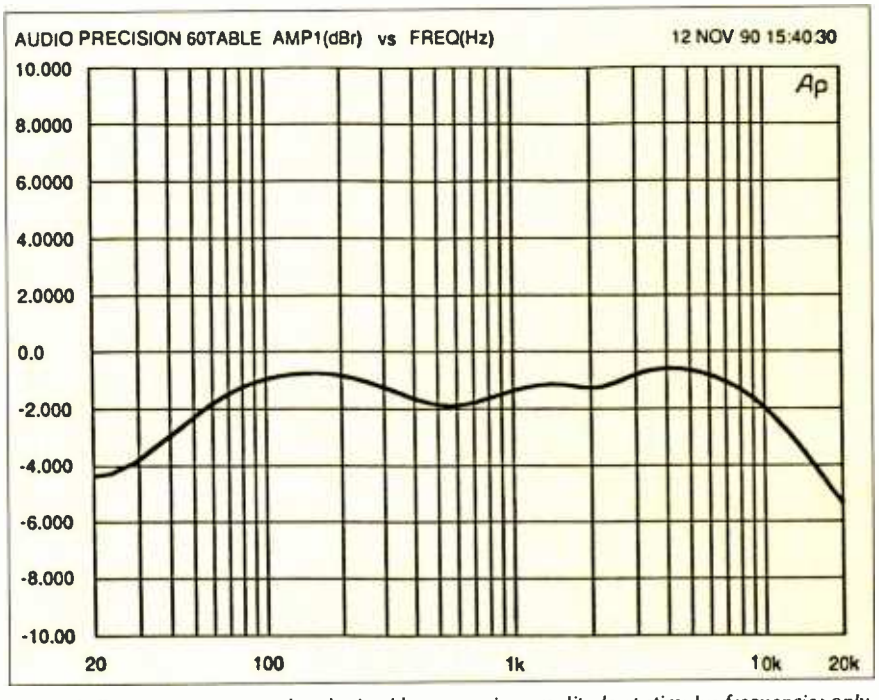


Figure 3. Frequency response plot obtained by measuring amplitude at stimulus frequencies only.

DIGITAL TESTS

Although digital audio was touted as "perfect audio forever," the industry soon realized that digital requires its own new set of measurements, which are still evolving. Digital systems involve a class of circuitry (A/D and D/A converters) that is among the most complex and "tweaky" in its analog aspects. This produces imperfections that have not occurred with analog systems. Several techniques have been developed to characterize these imperfections. As the subtleties of digital signal processing are discovered, there will be more such imperfections uncovered.

The conversion of analog signals to digital words starts with an infinite resolution signal and converts it to a series of numbers with finite precision. This process is called quantization and adds noise to the signal. Unlike noise in analog electronics, quantization noise changes with the signal itself. To measure this effect, a variable-level, low-frequency signal is applied to the test device. The noise amplitude after removing the signal is measured as a function of signal level.

Level linearity measurements examine the ability of digital systems to correctly reproduce low-level signals. It was devel-

oped in response to the complaint that some digital systems lost the reverberation in recordings. With misadjusted or poorly designed converters, low-level signals can be reproduced at the wrong level. Level linearity testing applies a signal of adjustable level to the device and measures the level of the original signal in the output using a bandpass filter. As the signal level is decreased from full scale down into the background noise, the output level should track. Any deviation in gain represents an error.

This quantization noise measurement does not address the changes in spectral distribution that may occur with the signal. It is quite possible for different nonlinearities to produce the same audio band noise level but have completely different tonal balance. The ear is quite sensitive to shifts in spectrum, detecting changes of less than 1dB. If the quantization noise measurement is followed by a 1/3-octave analysis of the noise spectrum, potentially audible shifts in tonal color may be detected. The input signal level is changed and the noise floor is measured as a function of frequency for each level. If the converter was ideal, all of the traces would be identical and there would be no change in the background noise with signal. Any change that occurs is representative of level and/or spectral changes in the converter output. If a single number measurement is desired, the largest deviation in any of the 1/3-octave bands is then defined to be the noise modulation.

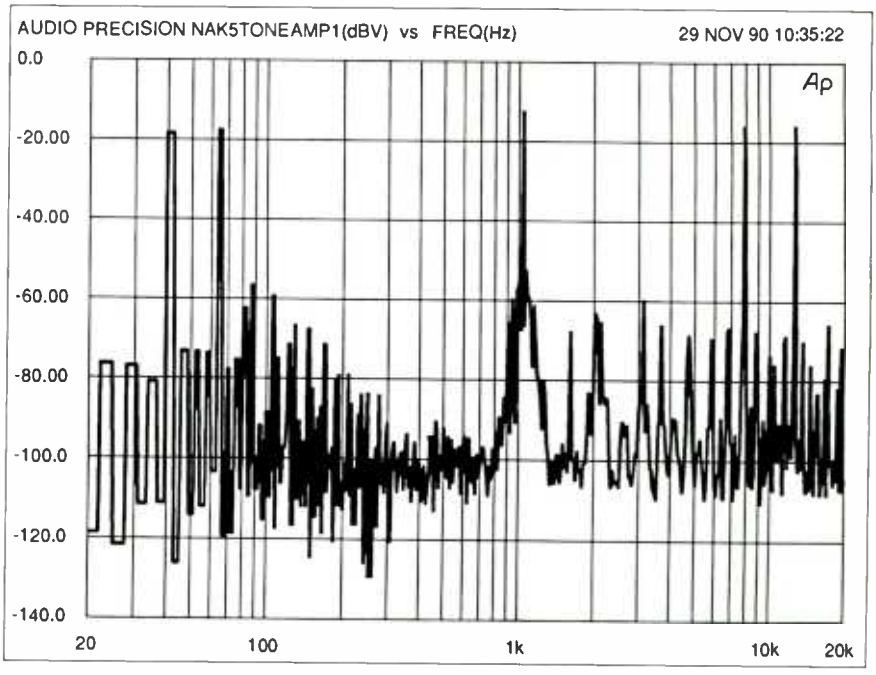


Figure 4. Five-tone signal spectrum showing fundamentals, harmonics and intermodulation of a noise-reduction unit.

NEW TEST TECHNIQUES

One way to speed a complex set of measurements is to use parallel processing. To do this, all test frequencies are applied simultaneously as shown in Figure 1. To obtain the desired data, each one must be measured individually at the output with a dedicated bandpass filter, voltmeter and phasemeter. The cost and complexity of multiple bandpass filters and RMS converters would be substantial, especially if high accuracy was required. The sharpness of each filter, which is required at high frequencies to separate distortion products from original stimulus frequencies, would work against the use of inexpensive 1/3-octave-type filters.

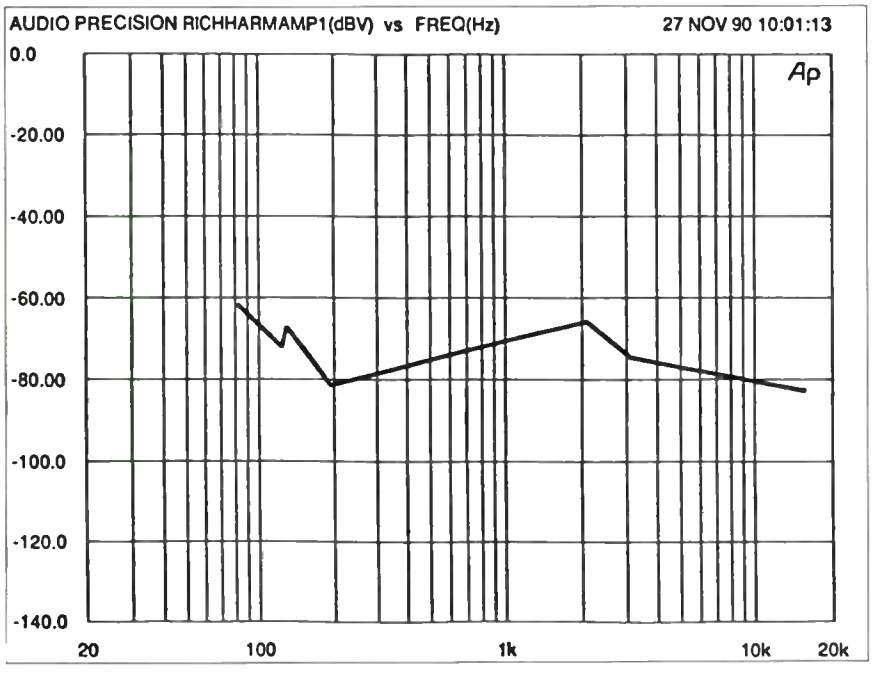


Figure 5. Distortion plot obtained by measuring amplitude at harmonic frequencies only.

This high performance, frequency-selective analysis is supplied by an FFT. The FFT operates with sampled data, acquiring a block of input signal, and transforming it to the frequency domain. The block length is typically chosen to be a power of two, but this is not required with some FFT algorithms. The transformation yields one frequency point for each pair of input samples, giving 8192 frequency points from 16,384 input samples. Because a fixed number of points will be acquired for analysis, the stimulus signal may be generated digitally to exactly match the acquisition length of the FFT analysis. This block orientation of stimulus and analysis produces a fixed frequency resolution of the stimulus frequencies matching the bin centers of the analysis.

Figure 2 shows the spectrum of a 60-

tone (1/6-octave) test signal. All frequencies are contained in the signal simultaneously. By using data at only the frequencies of the original stimulus, a conventional frequency response graph is obtained as shown in Figure 3. The measured points are interpolated to obtain the complete curve. Because the frequencies used in the stimulus may be user-selected, detail may be concentrated in frequency ranges of special interest. If performance in the low-frequency and high-frequency regions are known to be the problem areas, the test signal might consist of five tones from 20Hz to 100Hz, a tone at 1kHz and five tones from 10kHz to 20kHz.

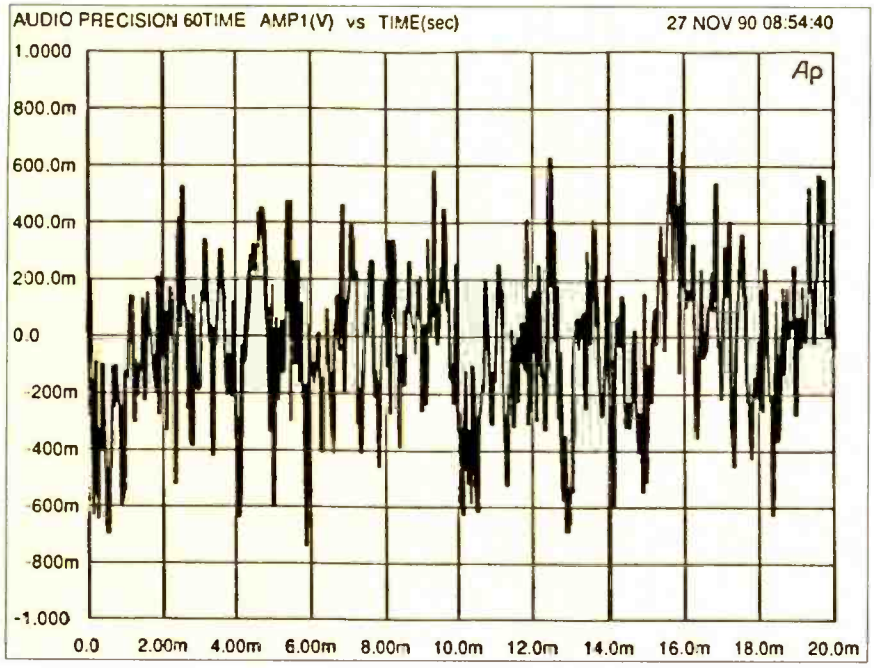


Figure 6. Time-domain view of a 60-tone test signal with random phases.

Non-linearities in the system under test will produce harmonics of the stimulus sine waves. If stimulus frequencies that are not integer multiples of each other are selected, the harmonics of these tones will occur at unique places in the spectrum. The high-frequency resolution of the FFT allows the amplitude of each harmonic to be measured separately. If the system has non-linearities, there will be intermodulation products between all combinations of tone frequencies. By modeling the non-linearity as a power series, the intermodulation frequencies can be predicted.

These intermodulation components will appear at frequencies above, below and between the stimulus frequencies. The calculation of these intermodulation frequencies gets very complex when many stimulus tones are included and when the non-linearity is of high order. A plot of a

5-tone signal, its harmonics and intermodulation distortion is shown in Figure 4. With the appropriate selection in software, the distortion products alone may be measured and compared to limits as in Figure 5.

By picking stimulus frequencies that leave gaps in the harmonic and intermodulation spectrum, it is possible to measure noise with this same test. The FFT analysis merely has to display the levels in the otherwise empty bins to obtain a plot of noise floor spectrum. The squared and summed value must be multiplied by a constant representing the number of bins used in the computation, the bandwidth of the bins and the bandwidth of the measurement, to yield an accurate wideband noise figure. If enough frequency points are used it is possible to factor in weighting filter gain vs. frequency when computing noise, yielding a weighted noise measurement.

It is important to note that the distortion measurements obtained with this technique are not directly comparable to those obtained by single sine wave THD+N testing or by conventional IMD testing. There are several reasons for this. The crest factor of a multitone stimulus will always be higher than that of a single sine wave. For the same peak signal amplitude, the amplitude of each individual tone will be lower than a single sine wave at that frequency. The resulting distortion products will be different in the two cases.

Multitone test signals are much more like program material in the time domain than traditional sine wave stimuli. The waveshape of the 60-tone signal is shown in Figure 6. The software that creates the stimulus waveform allows the amplitude of each component to be separately specified. This capability may be used to shape the stimulus spectrum to simulate the program material. If the test signal spectrum matches that of typical program material, it will more accurately predict the behavior of noise reducers and other processing equipment in use. ■

REFERENCES

Cabot, R.C., "Noise Modulation in Digital Audio Devices," R•E•P, 19 (7):20-24; 1988 July.

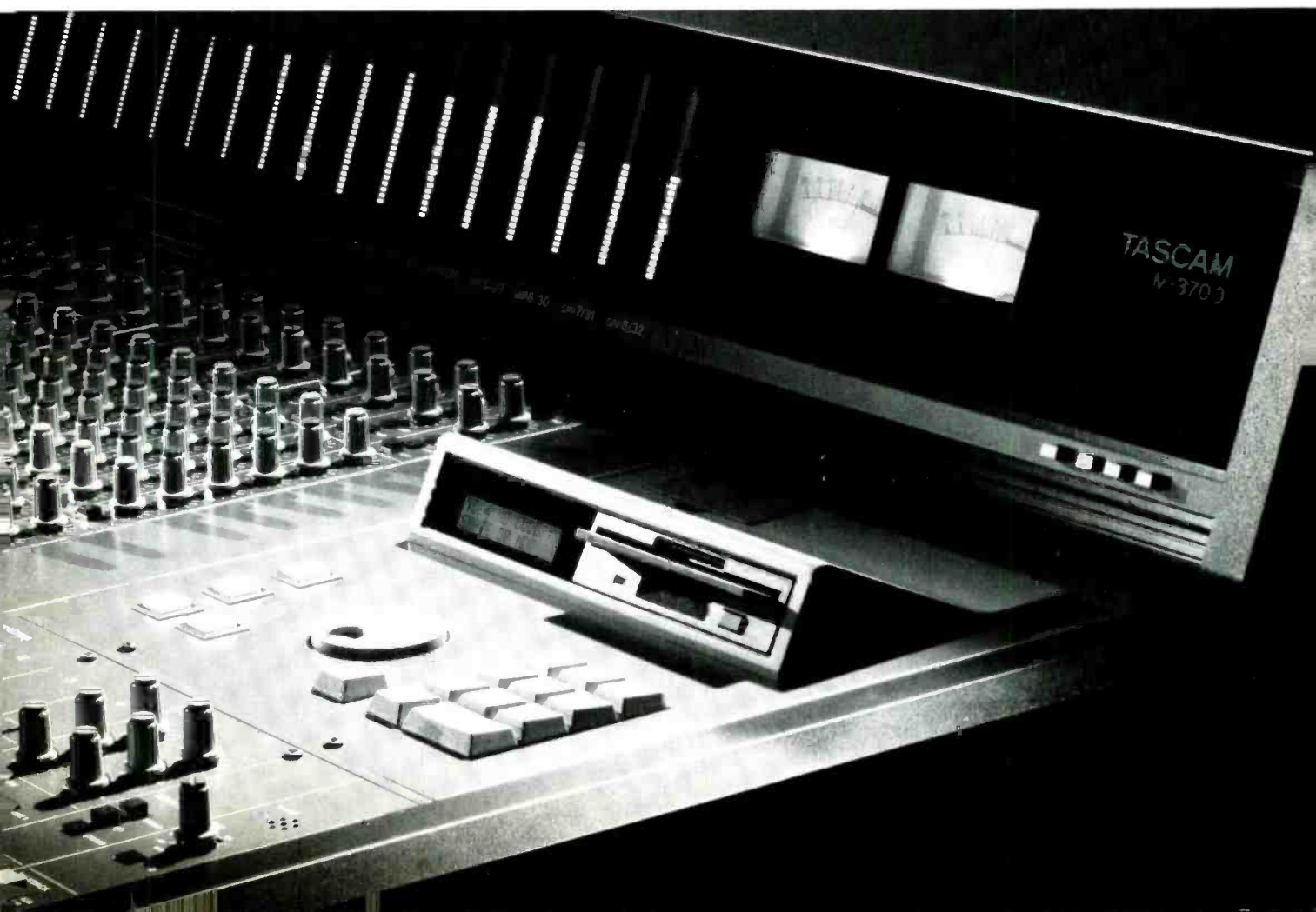
Cabot, R.C., "Measuring Digital Devices in the Digital Domain," presented at the 86th convention of the Audio Engineering Society, March 1989. Journal of the Audio Engineering Society (Abstracts). 37(5):399, 1989 May; Preprint #2800

Cabot, R.C., "Measuring AES-EBU Digital Audio Interfaces," Journal of the Audio Engineering Society 38(6):459-468, 1990 June.

Cabot, R.C., "Fast Measurement of Response and Distortion," to be presented at the 90th convention of the Audio Engineering Society, February 1991.

Fielder, Louis D., "Evaluation of the Audible Distortion and Noise Produced by Digital Audio Converters," Journal of the Audio Engineering Society, 35(7/8):517-535; 1987 July/August.

Finger, Robert A., "On the Use of Computer-Generated Dithered Test Signals," Journal of the Audio Engineering Society, 35(6):434-445; 1987 June.



By Sean Kitzmiller

Producing For New Technologies

The coming of multimedia appliances.

With the convergence of a number of newly emerging technologies, information producers now have many more effective ways to communicate their subject matter. One long-promised vehicle that has finally arrived on the scene is interactive multimedia, with many companies on different continents racing to provide hardware. A large need will arise for audio and video production to satisfy the huge projected requirements of commercial, industrial and consumer program material for the just-emerging multimedia hardware platforms.

With multimedia, consumers of information can experience sound, text, graphics, pictures and even video in any form, mixture or order they desire. This means that a viewer/listener (or maybe, "interactor") can much more widely experience ballet, or learn who Beethoven was, or perhaps tour a museum, choosing which halls and exhibits to see. A mechanical technician might select a component of an engine on a screen and call up a complete parts list, see a video or animation on how that part works and even hear what probable problems sound like. The scope of interactive programs that will appear in the future will be limited only by the imagination and commitment of the producers — people like you — working with audio, video and text.

Industries affected by this multimedia revolution will not only be in the training and education fields, but also in entertainment, marketing, information reference and more. Big players have already plunged headfirst into the arena because

One of the end products engineers and producers will be producing for audio will be multimedia appliances — dedicated playback machines built for interactive applications.

Sean Kitzmiller is an industrial designer in charge of product design and corporate communications for Empruve, Knoxville, TN.

researchers have predicted that multimedia products and services will be an $11 billion market by 1993. In a recent *Business Week* article, Apple chairman John Sculley said, "Multimedia will change the world in the 1990s as personal computing did in the 1980s." Microsoft chairman William H. Gates III has also insisted that multimedia "will be bigger than everything we do today."

THE IMPORTANCE OF VISION

"Computer and TV manufacturers are obviously looking at the multimedia industry as a way to sell more computers and TVs," says Danny McCall, president of playback hardware manufacturer Empruve. He noted that only 2% of the top decision makers in the country and fewer than 10% of the nation's doctors feel comfortable with personal computers. IBM and Apple both have multimedia stations, which usually consist of their high-end personal computers, equipped with special video or audio processing cards; A/D and D/A converters; a menagerie of external components, such as CD-ROM drives; videodisc players; and peripherals, such as speaker systems. Philips is offering a solution called CD-I, which is positioned and priced as end-user consumer based. It consists of a player that is attached to a standard TV. Commodore's CD-TV, another video-based consumer platform, is similar.

Before specifically describing new developments in hardware, it is important to point out the technologies that have allowed multimedia to become a reality. One of the prerequisites of interactive multimedia is massive storage. Like its audio cousin, CD-ROM (read-only memory) stores information digitally. However, audio is not the only form of digital media the disc handles. One standard ROM disc can store more than 600Mbytes of data in text, audio, graphics, animation and video. Such a disc can contain the equivalent of 650,000 pages of printed text. A standard 1-hour audio disc can hold only 30 seconds of high-resolution digital video.

DVI (Digital Video Interactive) is a new technology from Intel that allows the compression of digital information by factors of 100 or more. DVI compression is unique in that it can be accessed randomly and in real time, with no off-line number crunching involved. This means that CD-ROMs can now store true multimedia, including full-motion video at 30 frames per second.

A CORNUCOPIA OF INFORMATION

An example of an all-in-one playback platform is Empruve's Cornucopia. This device has taken a ground-up approach to this new emerging industry.

"Instead of starting with a computer and adding-on pieces or trying to turn a television into an interactive tool, we concentrated on the human considerations, both cognitive and ergonomic, in coming up with the solution for the delivery, access and navigation through information," McCall says.

The product is billed as an interactive multimedia appliance, and in many ways it is a book with moving pictures and sound, using a microprocessor for navigation.

"The importance of the audio cannot be ignored," says McCall. "No other media is so spontaneous and powerful in creating a direct response, not to mention communicating information."

Beneath the ergonomic surface is technology that includes a 386/20MHz processor with 1Mbyte of RAM. Media comes from an interchangeable CD-ROM optical disc and on-line sources. There is also a solid-state disc; a digital signal processor using DVI technology; and a variety of optional hardware, such as hard, floppy or floptical drives, a voice-synthesized annotator, a bar code reader, a LAN adapter, CD-ROM tower Jukebox network applications and a modem. To take advantage of this system, Cornucopia offers serial communications and printer ports, video and external monitor outputs and a regular keyboard connector.

In a break from typical consumer sales-oriented manufacturing, Empruve is acting as an OEM and configuring systems to special business-user specifications for their own internal use or to distribute to their customers. Examples of possible applications and areas of commercial development include universities and their students, automobile companies and their dealer's service technicians, or insurance companies and their sales forces.

PRODUCING FOR MULTIMEDIA

To facilitate multimedia production for Cornucopia, Empruve is currently putting together a Content Development Center. The center consists of both a PC and Macintosh II hardware platform and an authoring software package, which is designed to guide an audio or video producer when creating material that plays on such a multimedia hardware platform as the Cornucopia. The center will also consist of a console to simulate the way a program author's presentation will be seen on Cornucopia. Empruve is currently developing its own authoring tools and investigating the use of custom versions of new off-the-shelf multimedia authoring software packages.

For the engineer or producer, the program material can be created using relatively traditional techniques, mapped into interactive segments. Video can be captured and digitized from such sources as videotape, camcorders or high-end film production cameras. The audio source can be from tape, a sample or live, and prepped to digital tape just as program material destined for a CD would be.

Farrel Smith, the audio design engineer at Empruve and a 30-year veteran at Philips/Magnavox, believes that even with DVI compression, program material has the capacity to be as clean in resolution as the source.

"The sampling rate is actually higher than CD audio production," Smith says. As with any production, there will be various levels of sophistication involved. Publishers/producers will use the actual center to construct multimedia information products, pulling together produced segments from different recorded media, and then refining these products before producing an optical disc.

Producers can either undertake entire multimedia designs themselves or can involve program segment producers before the overall program design, much the way audio post or sweetening is accomplished in video or film work.

"We are anxious to seek partnerships with content producers," McCall stresses. "We will not be offering our product to the end-user. Rather, we will build appliances tailored to the specific needs and business agenda of the purveyors of information, such as a medical reference company, an encyclopedia company, a government agency or a corporation.

"With the recent release of the product's announcement, we have attracted the interest of many Fortune 500 corporations. We think multimedia hardware like Cornucopia will spawn whole new industries of publishing and producing for use with this appliance." ■

By Mack Clark

FIVE QUESTIONS: The Modern World

Q: How will technology change our industry in the 1990s?

A: The most significant change will likely develop as storage for digital audio matures. Magneto-optical technology is a rising star in the data storage arena. This is a very high density storage medium; tests have shown it to be more stable and reliable than other magnetic media such as hard or floppy disks.

Removable disks can contain a number of gigabytes of data. Currently, a gigabyte of media (roughly three hours of single-channel audio) may cost $300 or less, which will likely drop significantly as the technology is more widely used. Compare that to a reel of 2-inch 24-track tape (six hours of single-channel audio at 30ips). So next time your producer says, "Gimme MO," you will know what to do.

Q: I understand dynamic processing and effects processing, but what is spatial processing?

A: Spatial processing is a term that represents the latest audio techniques to place sound in a space. This process began with the advent of stereophonic sound, followed by the development and lack of acceptance of quadraphonic sound in the 1970s. The multichannel format has reappeared recently with the Dolby surround capabilities incorporated into consumer units for home video applications.

Localization of sound has been founded primarily on the phase and time relationship between sounds arriving at our respective left and right ears. Psychoacoustic research in the 1980s discovered, among other things, the effect of the ear pinnae on our perception of sound location. This has led to the development of techniques in audio to "move" an aural image through space. The devices currently marketed as spatial processors combine some or all of these techniques in an attempt to expand the 2-dimensional image of stereo to a 3-dimensional one.

Q: How does optical fiber help aural health?

A: Does speaker wire with oat bran maintain healthy phase coherence? Fiber optics is a recent technology that improves upon conventional wire in just about every spec: size, weight, bandwidth, durability, and EMI and RFI immunity. This is possible because the signal is transmitted down a length of small glass fiber in the form of photons (light) rather than along metal wire as electrons (electricity). As the components of a fiber-optic system become more modular and easier to use, it will likely replace copper wire as the choice signal transmission medium.

This technology has not yet found its way to widespread use in the audio industry, though there are several applications currently under development.

Q: How can I go "virtual" without disposing of all of my equipment and buying a digital workstation?

A: Are you sure you don't mean "virtuous?" As an industry we are steadily moving toward systems that are tightly integrated. The recording studios of previous decades were characterized by separate, manually controlled pieces of analog audio equipment, passing only sound signals between one another. As various common denominators of communication and control have been developed and accepted (SMPTE, MIDI, MTC, MIDIfile, RS-422, R2-D2, etc.), we have progressed more toward the one-mind-one-machine mode of operation.

The digital workstation is obviously the closest approximation of a "virtual recording studio" to date, although it seems as though this will progress toward larger systems being controlled from smaller control surfaces as soon as we can let go of our need to be handling huge pieces of hardware. In the meantime, there are ways to integrate your current system without unloading it all and starting from scratch. Most of the synchronizer manufacturers provide a means to control all machines (and, in some cases, MIDI) from one keypad or console-mounted controller.

Sequencers are getting more sophisticated in what they control and how they control it. Virtual tracks under sequencer control are commonplace in your MIDI studio today. Sound sources can be set up for a track, effects can be controlled in real time, virtual mixers can control multitimbral sound sources. That is a lot of control from one piece of software. Mark of the Unicorn has developed one piece of hardware that can route, merge and filter MIDI signals from a sequencer, as well as expand the capacity of your sequencer.

Another piece is a hardware mixer that is controlled via sequencer. Opcode's Vision sequencer has recently integrated control of Digidesign's Sound Tools into its capabilities, adding a truly digital aspect to its operation.

Q: Oversampling—does it really matter?

A: You will have to decide for yourself. Oversampling is a misnomer (as it is commonly used by current industry marketing) for what is essentially digital filtering that takes the pressure off of the analog filter that is necessary in the A/D and D/A conversion processes to prevent aliasing. The early digital devices had analog filtering that introduced audible anomalies into your signal, such as phase distortion.

Oversampling has proved to be a viable means of solving that problem. How much oversampling is enough or even too much is a matter of preference, or even debate. I refer you to the following excellent articles on oversampling and digital systems by Dr. Richard C. Cabot: "Practical Performance of Digital Systems," R•E•P, March 1988; and "Performance Aspects of Digital Oversampling," R•E•P, March 1989.■

Mack Clark operates McTech Associates, an audio systems engineering and technical support firm in Oakland, CA.

Poor Acoustics In Sports Arenas

By David Scheirman

At a convention of the International Association of Auditorium Managers several years ago, many facility managers reported that in their respective sports arenas, contemporary music events were bringing in greater building revenue than the competitive sports events that the buildings were originally designed for. In other words, concerts (primarily rock) were keeping the building staff working more than the home team's game schedule.

As managers begin to realize that a competitive market actually exists for venues in which to hold rock concerts, and as promoters begin to take a long, hard look at what different buildings have to offer in a regional market before deciding where to book a rock concert, more attention is being focused on the facilities' ability to satisfy rock groups and their audiences.

One of the first things that needs to be considered when attempting to present a rock concert in a sports arena is the building's acoustics. If a building's management is attempting to make it more attractive to the concert industry, and if funds are going to be spent on improvements, acoustical treatment is one of the most important considerations.

As anyone who has operated a music-quality concert sound system in an ice hockey rink can tell you, those are the shows that the sound crews suffer through. The same lively acoustics that make the crowd's roar sound exciting when the goalie misses a slapshot are the ones that spell disaster for amplified musical events in that same space. Mid-band reverb times in excess of six seconds make even a vocal-bandwidth PA system hard to understand; they wreak havoc on full-bandwidth amplified rhythmic music presentations.

BUILDING ACOUSTICAL CHARACTERISTICS

Although all arenas are slightly different in design, there are certain basic architectural patterns that are observable. Some can be treated with relatively simple techniques to reduce reverberation time; others are more difficult to deal with. One of the most critical determining factors in the acoustics of any building space is the shape of its ceiling.

In particular, the intentional acoustics of a domed ceiling facility spell trouble for musicians and sound crews. This is because of the behavior of the extremely different types of sound waves that compete for the listener's attention in the same building space: early reflections, flutter echoes, mid-band "time smear" and every other nasty acoustical anomaly that will usually show up in a dome.

In the early 1900s, it was nearly impossible for architects to accurately predict the acoustics of a new public facility in advance of its construction. Classical concert halls were modeled on buildings in Europe that "worked." However, venues for sports events were often based purely on budget size, available space and materials. Rapid advances in the field of acoustics have changed that considerably.

Although the prediction of building acoustics through computer-aided design is an established science, many large assembly venues that have been built within the past few decades do not offer the variable acoustics required to turn the facility into a real multipurpose building. Recently, though, many newer structures have been designed with true multipurpose acoustics in mind.

As an example of how sports arenas are often intended to be lively, witness this quote from Cliff Faszer, the engineer in charge of the design for the architectural acoustics of the Olympic Saddledome in Calgary, Alberta: "You have to make a trade-off between the liveliness that is desirable for a sports arena and having a short enough [reverb] decay time to make the sound system intelligible."

The 17,000-seat Saddledome makes use of a negatively curved hyperbolic roof to allow a larger audience seating area with approximately 55% less internal cubic volume than a traditional domed arena.

ACOUSTICAL ALTERATIONS

The fact that new, consciously designed facilities are being conceived by competent acoustical designers still leaves us with the problem of trying to present musical events in sports arenas. Many existing arenas suffer from excessively long reverberation times. The large domed arenas often have compounded problems. However, the acoustical characteristics of a building space, even a domed one, can be altered by the use of certain absorbent materials. Cotton, cellulose, mineral fiber and polyurethane foam are examples of such materials currently in use to absorb sound.

Sports arenas can be retro-fitted with acoustical material to improve the building space for use with live musical events. Panels of acoustical foam, custom-built Helmholtz resonators and other devices can make a world of difference during renovation of an existing building. Or, temporary acoustical treatments can be applied for specific events.

PORTABLE ACOUSTICAL SYSTEMS

A method for temporarily improving the acoustical space of a sports arena that is actually used more often for rock music concerts could be developed through the use of scale-model building forms, impulse-testing in the existing spaces, and with the knowledgeable application of computerized measurement devices. An acoustical analysis of various structures could yield a wealth of information that would be applicable to this problem.

The development of a permanent system that would offer variable acoustical treatment for large, multipurpose facilities would enable an event promoter or building manager to play host to a basketball game one night and a contemporary rock singer the next, while offering each assembled audience the preferred acoustical setting in which to experience the show or game. Even more attractive to the rock concert industry would be a portable service company that traveled with the show to each venue. It would take yet another semitrailer on the road with the show, it would mean more traveling technicians and a larger stage crew to get the show up-and-running on time. But, it could also mean a dramatic improvement in sound quality for the entire tour.

An ideal future for the concert sound industry would include the temporary alteration of large-space acoustics to offer audiences a more pleasurable listening experience. The increasing interest in the sound of contemporary musical events, and the rapid advancements in the field of computerized acoustical measurements, may help lead the way to arenas that can be made to sound better not only with adjustments to the sound system, but also by the scientific application of acoustically absorbent materials. ■

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

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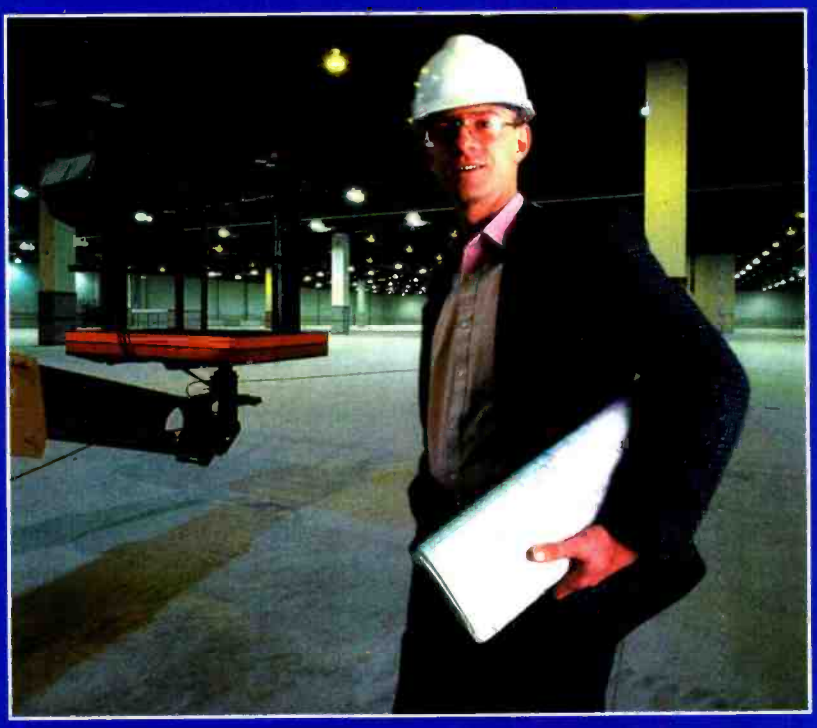
Scenario Systems, Incorporated



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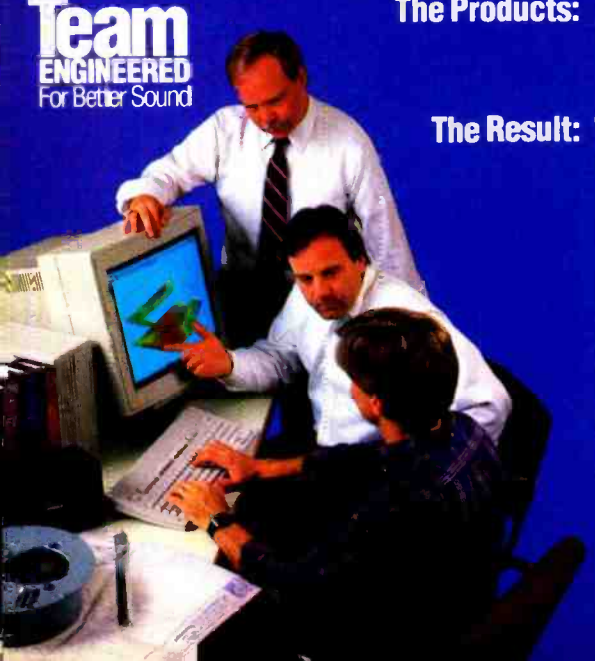

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By Mark Herman

MP PRODUCTIONS, LITTLE ROCK, AR

Headline Act:
REO Speedwagon

Support Act: Alias
Dates: Oct. 26-Nov. 22, 1990
Region: Midwest, New York and Pennsylvania

PERSONNEL
House Mixer: Neil Atkinson (independent)
Monitor Mixer: Neil Shaeffer (independent)
Support House Mixer: Jim Carroccio
Support Monitor Mixer: Todd Hunt
Head System Technician: Todd Hunt
House Technician: Duane Griffin
Rigger: Ron Anderson (independent)

CONSOLES
House: Yamaha PM3000, 40-channel
Monitor: Ramsa WR-S840, 40×18
Support House: Soundcraft 8000, 40-channel
Support Monitor: Soundcraft 500, 40×12

AMPLIFIERS
Main FOH: Carver PM 1.5 and 1250
Lows/Subs: Carver PM 1.5 and 1250
Monitors: Crown PSA-2
Sidefills: Crown MA2400 and MA1200

MAIN LOUDSPEAKER CABINET
Manufacturer: MP Productions
Model: (18) MP Mid-High Frequency (46″×46″×22.5″)
Components: (4) 12-inch JBL 2202, (2) JBL 2385 60°×40° horns with 2445 2-inch, (2) JBL 2405 tweeters

Mark Herman is president of Hi-Tech Audio Systems, a sound reinforcement equipment rental company based in Half Moon Bay, CA.

LOW-END CABINET/SUBWOOFER
Manufacturer: MP Productions
Model: (18) MP Lo Frequency (46″×46″×22.5″)
Components: (4) 15-inch JBL 2225

FOH SYSTEM
Configuration per side: Flying (6) Mid-High & (6) Lo, Floor (3) Mid-High & (3) Lo
Flying System: MP Wahoobe
Truck Pack: Four wide single-stacked or two across single-stacked

ONSTAGE MONITOR WEDGES
Manufacturer: MP Productions
Model: (18) 15-2 Floor Wedge
Components: (1) 15-inch JBL 2225, (1) JBL 2311 horn with JBL 2442 2-inch
Crossover Model: TDM 24 CX-4
Manufacturer: MP Productions
Model: (2) Drum Sub
Components: (2) 18-inch JBL 2240
Crossover Model: TDM 24 CX-4

ONSTAGE SIDEFILLS
Manufacturer: MP Productions
Model: (10) 18-10-2
Components: (1) 18-inch JBL 2240, (2) 10-inch JBL E110, (1) JBL 2343 horn with JBL 2445
Crossover Model: TDM 24 CX-4

HOUSE RACK (Headliner Only)
Equalizers: Klark-Teknik DN360
Crossover: BSS FDS 360
Effects: Lexicon PCM 70, Lexicon 200, Lexicon 480L, (2) Yamaha SPX90-II, Roland SDE3000, Eventide H3000-S
Gates: (2) BSS DPR 504
Compressor/Limiters: (8) dbx 903 cards (for channel insert)
Compressor/Limiters: Klark-Teknik DN504 (for drive lines)
Intercom: Clear-Com 2-channel
CD Player: Sony D11 portable
Cassette Deck: Carver 2400 dual
Headphones: Beyer DT 770
FOH Monitor Speakers: Ramsa close-field monitors

ONSTAGE SIGNAL PROCESSING (Headliner Only)
Equalizers: (12) White 4000 graphic, (4) Klark-Teknik DN410 parametric
Effects: Yamaha REV-7, Yamaha SPX90-II, Lexicon PCM70
Gates: (12) Rebis
Compressor/Limiters: (8) dbx 903 cards
Analyzer: Audio Controls

MICROPHONES (Headliner Only)
Vocals: Beyer TGX 480
Kick: Sennheiser 421
Toms: Ramsa ES-5
Overheads: Ramsa ES-1
Snare Top: Ramsa ES-5
Snare Bottom: Ramsa ES-5
High Hat: Ramsa ES-1
Guitar No. 1: Shure SM57
Guitar No. 2: Shure SM57
Keyboards: BSS DI
Bass: Ramsa ES-5
Direct Boxes: BSS

CABLING
Main Snake: 300-foot Alpha 55-pair; 250-foot Belden 38-pair
Multi-pair connectors: Cannon NK27, AMP G-4, G-2 & G-1
Stageboxes: Pro-Co
Splitter: (1) 40-channel 2-way transformer split with 8-channel drive and six aux sends; (1) 32-channel 2-way split with six aux sends

SHOWCO, DALLAS

Headline Act:
Linda Ronstadt

Support Act: Neville Brothers
Dates: Summer/Fall 1990

PERSONNEL
House Mixer: David Scheirman (independent)
Monitor Mixer: Vish Wadi (independent)
Support Act House Mixer: Dave Cheramie
Support Act Monitor Mixer: Kelsey Smith (independent)
Showco Technicians: Dave Cheramie & Kevin McCarthy
Rigger: Billy Phillips (independent)

CONSOLES
House: Harrison HM-5 32×16×2 with bus-linked 20-channel extender unit
Monitor: Harrison SM-5 32×16 with bus-linked 20-channel extender unit
Support Act House: Yamaha PM3000, 40×8×2
Support Act Monitor: Yamaha 2408M, 24×8

Continued on page 73

Lean and Mean: Schubert Systems Group

Compactness counts as shown by the recent tour of Bruce Hornsby and the Range.

By Mike Joseph

One of the biggest challenges in the sound reinforcement touring world is the need to run as tight a ship as possible. Gas and transport costs are way up. Budgets are down and paying customers, both audiences and acts, are saving their pennies. Few but the largest draws are playing the big rooms right now. To keep the production in the black, a system packager has to run a lean operation.

Schubert Sound Systems, with Dirk Schubert at the controls, understands this well, as evidenced on the recent Bruce Hornsby and the Range tour. To stay profitable, he has learned the necessities of touring economics. The sound system fielded for these series of shows uses equipment packaging techniques learned after years of trying to get more pounds of performance on the road without giving up an ounce of quality.

FRONT OF HOUSE

Although this tour's system has played outdoor venues and much larger halls (very effectively, Schubert is quick to point out), it is configured for midrange theaters and auditoriums. Using a maximum total of 32 of Schubert's proprietary Steradian trapezoid full-range boxes and 16 double, 18-inch trapezoid subs, the system can be tailored specifically to the dozens of venues on this tour. The show R•E•P caught, at Memorial Hall in Kansas City, KS, used 24 cabinets in a 2:1 ratio of tops to bottoms. There was more than enough volume and clearly lots of headroom left for this 2,500-seater.

The 3-way, full-range main boxes consist of four JBL 2402 tweeters with 2404 diaphragms in a horizontal arc, under a large format 2441 driver with 2445 diaphragms substituted, mounted on a cus-

Mike Joseph is editor of R•E•P.

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Figure 1. A custom "steering box" allowed the amp racks to be switched to the left or right mains without repatching.

tom horn. The bottom end uses two JBL 2226 high-power 15s. The entire box weighs 220 pounds, including internal rigging fittings and bracing.

The subs, built into identically sized and similarly weighted trapezoid cabinets, consist of two JBL 2241 18-inch high-powered drivers. Thanks to the low weight and compact size of these boxes, eight can be hoisted by a 1-ton chain motor, or 16 with two motors. This tour, however, primarily uses the system in a stack-em-up mode on the stage wings.

FOH amplifier power is supplied exclusively by Crests, with 8001s for sub-bass, bass and mid drive, and 7001s for tweeter action. Most channels load into 2Ω. Each woofer in the system is configured to receive up to 1kW of available power. The entire FOH speaker stack was fed by eight 8001s and four 7001s, or six amps per stage side. Very impressive, efficiency-wise.

According to Schubert, the amplifiers have never suffered from sun or heat problems, although Schubert clearly takes extra care to leave a wide margin of safety in the operating parameters. Extra fans force air through the sealed racks in the same flow direction as the on-boards, and the foam air filters have been removed from the amps proper (on the theory that dirty circuit cards are less fatal than fried parts caused by impeded air flow).

A very interesting custom "steering box" switch and connector panel sits at the top of each amp case (see Figure 1). Using four so-called "intelligent" silent relays, the switch position determines without repatching whether that particular rack picks up the left or right mains signal off the stage feed. A 2-color LED instantly shows status. The switch obviates the need to patch each rack to a splitter box or snake head and verify proper routing with tones or signal. Here, as throughout the system, the design is intent on supporting quick, reliable setup and strike, without handfuls of loose patch cables.

Figure 2. Customized Helpinstill pickups and pre-amps provided a high-quality amplification of Bruce Hornsby's piano without using any microphones.

Figure 3. Schubert's proprietary P.A. System Processor.

FOLDBACK

The monitor system consists of newly designed and standard Schubert boxes, as well as special designs fabricated specifically for Hornsby. In all of the large monitors, the JBL 2450 neodymium drivers are the top end of choice, all mounted on DDS (Northwest) horns. In keeping consistent, the bottom end is also JBL, with small boxes using 2206s as 12-inch drivers, and larger single and double 15-inch slant cabinets using the relatively new 2226 high-power woofers.

A custom monitor on a stand for Hornsby at the piano position uses a JBL 2426 screw-on 1-inch on a 2342 bi-radial horn, with a 2123 10-inch underneath. This provides the vocal and piano punch needed to rise above the 4-piece band rocking behind him. The entire monitor system is powered by eight 7001 amplifiers.

Offstage, a Gamble SCC 40-16 monitor console, with Alan Bonomo at the helm, provides mixing control. Although getting on in years, this particular board still performs on a day-in/day-out basis. It is also the only version of this model ever built with a center output section, with Schubert himself contributing the design.

SIGNAL SOURCES ON STAGE

Although the music is straight-ahead rock 'n' roll with acoustic piano, live drums and real vocals (imagine that in this day and age!), Hornsby and his players use a number of techno tricks on-stage, including triggered drum samples, a wireless MIDI feed from an accordion to a Juno 106 synthesizer, wireless guitar and bass links,

and an excellent piano pickup scheme.

Hornsby's vocals are handled by two different microphones: an AKG 535 on a piano-mounted boom stand and a Shure Beta 58 on a straight stand, center stage.

An AKG D-112 is positioned inside the kick, with Shure SM-98 mics on all of the toms and inside the two rack-mounted bongos. A Shure SM-94 does snare duty, with AKG 414s capturing air. Several trigger pads mounted between the toms drive an Akai 100 sampler, which along with an Akai Linn MPC 60 drum machine/sequencer, controls the samples for special effects and unusual drum sounds specific to the show. An Aphex Impulse triggers sounds directly from the snare. These samples feed a stereo mixer with drum monitor, stage monitor and house outputs.

A well-thought-out and highly customized mounting arrangement of Helpinstill pickups and purpose-built pre-amps provides very high-quality, feedback-free piano amplification without the use of any mics (see Figure 2).

The pickup outputs feed a custom stereo pre-amp (although its channels are panned to one output), which, in addition to level and position, provides up to 30dB of preset frequency equalization on specific pickup inputs. The sound is excellent, closer in sound to good condenser mics in a studio than magnetic bar pickups over metal strings.

The mono output from this piano pickup is then fed to monitors and house, where a special arrangement of dynamics and effects devices manipulate the piano sound through the system.

AT THE MAINS

The FOH mixing position has Schubert and systems engineer Joe Johnson sharing duties for the show, which often lasts three hours, with Johnson lending opening act navigational aid. A 56-input Gamble EX is operation central. In keeping with the theme of efficiency and compactness, the devices in the several racks are limited to necessities. Reverb and effects are handled by Yamaha, AMS and Lexicon units, with some delay effects going through a Roland SDE-3000.

Two REV-5s are in the rack, one for toms and occasionally kick, the other for background vocals. The AMS dmx 15-80 and rmx 16 stack provide vocal harmonizing, delay and reverb. A Lexicon PCM 60 (the "best reverb ever," says Schubert) is fed from the snare alone, and a PCM 70 sits across the piano feed, adding reverb and air. A Yamaha SPX-90 is used for special keyboard effects.

The way the piano signal is manipulated electronically is rather unique. The mono feed from stage is split to two parametric equalizer channels, then into two dbx 165 channels. This splitting and separate parameter arrangement for dynamics and tone provide a piano sound through the stacks that has motion and character, more so than a straight-through artificial left/right split of Helpinstill pickups alone. The net result really works — the sound of the piano through the system is clear, large and present, with movement and air adding to the clarity.

Additional mic signal processing includes four Aphex expander/gates, dbx 160x compressors on background vocals and Hornsby's Beta 58, and a modular dbx 903 over-easy compressor and 902 de-esser combo on Hornsby's 535 piano vocal mic.

Triggered directly from the kick at the console is a Wendel Jr, whose slots were loaded on this particular night with "Heart 1986 Summer Tour" kick samples. Accord-

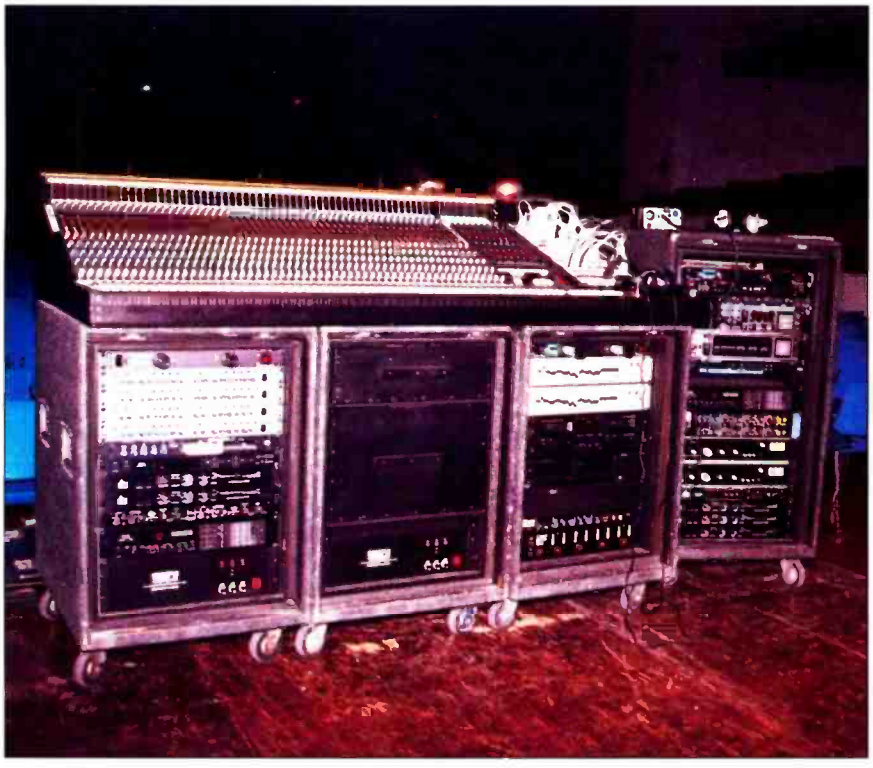


Figure 4. The house mix position shows the compact and efficient use of equipment.

ing to Schubert, these are used selectively for certain songs, but only in rooms that need the reinforced low-end.

DRIVE TIME

The stereo outputs of the board feed two K-T DN-300 equalizers for house tune, and then into the proprietary Schubert P.A. System Processor (see Figure 3). This 2-unit package consists of a high-quality 4-way crossover, straddled by an unusual component that models the resonance frequencies (Schubert calls them "ring points") of the separate component sections in their specific cabinets or on their specific horns. The dynamic thresholds can be adjusted to trigger the inverse injection of this modeled curve, thereby countering the effects of the distortion.

The net result of all of these approaches and devices contributes to a relatively compact, simple system which, on the night we heard it, was crystal clear, loud, extremely dynamic, and free of blare and harshness. The fact that Johnson told me his job as a third member, or extra setup hands for the sound crew, was almost unnecessary is testament to the ease and speed with which this system packs and sets up. And in these leaner, meaner times, you can't ask for anything better. ■

HANDS ON

Drawmer M500 Dynamics Processor

By Paul D. Lehrman

Drawmer is an English company noted for high-quality studio dynamics processing gear. The M500 has been available for nearly three years but, like the company itself, it is still not well-known in this country. Which is too bad; although at $2149 it is not the cheapest processor, the M500 is one of the most interesting pieces of dynamics processing hardware anyone has come up with yet.

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

The M500 is a hybrid of technologies that brings dynamics processing into the digital age without sacrificing the advantages, real and perceived, of analog circuitry. It uses high-quality VCAs under digital control, and that control extends to the outside world through MIDI. The programmability of the unit is exceptional, and the user interface lets the engineer think about dynamics control in a musical context, greatly enhancing its creative potential.

The stereo device incorporates separate modules for compression, limiting, expansion, gating, panning, de-essing and fading. These modules are in software; there is actually only one VCA per channel, and the modules simply tell it how to behave. The modules can be arranged in any order within reason (the compressor can't follow the limiter, for example), and can be interactive. Using a single VCA eliminates the signal degradation that one might encounter with multiple discrete devices.

Each channel can be used independently, with its own modules and settings or can be linked for true stereo operation. Inputs and outputs are balanced XLR connectors, with unbalanced 1/4-inch jacks for key inputs and sidechain input/output. The operating level is switchable; in software it is between −10 and +4dBm.

THE PROCESSING MODULES

Each module contains all of the parameters one would expect from a stand-alone processor, plus some surprises. The compressor offers ratios from 1.1:1 to 20:1, as well as "soft-knee" ratios from zero to nine. The threshold adjustment includes an "auto" setting, which links with the limiter. It automatically sets the threshold so that the compressor's peaks are just below the limiter's threshold. Attack and release times also have an "auto" setting, which allows them to vary according to the program material. A "hold" parameter freezes the level for up to 10 seconds.

The limiter and expander modules are fairly straightforward, with adjustable ratio, threshold, attack, hold and release. The fader module fades the signal up and down between 5dB and 90dB, and the fades can last from 10ms to 10 minutes.

A fade can be triggered by a MIDI command or a front-panel button, and the fade-out can be pre-programmed to occur at a certain length of time after audio appears at the input — so getting a 2-second fade to occur at exactly 28 seconds for a TV spot is simple. The timer can be set numerically or by "recording" a real time interval.

The Panning module lets you sweep the signal across the stereo field, using a variety of waveforms, including sine, triangle, ramp and square, as well as "duo sine" and "tri sine," which creates two or three volume swells in the first channel before panning to the other. The pan rate is adjustable from 1/60Hz (one per minute) to 10Hz. The amplitude range of the sweep can be ramped so that the panning action can start narrow and get wider over time. The panning waveform can be triggered from incoming audio or MIDI.

The de-esser offers four different modes of frequency-conscious compression. There are two filters, one for each channel, which can be applied to the internal side-chain circuit of the unit, and can be set up as high-pass, low-pass, or bandpass, with continuously variable bandwidth. In the "Full band" mode, any audio that passes through a channel's filter is detected and its level is used to compress the audio signal over the entire frequency spectrum. In the "Single band" mode, only the audio frequencies that pass the filter are compressed, and other frequencies are left alone.

In the "Two band" mode (which only

works on a mono audio signal), you can use both filters, and set them to different frequencies. The signal going through each filter will compress only the part of the spectrum corresponding to that filter. The filter outputs can be split between the audio outputs — one factory patch, "Filter Pan," alternates the filter outputs across the audio outputs for an interesting "spectral-vibrato" effect.

In the "Two band complex" mode, the audio signal passed by the Channel 1 filter goes to one output. At the same time, the signal *rejected* by the Channel 1 filter is added to the signal passed by the Channel 2 filter, and this goes to the other output, ending up as a signal with two peaks and a notch. Throw a panner onto the outputs, and you get some very nice "floating" effects, as in the factory patch "FiltrPhaze."

Finally, there are the gates. A gate can be triggered from incoming audio or from MIDI (which we'll get to in a moment). There's a "peak" function, which adds a short burst of gain, up to 16dB and lasting up to 10 seconds with adjustable decay, to the opening of the gate, which is excellent for spiking a drum hit. The way the gate re-triggers in response to incoming audio is highly programmable, with two different modes; adjustable delay and a re-triggering threshold setting separate from the main threshold.

In addition, you can record an envelope that will define the gate action. Press the "Record" button and input a sound lasting from 1/4 second to 60 seconds. The changing volume level of the sound over time will be recorded and stored in one of 16 memory locations, and it can then be called up and applied to a gate at any time. This lets you perform tricks like imposing the envelope of a gunshot sample on top of a choir. You can even tell the envelope to play backward.

The gates can also be used in "duck" mode, in which the level is reduced when a gate is triggered. The trigger can come from the audio signal itself, or from a separate signal appearing at a "key" input on the back panel. If the filters are not currently being used by a de-essing module, they can be used for the keying action.

An example of how this might be useful is when you need to duck a background music track under a track that contains both dialogue and sound effects. If the key input is filtered so that only vocal frequencies get through, then the music will duck under the voices, but not under the sound effects.

PUTTING THINGS TOGETHER

Modules are designed — that is, their parameters are set — one at a time. The front panel of the M500 consists of 21 buttons, four "cursor" keys, a two-line by 24-character LCD, and a continuous parameter adjustment knob. A module is called up by pressing a button, and then the various "screens" pertaining to the module are selected by the up-down cursor keys. Each module has from two to five screens. The top screen is a meter, showing input, output and gain reduction levels for the current module.

Individual parameters within a screen are chosen with the left-right cursor keys, and the selected parameter is then adjusted with the knob. To make things easier, there are several routes available to many parameters, which allow you to view and adjust them in different contexts. For example, pressing "Thresh" shows you the threshold settings of all of the modules at the same time, while pressing

"Meters" show you the instantaneous input and output levels for both audio channels simultaneously.

Modules are put on line, on one or both channels, in whatever order you choose, using the "Assign" function. All of the modules are available all of the time, although as noted earlier there are some restrictions. An entire program — that is, all the module assignments and settings — is called (and very appropriately so) a "patch." A patch can be stored into one of 50 user registers and recalled instantly. It can be mono or stereo, and if a mono patch is loaded into Channel 1, the program in Channel 2 will be unchanged.

There are also 70 non-erasable factory patches, which do a good job of illustrating the complexity and capabilities of the unit. Switching between two patches is generally glitchless, although certain complex programs will make noise if they are called up while a signal is present.

MIDI CAPABILITY

Patches, both user and factory, can be recalled using MIDI program change commands, so a sequencer or other device that generates these commands can be used to automate the action of the M500. But there's more: The designers have thought hard about how to use MIDI with a dynamic processor.

MIDI commands can control gates, pans and faders. A gate can be triggered to open when a MIDI note within a specified range (which can be as small as one note) is received, so that a continous noise track, for example, can be used as a snare drum. Or a timer can be set to count incoming MIDI clocks so that the gate opens at regular intervals based on the tempo of the sequence playing. The rhythmic interval can be set anywhere from one MIDI clock (1/24 of a beat, which the M500 incorrectly refers to as a "frame") to just under 10 beats.

Conversely, it can transmit a MIDI note whenever the gate threshold is exceeded (from whatever source it happens to be set to), so that an incoming snare drum hit can trigger a sampler. The note number is programmable, and the note velocity and duration are controlled by the gate peak level and envelope time, respectively.

In the pan module, MIDI clocks can be used to retrigger the pan envelope, so that sweeping effects can follow a sequencer's tempo. Note numbers are used in a different way: An incoming note number can determine the *instantaneous* position of the output signal in the stereo field. This allows you "play" in the stereo position of a signal by jumping around the MIDI keyboard, or if the keyboard is also connected to a synthesizer, you can make the synth's output stereo, with high notes on one side and low notes on the other.

In the fader module, the fade-in and fade-out can be triggered by MIDI start and stop commands, or by toggling a user-definable MIDI controller. For example, pressing a footswitch that sends out controller number 65 (normally portamento) will start the fade up, and pressing it again will start the fade down.

Each of the two audio channels can be set to respond to a different MIDI channel, maintaining the M500's two-processors-in-one capability. The overall output level of the unit can be set to respond to controller number 7, MIDI Volume. System-exclusive information can be used to slave a second M500, or to store patches, function settings, and/or user-defined gate envelopes in a sysex librarian.

There is also a way to control individual patch parameters over MIDI, but, unfortunately, it's not as simple as with many MIDI-controllable processors, which allow you to assign a controller directly to a parameter — so, for example, you can't have a mod wheel controlling pan sweep rate. Instead, you must go through a complex series of context-sensitive "button pushes," which, although they might be feasible with a sequencer that has sophisticated macro features, are impossible with any live MIDI input device and will be beyond the capability of most studios.

On the other hand, you can have the unit *transmit* controller data every time you push a button or move the knob, and record that data in a sequencer, giving you some automation control — but you're not allowed to make any mistakes.

SOUND QUALITY

The sound quality of the M500 is excellent. I didn't put it through any rigorous testing, but I see no reason to doubt the manufacturer's noise spec of −92dB (unweighted), or the claimed 102dB dynamic range. It certainly is as quiet as anything in my studio. Frequency response seems uncolored, distortion is unnoticeable, and crosstalk is far below the capabilities of my console.

USING THE UNIT

The M500 is a complex beast, and the one-screen/one-knob approach to adjusting parameters is not ideal. There are many parameters that interact with each other but do not appear on the same screen, so it's easy to find yourself playing with a parameter and have no idea why nothing seems to be happening. In fact, it took me about 45 minutes and a phone call to the manufacturer's rep before I could figure out how to get the filters to have any effect.

OUTPUT LINK

There is also an "output link" setting that under some circumstances (it's unclear which ones) defaults to "Ch1 Mono." This means that if you are using a single-channel effect, like the 2-band de-esser, you will get no output on the right channel at all unless you remember to reset this link to "Two channel."

Unfortunately, the setting is not saved with the patch, which can result in a lot of hair-pulling until you figure out what's going on. But considering the power and versatility of the unit, a front panel that would make everything obvious would be enormous and, no doubt, cost-prohibitive. So the stinginess of the user interface can be considered an acceptable compromise. Perhaps some enterprising MIDI hacker will write a graphic-oriented program for controlling the M500 from a personal computer. (I can imagine a great Hypercard stack for it.)

On the other hand, I don't think it would have been unreasonable for the designers to provide some way to view signal levels at the same time you are adjusting parameters. Because the LCDs show either parameters or levels, but not both, all adjustments must be done "blind."

Of course, most adjustments you make will affect what you *hear*, but it would be nice to *see* what's going on, too — perhaps with a simple 8-LED display showing output level or gain reduction, especially at those times when it seems like nothing's going on. (There is an overload LED for each channel, but by the time it lights, you've generated a +18dB signal, and it's too late to do much about it.)

SLOPES

A strange design quirk is that parameters on the display referring to time are not absolute: They are instead *slopes*, and refer to the time to affect a 10dB

change in level. This means that if you set a gate's attack time to 10ms and its dynamic range to 90dB, the gate will not open in 10ms, but in *90*ms, which is a significant difference. Although this method is not totally illogical, it doesn't seem like the best way to have done it.

MANUAL

An even more serious problem is the manual. It's not terrible, but a device that breaks as much new ground as the M500 does deserves a lot better. The manual explains *how* all of the buttons and menus work, but precious little as to *what* to do with them. Engineers unfamiliar with MIDI will be utterly bewildered by the way the manual explains its use (and the incorrect nomenclature doesn't help). There are also many ways that different parameters can get in each other's way — if a gate attack time is longer than the space between MIDI beats, for example, there will be no sound — and much more discussion is needed about this problem in the manual, before the confused user rips apart his entire patch bay trying to figure out why there's no output.

Although the manual wisely advises the user to look at the factory patches and play around with them as a way of learning the unit, it fails to follow up with any details. The M500 is a device that cries out for a good set of tutorials that can guide the user from scratch, but this manual has none of that. Instead, it serves as a sterling example of why engineers who design a new product should *not* be the ones responsible for instructing others in its use.

WRAP UP

But these are small problems, and although they would help make the learning curve easier, as it stands, the M500 is certainly not impossible to use, and the time invested in learning it is well-spent. In every respect, it is a remarkable piece of equipment, providing an extremely high degree of functional performance, excellent audio quality and an unprecedented level of automation capability. Given the unique creative control it provides, not to mention the amount of equipment it replaces, it can even be called reasonably priced. Anyone seriously into the creative aspects of dynamics control should consider it strongly.

Circle (100) on Rapid Facts Card ■

HANDS ON

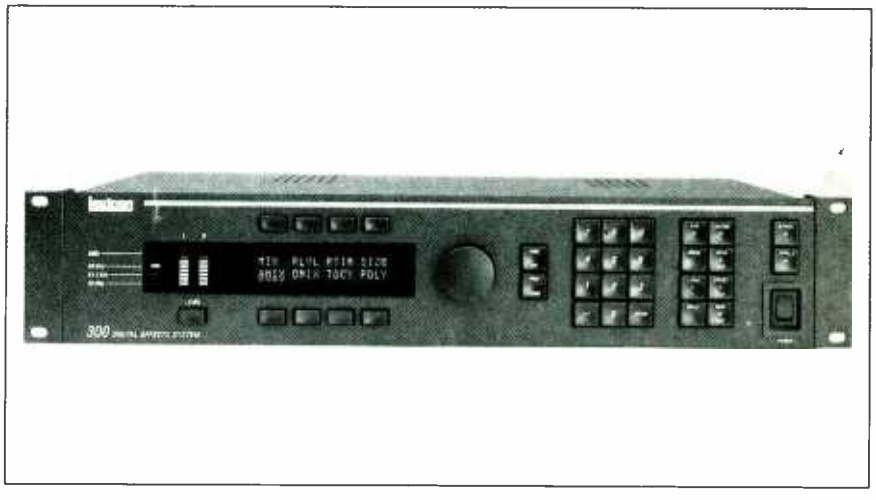
Lexicon 300 Digital Effects System

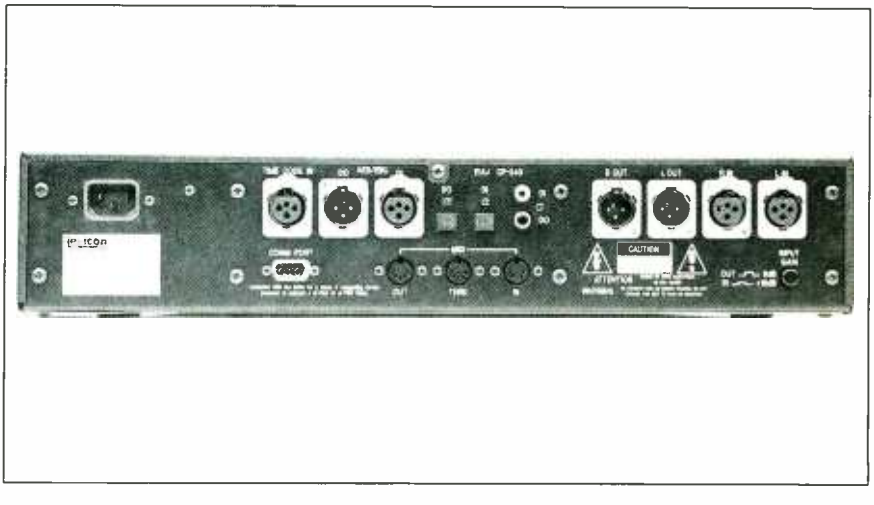
By Rick Schwartz

Although shown at the previous NAB and AES conventions, the Lexicon 300 digital processor was hard to fully experience in a room crammed full of people. I wondered how the new box would sound in a side-by-side comparison with the 480 (the current flagship of the Lexicon product line). Would the 300 be a new digital wonder box or just a slimmed-down 480?

I quickly unpacked the unit, powered it up and fed in a signal from a 24-track master. I must confess that without glancing at the enclosed help card, I was unable to get a sound out of the unit.

As it turns out, the 300 has to be configured before it can be used. Once I told the device that I wanted to use its analog inputs at an internal sample rate of 48kHz, I was ready to roll. Fortunately, Lexicon ships the unit with presets for eight common configurations. Perhaps the company should consider having the unit boot up in the run mode instead of the control





The front and rear panels of the Lexicon 300.

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mode. [According to the company, this will be implemented in the next software revision — Ed.]

NEW REFINEMENTS

According to Lexicon, the 300 takes advantage of several recent advancements in converter technology. The A/D section uses 64x oversampling Delta/Sigma conversion techniques, while the D/A section uses an 8x oversampling circuit. Oversampling allows the use of warmer-sounding filters, instead of the brick wall circuitry used in early digital products. These refinements are apparent in the smoothness of reverberation decay times, with the absence of any low-level graininess or distortion.

According to Lexicon, the new spin and wander parameters are greatly responsible for this smooth decay, by randomizing the processed signals. Lexicon also swears by the new 1-bit converters, and is researching new methods of audio data acquisition.

Digital reverbs use computer algorithms to create the illusion of different acoustic spaces. The 300 uses a new set of algorithms with additional parameter settings. Now reverb and ambience algorithms have dynamic-size parameters. By using time code, it is possible to change these parameters on the fly and even rotate a listener's position in space. In addition, there is a stereo pitch shifting algorithm for harmonization and chorus effects. A mastering algorithm rounds out the sound with digital EQ and precision level/balance controls.

BUILT FOR SPEED

The front panel of the 300 has been designed for speed — with dedicated function keys and a numerical keypad. There is also a soft knob, soft buttons and a large display. The display is easy to read at any angle, unlike most LCD readouts. The soft keys operate in a manner similar to earlier Lexicon products, with a single rotary control (instead of faders) to save panel space.

Although there are eight function keys, I spent most of the time with Setup edit and Effect edit keys. I found it easier to change parameters on the 300 than the 480, because there is no need to null the faders — just click on the desired soft buttons and tweak its parameters. Pressing the value key displays all of the parameter settings on the current page, which is useful if you ever need to document front panel settings.

When operating in run mode, presets can be loaded by entering the preset number via the keypad or browsing presets by rotating the soft knob and pressing the enter key.

THE BACK PANEL

The back panel has stereo inputs and outputs on professional XLR audio connectors. I must admit, it's a bit unusual to find a balanced time code input on a piece of signal processing gear. Let's hope Lexicon has started a new trend.

There are other connectors as well, for MIDI and a DB-9 Comm Port for future use. The 300 has not one, but three different types of connectors for digital I/O — XLR, RCA and optical. Although the SPDIF I/O makes it easy to hook up the 300 to consumer DAT recorders, it uses an

unbalanced RCA connector. Unless your device is located in the same rack as the 300, balanced XLR jacks are a better choice for digital signals. The manual states that the AES/EBU outputs will not work reliably if normal microphone cable is used and recommends the use of Belden 9860 cable.

One has to question the choice of a 3-pin XLR-type connector by the AES standards committee for two reasons. A cannon-type connector is not rated for high bandwidth applications (like digital audio). In addition, it's all too easy to accidentally patch an analog cable into a digital source.

For this reason, some engineers prefer to use the SDIF standard because it uses the same type of BNC connector used in professional video applications. Getting any of the digital inputs to work is easy because they automatically lock to the incoming sampling rate. Digital format conversion is also possible.

Say you want to mix an analog source straight to DAT — digitally. The digital I/O sounds so good that some engineers will use the 300 as a front-end to their DAT recorders. It's also easy to convert from DAT (SPDIF) to a Sony PCM-1630 (with the AES/EBU option) for CD pre-mastering. You can even mix digital and analog signals together, which opens up all kinds of new possibilities, including the ability to make a digital safety copy during a final mix.

OVERVIEW

The setup includes information such as the sample rate, emphasis options, I/O formats and the effect preset. The 300 is shipped with eight preset setups, which should cover most situations. In addition, there are 64 registers for custom-user setups. The 300 contains four algorithms: reverb, ambience, pitch shift and stereo adjust. Some of the 300's algorithms, including Random Hall and Ambience, came from 480 technology included in that unit's recent software updates. An algorithm is a set of instructions stored on ROM that tells the 300's processor how to affect the input signal. Each algorithm has its own control parameters, which can be adjusted along a range of values. The reverb algorithm has 28 parameters. I was pleased to find that there are wide ranges on many of the parameters. For example, the pre-delay goes up to 1,000ms and is not limited like the PCM-70.

An effect contains an algorithm, user-definable parameters and five patches. All effects presets and setups can be dumped and loaded using MIDI, eliminating the need for RAM cards. The 300 is shipped with 75 effects presets. Presets are factory-installed setups and the effects cannot be overwritten, but can be modified and stored as custom setups into registers. There are 64 effects registers and 64 setup registers.

THE BOX

The 300 is a 2U device. The device doesn't seem to generate a lot of heat, which is a good sign. Metering on the 300 is good; LED indicators display almost 50dB of range. Input and output trims (± 10dB) provide fast and easy setup for unity gain. If additional gain is needed, there is a rear panel switch that adds 16dB gain to the signal for MI applications. In the past, Lexicon has encouraged "pushing" the meters on some models to maximize the S/N ratio. With the 300 this is not necessary. On the other hand, I was unable to get the 300 to go into hard clipping,

no matter how hard I drove the inputs.

THE SOUND

I was surprised by the large amount of factory presets in such a new product. It would be nice if Lexicon included a guide to factory presets in the future. The first preset is called Large Hall. I was surprised at how warm it sounded next to the 480. The reverb algorithm is rich, smooth and realistic, without any metallic quality or graininess. The frequency response was full, especially on the bottom end. It's flat down to 10Hz.

Most of all, I was blown away by the lack of noise. It's ironic that most digital reverbs are noisier than the plates that they replaced. There was negligible hiss with the 300, even when the master volume was cranked. With this kind of fidelity an engineer can use the 300 on anything, without worrying about adding hiss to a track.

I also noticed the smoothness of the decay. I monitored the sound on large studio monitors with the outputs of the 300 soloed, so I could concentrate on the reverberation. Although some manufacturers would cringe at this type of listening test, it is a painfully obvious indication of how the algorithms really sound.

THE PRESETS

Studio A is one of my favorite presets; the sound is big and wide. Wetsuit and Canyon Walls are also good, should you want a more dramatic panned effect. The plates are OK, but don't seem to have the same sizzle as an EMT plate. Contemplate is the brightest of the plates and sounds good on drums and vocals. Le Gate is an AMS-like reverse-gated reverb, which sounds incredible on drums. The Gated Hall sounds good on kick drums as well.

Some of the preset names, like Salad Plate, are a bit too silly for my taste. This may seem trivial, but I have had clients who would insist on using a preset simply because they liked the way it was named.

I tested the 300 with drums, vocals, piano, acoustic guitar and even with mixed tracks. The Large Hall preset is smooth and sweet. The acoustic spaces like Dance Hall, Lecture Hall, Ballroom and Basement are very realistic-sounding and should be welcome in audio-post environments.

There is even a preset called Sound Stage that corrects for overly close miking by placing a soloist back in the mix. The mastering algorithm has a rotation parameter. Rotation is a very interesting way to move things around in a mix. The result is an almost three-dimensional kind of processing.

The pitch shifting is good, but not great. (Lexicon has never been known for its pitch shifters.) I noticed a low-level, high-pitched sound that accompanied certain types of input signals. According to the company, this was the result of noise modulation caused by the pitch change. The EQ was clean, perhaps too clean. Ma Bell EQ, a factory preset, didn't seem to have enough phase distortion and resonance to sound believable. The flanging did not seem to sound as good as the PCM-70, either. So much for linear phase response.

AUTOMATION

Real-time MIDI control of signal processing devices has been around for years, al-

though many mixing engineers still do not take full advantage of it, possibly because of the zipper noises early products made when making real-time changes and the long preset load times. The 300 loads most presets almost instantly and seamlessly segues from one sound to another.

The 300 is the first reverb on the market to actually glide from one preset to another. Loading presets using the same algorithm is generally very smooth although occasionally the device will mute for a second. It seems to take longer to load some presets than others, perhaps because of the algorithm type.

Thanks to a built-in time code reader, the 300 can change presets using SMPTE time code. Although time code-triggered program loading is a great idea, frame-accurate loads are not always possible. This is not a problem if time code values are trimmed, and most engineers checkerboard ambience tracks anyway (so they can crossfade them).

Up to 50 different settings can be recalled, thanks to the 300's built-in event list. Fifty events may not be enough for some film and video work. Users requiring more than 50 preset changes can create very long lists, using software like Q-sheet A/V for the Macintosh.

EXPANSION

Although the 300 does not have a slot for a RAM card like the 480, this should not be a problem, thanks to MIDI. Programs can be stored as MIDI system exclusive data and edited using third party software, similar to the PCM-70 librarian for the Macintosh. Additional algorithms can be added via ROM chips. Lexicon has a number of other tricks up its sleeve that will involve the Comm Port on the back of the 300.

Another big question is whether Lexicon will provide a remote control for the 300. Although the 300 won't work with the LARC controller, the MRC controller is a low-cost alternative controller that uses MIDI.

CONCLUSIONS

At $4,795, the 300 is definitely a "best buy." I have yet to find an area where Lexicon cut any serious corners. In some ways the 300 shows up the 480. The sounds are so nice and clean that they can stand up on their own without being blended in with the original. Try that with other reverberation devices.

Although the press has been describing the 300 as half-of-a-480, my listening tests suggest it is an entirely different beast. Although the new reverb and ambience algorithms are superb, many of its 75 presets seem to have the same general quality.

Digital studios will kill for this piece, because of its low noise floor and extensive digital I/O. The 300 is also ideally suited for audio post and CD mastering applications because of its time code capability and new presets. The 300 will not replace every other signal processor in your studio. However, the things that it does well, it does very well.

Circle (154) on Rapid Facts Card ■

Circle (38) on Rapid Facts Card

Circle (39) on Rapid Facts Card

Continued from page 56

AMPLIFIERS
Main FOH: Crown MA1200, Crown PSA-2
Monitors: Crown MA1200, Crown MT1200

MAIN LOUDSPEAKER CABINETS
Manufacturer: Showco
Model: (40) Prism

LOW END CABINETS (Subwoofer)
Manufacturer: Showco
Model: (8) Prism Sub

FOH SYSTEM
Configuration per side: (16) Flying Prism 4×4
Flying System: Showco Prism grids
Truck Pack: five across with subs on top

ONSTAGE MONITOR CABINETS
Manufacturer: Showco
Model: (13) BFM600 wedge
Model: (4) Prism sidefill (flown 24 feet high at 45° angle)
Crossover: Showco 1016 (3-way)

HOUSE RACK (Headliner Only)
Equalizers: Industrial Research Products TEQ DG-4023 (featuring non-interactive filters)
Crossover: Showco Prism Digital 1040
Effects: Lexicon LARC 224 XL (for lead vocal), Lexicon 200 (background vocals), Yamaha REV-7 & SPX-90II (instrument groups), Roland SDE3000 (vocal special EFX) and AMS DMX (dual channel digital delay line and pitch changer).
Compressor/Limiters: dbx 900 series 903, dbx 160x
Gates: dbx 900 series 904
DAT Machines: Panasonic SV-3500 and 255.
Intercom: Clear-Com
SPL Meter: General Radio 1565B handheld
Headphones: Sony DR6M (15 years old with leather ear protectors and metal cans); Sony MDRV6

ONSTAGE SIGNAL PROCESSING
Equalizers: Klark-Teknik DN360
Effects: Lexicon PCM70, Yamaha SPX-90, Yamaha REV-7
Compressor/Limiters: dbx 903
Gates: dbx 904

MICROPHONES:
Linda Ronstadt: Beyer 88
Background Vocals: Sennheiser 431
Aaron Neville: Shure Beta 87
Choir Vocals: AKG C460B
Kick: Electro-Voice RE-20
Toms: Shure SM98 with pattern modifier
Overheads: AKG C451 with swivel heads and 10dB pads
Snare Top: Shure SM57 (noise gate on the bottom & phase reverse on the top & bottom)
Snare Bottom: Sennheiser 421
High Hat: AKG C451
Piano: AKG C414 Hammond B3
Bottom/Sennheiser 421
Guitar: Shure SM57
Bass: Showco DI
Direct Boxes: Showco ■

First Look

By Laurel Cash-Jones

ROLAND SLIPS A DISK

A hard disk recorder, that is. The DM-80 is Roland's new "Personal Digital Workstation." It is designed as an affordable, digital multitrack recording system that offers 18 minutes (at 44.1kHz) on its built-in 100MByte hard disk of simultaneous 4-track recording. And if that's not enough tracks for you, it can be expanded with an optional expansion kit to eight tracks.

Plus, it has a built-in SCSI interface that allows you to connect up to 16 external devices, such as hard disks or magnetic optical disk drives, thereby dramatically extending recording time. The DM-80 accommodates SMPTE, MIDI Time Code and MIDI Tempo Clock so you can sync it to practically anything. The DM-80 consists of a rack-mount unit with internal hard disk, connectors, a remote unit with controls and an LCD screen. From a technical perspective, the data format is 16-bit linear, A/D conversion is 16-bit, D/A conversion is 18-bit, and internal processing is 24-bit.

And if you love numbers, here are some more — the DM-80 supports three selectable sampling rates: 32kHz, 44.1kHz and 48kHz. Because the DM-80 has random access capability, any portion of a track not containing recorded data, does not consume memory, so the effective playback time can be more than 18 minutes. There are both analog and digital inputs and outputs (optical/coaxial: AES/EBU), which allow you to process recorded data using outboard gear such as Roland's E-660 digital parametric equalizer or the R-880 digital reverb.

The optional expansion kit features a sample rate converter on the digital input that allows you to change data with different sample rates. Among the recording and editing functions, auto punch in/out and loop-type recording are available, as well as editing functions such as crossfade, cut, paste, delete and insert. Additionally, the auto locator allows you to specify a point and jump to that position instantly.

The data is recorded much the same way a sequencer stores a song. The first pass is called a Take. From the Take, a Phrase can be designated (such as a verse, chorus, or a single note) and then these Phrases are linked together to form a Song using a Play List. (However, I think that Roland might want to consider the applicability of this terminology to other types of recording. For instance, audio for video post production or commercials may benefit, because sound effects and dialogue do not fit into Roland's convenient catagories.)

The DM-80 also has a built-in mixer with 2-stage EQ, pan and gain, plus it uses inexpensive DAT technology for backup of the hard disk or magneto optical disk. All in all, it seems that the DM-80 will be an interesting new toy to play with when it comes out sometime in early 1991.

Circle (103) on Rapid Facts Card

HEY, TRY TO KEEP THIS QUIET

Sonic Solutions, the *other* noise reduction company from San Francisco, has released NoNOISE 2, the second generation version of its successful digital signal processing system for noise reduction.

Among NoNOISE 2's increased capabilities are:

- A new way to remove surface scratches or crackles from disc recordings.
- A new broadband (hiss) noise reduction program that operates on a stereo signal in real time.
- A de-clicking program that is 20 times faster than the original NoNOISE package.

Along with this new version, Sonic Solutions is also introducing the "Sonic FX" Digital Effects Processor. (Remember when products had short and simple names?) Sonic FX is a processing card that uses the Macintosh II's NuBus and software modules, which are available separately enabling you to design your own system.

Circle (101) on Rapid Facts Card

I THINK THERE'S AN ECHO IN HERE

Lexicon is introducing the LXP-15 multi-effects system, which combines remote control of its 27 variable parameters and 128 preset effects to create a very unique combination of effects, such as pitch shifting, gate, plate, stereo delays and various reverbs.

The LXP-15 also incorporates the company's Dynamic MIDI and works with nearly every type of controller, including breath controllers, pitch benders, sliders or expression pedals. Because the LXP-15 has a number of user-stored memories, you can set global patches that can be activated with each set-up.

Circle (102) on Rapid Facts Card ■

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

Cutting Edge

JLCooper CS-1 Control Station

The CS-1 provides an easy-to-use hardware control interface for disk-based recording systems, sequencers and multimedia software. An optically encoded jog/shuttle wheel allows sample-precise positioning within a recording and effortless scrub editing. Complex commands can be initiated with a single button using the CS-1's programmable function keys and footswitch input. The CS-1 is available in Apple Desktop Bus, MIDI and PC versions. Retail price is $599.95.

Circle 104 on Rapid Facts Card

Kenwood recordable CD system

The CD-Write Once System, which records music or data on CDs, consists of a CD Encoder, a CD Writer and basic systems software. The CD-WO is controlled by a PC and records CD graphics and produces CD-ROM in real time. Discs are manufactured from a single master disc. A CD-ROM/I Formatter, A/D converter and a CD graphics unit are available options.

Circle 107 on Rapid Facts Card

Wohler Technologies AMP-2

The AMP-2 is a self-powered rack-mount stereo audio monitoring system designed to be used where space is a premium. It occupies two units of rack space and delivers a frequency response of 100Hz to 16kHz, ±5dB. Two stereo amps are rated at 20W peak; center channel amp is 32W peak. Acoustic output at 2 feet measures up to 104dB SPL. The standard version of the AMP-2 includes balanced XLR and unbalanced RCA inputs, LED peak meters, an LED-matrix visual phase indicator, and volume and balance control. Magnetic shielding allows the AMP-2 to be installed adjacent to most video monitors.

Circle 105 on Rapid Facts Card

Summit Audio TPA-200A

The Dual Tube Pre-amplifier model TPA-200A combines vacuum tube and solid state technologies. It uses either mic input, line level input or front panel high-impedance input. Three-pin XLR connectors and quarter-inch jacks enable interfacing. Output is balanced or unbalanced using 990 op-amps. Maximum output is +25dBm. Input is transformer balanced. The TPA-200A features 35W of power.

Circle 106 on Rapid Facts Card

Sonic Solutions Sonic Mini Editor

The Sonic Mini Editing System is a 2-track, 16-bit, disk-based editing system, which is a less expensive version of the Sonic System CD PreMastering System. Designed for users who want to edit DAT source material in the digital domain, it features seamless waveform editing and real-time playback of edits. List price of the fully expandable system is $8,750; a full system, which includes an Apple Mac II with more than 80 minutes of storage, costs a little more than $20,000.

Circle 108 on Rapid Facts Card

Digidesign Pro Store

Pro Store is a 660Mbyte (enough to master an entire CD), high-speed SCSI hard disk drive encased in a standard 2-space, 19-inch rack-mount box. It features quiet operation, shock mounting and a five-year warranty. The hard disk drive can be used with Digidesign's direct-to-disk recording products, Sound Tools and Audiomedia. It is compatible with any model Macintosh PC. The Pro Store consists of the drive, formatting software and a 9-foot SCSI cable. List price is $3,995.

Circle 109 on Rapid Facts Card

Otari DTR-900-II

The DTR-900-II PD format tape machine includes an internal digital matrix that is addressed from the remote controller, which assigns any input to any other track. Other features include a front panel status display, 8X oversampled D/A converters, linear power supplies for all analog audio electronics, selectable crossfade times and curves, and time advance output for use with external digital processors and mixers.

Circle 110 on Rapid Facts Card

Peavey PMA 250 amp

The PMA 250 is a dual-channel power amp that produces 125W RMS per chan-

Cutting Edge

nel at a 4Ω load. Total harmonic distortion is at 0.008, with a high slew rate and damping factor of more than 300 at 1kHz into 4Ω. The amp features a 5¼-inch standard rack-mount configuration, a rugged steel chassis, built-in load protection and distortion protection circuitry.

Circle 112 on Rapid Facts Card

Panasonic SV-3700

The SV-3700 Pro-DAT Recorder features a front-panel shuttle wheel, with 0.5 to 15 times speed range; a horizontal cassette tray for easier tape loading; an infrared wireless remote; program, absolute and time-remaining displays; and push-button selection of 44.1/48kHz sampling rates,

via analog or digital inputs. Precision Quad DACs at the analog output reduce zero-cross distortion and enhance linearity at low signal levels. The SV-3700 provides up to 400 times fast-forward, rewind and search speeds.

Circle 111 on Rapid Facts Card

Peavey UltraVerb II processor

The UltraVerb II is a multi-effects processor that features 256 internal programs. All the original standard factory presets from the UltraVerb have been included, with the added capability to replace every effect group in the range of up to 128 effects slots. Each preset transfer step is reversible up to the last keystroke. The UltraVerb II is capable of real-time MIDI control for the synthesist, MIDI guitarist or MIDI-driven PA system. User friendliness is increased by two-color LEDs located near each function and detailed labeling on each function button.

Circle 113 on Rapid Facts Card

Carver PT-2400 and PT-1800 amps

The PT-2400 Magnetic Field Power Amp produces 1,200W/channel into 4Ω and 3,000W bridged into 4Ω, 20Hz-20kHz; it weighs 45 pounds. The PT-1800 is rated at 900W/channel into 4Ω and 2,200W bridged into 4Ω, 20Hz-20kHz; it weighs 42 pounds. Both amps are modular dual-monaural designs. Other features include positive locking detachable dual ac line cords, a quiet 100 CFM cooling system, a compression circuit for excessive long-term HF signals, a clipping eliminator circuit and a remote sequential power on/off feature.

Circle 114 on Rapid Facts Card

East West ProSamples Volume 1

ProSamples Volume 1 is a CD sample library that features 259 drum samples, recorded by producer/engineer Bob Clearmountain. Four performances of each sample make it easy to get a level on the sampler. The CD features more than 900 individual samples, with each individual sample in each series a different performance. The CD is fully indexed, pressed in gold and comes with a 16-page booklet, which details the studios and equipment used, mic type and placement, and information on ambience for each sample. All samples have been recorded direct to DAT. Retail price is $129.

Circle 115 on Rapid Facts Card

Omnimusic Zapfile

Zapfile 1 has been added to the Professional Broadcast Series, a collection of copyright-cleared production music on CD for TV and radio producers. The CD collection includes more than a hundred different tracks and is divided into four sections: musical logos, for station or product IDs, credits, fanfares, trailers and program segues; musical sound effects, including bells, sweeps, chords, orchestra hits, cues and stings; supersound effects, including laser shots, noise swirls, filter sweeps and zaps; and themes and patterns, including news bulletins, time tracks and expanded logos.

Circle 116 on Rapid Facts Card

TDK NF-CO9B Digital Noise Absorber

The NF-CO9B is a snap-on electromagnetic interference noise filter. The passive filters clamp onto signal cables and power cords up to 9mm in diameter. A high-density ferrite core absorbs UHF energy, eliminating the high-range distortion associated with EMI. The absorbers are available in two-packs; retail price is $10.

Circle 117 on Rapid Facts Card

Azonic Acoustic Analysis Service

This 3D computerized modeling program maximizes noise reduction within the parameters of a specific environment. The program simulates the use of Azonic noise and reverberation reduction products within a defined space to customize the acoustical environment to the desired sound level and/or reverberation time. A sound analysis kit, which includes starter gun, tape recorder and an in-depth questionnaire to describe the room's characteristics, is used to collect customer data. The data are returned to Azonic, where a complete analysis is furnished, including detailed graphs and recommendations.

Circle 119 on Rapid Facts Card

Ultimate Support Systems mic stand

The Liberty weighted-base mic stand weighs 9 pounds and features a dovetail base, which stacks up to six stands into the footprint of one stand. An on/off clutch design allows adjustment of the mic stand height with only a quarter turn. Retail price is $29.99.

Circle 129 on Rapid Facts Card

Morenz Development SA-1000 amp

The SA-1000 power amp incorporates pulse width modulation technology to amplify audio signals using digital-like signals. The amp features a 10Hz-to-30kHz frequency response, a dynamic range of

105dB, 95% amplifier efficiency, a damping factor of 440, intermodulation distortion of 0.05%, 40% line voltage range and 1,000W of power. The amp weighs 18 pounds; its dimensions are 3.25″×19″ ×12.875″.

Circle 118 on Rapid Facts Card

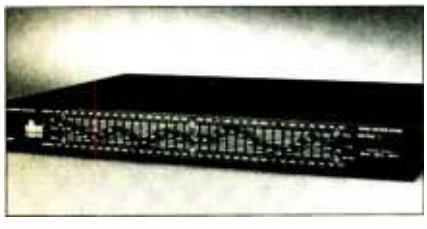
Professional Acoustics Consultants PAC-10

The PAC-10 dc alternative studio lighting system features a non-switching ramped dimmable source, overvoltage protection, current limiting and remote programming. The system replaces the 110V ac lighting currently in use with a low-voltage dc light source. The EMI and RFI created by ac power sources are reduced, providing a safe low-voltage source. The ramping feature prevents bulb shock, which can provide an indefinite lamp lifespan.

Circle 127 on Rapid Facts Card

dbx 1531X EQ

The dbx 1531X graphic equalizer features switchable dual 15-band or mono 31-band operation and high-pass filtering with selectable turnover frequencies. It is configurable for single-channel 1/3-octave or dual-channel 2/3-octave use, and offers symmetrical peak/dip combining filters on ISO centers. The front panel configuration switches allow bypass, selection of fader throw between ±15dB and ±7.5dB and high-pass filter in/out, with turnover at 20Hz, 60Hz or 120Hz. List price is $399.



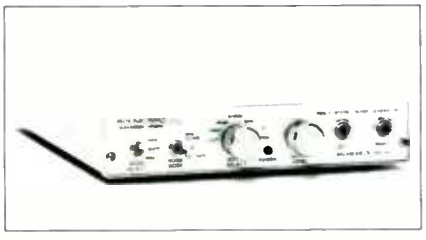
Circle 124 on Rapid Facts Card

Audio/Video File Systems storage units

Storage units for cassettes, CDs, digital audiotapes and Nintendo game cartridges are now available from Audio/Video File Systems. The storage units are made of Lucite Plexiglas and are available in clear, smoke and black colors. Units are available in 25, 50, 100, 200 and 250 amounts.

Circle 128 on Rapid Facts Card

Delta Electronics Model SNG-1



The Model SNG-1 stereo noise generator offers switch-selectable white, pink and USASI noise spectra, in either continuous or pulsed ouput modes. An external gate feature permits control of left and right channel noise for a variety of alignment and troubleshooting tests. Using two independent noise generators, the SNG-1 provides true uncorrelated stereo noise through front panel tip-ring-sleeve jacks for simple patch bay connection. Outputs are available through XLR connectors mounted on the rear panel. List price is $550.

Circle 131 on Rapid Facts Card

Community RS880 speaker

The 3-way RS880 loudspeaker system is housed in a rugged trapezoidal enclosure. Its 15-inch cast-frame speakers manage frequencies up to 450Hz; the horn-loaded LF drivers are outfitted with ferro-fluid cooled voice coils. The M200 2-inch compression driver handles the midband frequencies. At 3kHz, signals are directed by the system's passive crossover into a 1-inch titanium diaphragm driver, which is coaxially mounted in the bass horn section. Other features include an operating range of 45Hz-18kHz, sensitivity of 107dB 1W/1m and power handling rated at 400W pink noise/1,000W program. Retail price is $2,168.

Circle 120 on Rapid Facts Card

Turbosound Flashlight speaker system

The Flashlight System is a line of integrated loudspeaker enclosures with dedicated amplifiers capable of delivering 1,800W per channel. The control system comprises a fully time-aligned 24dB per octave crossover with factory pre-set limiters and balanced line drivers. The TFS-780L enclosure covers LF from 30Hz to 150Hz and contains a 21-inch speaker with a six-inch voice coil loaded with a TurboBass device. The TFS-780H handles HF from 150Hz to 20kHz and consists of two long-throw TurboMid devices and a high-Q 1-inch waveguide horn.

Circle 121 on Rapid Facts Card

Symetrix SX208 compressor/limiter

The SX208 is a stereo compressor/limiter in the half-rack format. Either channel can be used to control the dynamic extremes of a mono source, or both channels can compress or limit stereo signals. Three LEDs indicate proper level setting and a ratio control selects the degree of compression desired. Peak and RMS level detection respond immediately to hard transients and gently to gradual level changes. The SX208's 1/4″ TRS input and output jacks accept balanced and unbalanced signals automatically with no risk of level or impedance mismatching. List price is $299.

Circle 122 on Rapid Facts Card

Audio Precision Portable One

Portable One is a test set for field, benchtop and studio applications. The true-channel architecture provides full stereo

measurement capability and dual bargraph displays. Twelve different measurement functions can be selected by push buttons. List price is $4,000.

Circle 130 on Rapid Facts Card

SigTech AEC 1000 correction unit

The AEC 1000 Acoustic Environment Correction unit generates a test signal to automatically measure direct sound and room reflections, and then designs an FIR digital filter to correct for the room acoustics. Because it operates in the time domain, it is able to compensate separately for direct sound and later reflections. The resulting filter is capable of correcting up to 1,000 peaks and dips in the spectrum.

Continued on page 79

Cutting Edge

Hardware and Software Updates

Hybrid Arts TimePage software

For the ADAP II digital audio recorder/editing system, TimePage software changes the length or tempo of an audio file uniformly without changing its pitch. The algorithm can scale speech by ±30% without artifacts.

Circle 132 on Rapid Facts Card

Akai sampler price reduction

Akai's line of digital samplers has undergone a 25% average reduction in the suggested retail price. The S950 is $1,899.95; the S1000 is $4,599.95; the S1000HD (hard drive) is $5,399.95; the S1000PB (play back) is $2,699.95; and the S1000KB (keyboard) is $4,899.95

Circle 133 on Rapid Facts Card

Coda Music Software Finale update

The 1.1 version of the Finale PC music notation software, which is compatible with Microsoft Windows 3.0, is up to five times faster than the 1.0+ version, for such functions as note entry, copying music, recalculating and screen redraw. New features include Windows 3.0-compatible MIDI drivers that allow the use of MIDI while in Standard Mode; a Hand Grabber tool, which allows movement without the use of scroll bars; and a Zoom tool, which allows the user to drag-enclose a region, then enlarge it to fill the screen. Suggested retail price is $599.

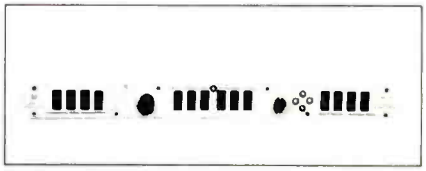
Circle 134 on Rapid Facts Card

JLCooper MAGI II Version 2.0

Version 2.0 software for the MAGI II Console Automation System is an upgrade providing cue list off-line editing, hit list, auto punch, multi-finder compatibility, enhanced user interface and real time and off-line MIDI event editing. A Cue List View Filter allows any combination of event types to be displayed, resulting in a less cluttered view of the information that is being edited. Version 2.0 requires an Apple Macintosh Plus or Atari 1040 ST computer. The update will be sent to all registered owners free of charge.

Circle 138 on Rapid Facts Card

Wohler Technologies AMP-1 update



The AMP-1A rack-mount stereo audio monitor features the same single-rack unit size as the AMP-1, but features a frequency response that extends from 80Hz to 15kHz, ±7dB. Its design consists of three amp/driver combinations, two for midrange and HF material in stereo, and a third center channel for summed LF information. Its sound field is tightly focused for optimum 1-to-3 feet monitoring. Electronic center-channel bass cancellation emphasizes phase problems occurring in the stereo feed.

Circle 135 on Rapid Facts Card

ADA update for MP-1 Guitar Pre-amp

ADA's level 2.0 software for the MP-1 MIDI Tube Pre-amp supports MIDI System Exclusive, allowing MP-1 users to up/download programs to a computer. Level 2.0 includes new and improved presets and a dictionary feature that increases user-friendliness. Registered ADA MP-1 owners can receive the update kit free of charge. A service special includes software installation and complete calibration and circuit updates by ADA technicians.

Circle 139 on Rapid Facts Card

Peavey DPM 3 SE Version 2.0

The DPM 3 SE Version 2.0 software provides local edit capability for samples loaded via MIDI Sample Dump Standard. It also supports dumping of samples from internal memory via MIDI Sample Dump Standard, with expansion Sample RAM capability of up to 1Mbyte. The DPM 3 SE also includes support for the DPM VE sampler module.

Circle 142 on Rapid Facts Card

Belden Wire and Cable power supply cords

Belden now offers the Japanese T-Mark on its power supply cords for appliances and electronic equipment. Products with the T-Mark rating conform to the Dentori Law, which regulates appliance and material control in Japan. All plugs made to the Dentori requirements use the Belden-patented design that ensures no stray strands or shorts within the attachment plug. The T-Mark can be used on both plugs and cordage, PVC and rubber.

Circle 136 on Rapid Facts Card

Peavey SyncController Version 2.0

The SyncController Version 2.0 is a SMPTE time code based machine synchronizer/controller. Both machines can be locked together by using time code information from an audio track of each machine and remotely controlling the speed of one. MIDI Time Clock and MIDI Song Position Pointer are also derived from the slave SMPTE time code. Version 2.0 also features 99 programmable events, with tempo changes available at every event time. Multiple keystrokes are eliminated because the slave machine will respond to master tallies.

Circle 137 on Rapid Facts Card

Oxmoor receives UL listing

The MDA-16 and MDA-26 Distribution Amplifiers and the RMX-62 and RMX-44 Mixing Matrix Amplifiers have recently received UL listings.

Circle 140 on Rapid Facts Card

Caig Cramolin DeOxidizer Wipes

Caig's Cramolin DeOxidizer is now available in wipe applicators that are non-flammable, non-toxic and ozone safe. The fast-acting deoxidizing solution cleans, preserves, lubricates and improves conductivity on all metal contacts, connectors and other metal surfaces, including gold. A kit includes 50 wipes in a pocket-size polypropylene container.

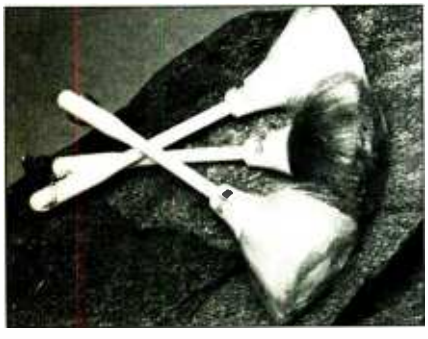
Circle (141) on Rapid Facts Card ■

Continued from page 77

The AEC consists of a signal processor and a specially configured laptop PC. The laptop provides a VGA display on its sharp gas plasma screen.

Circle 123 on Rapid Facts Card

Cory Instrument Products Studio Duster

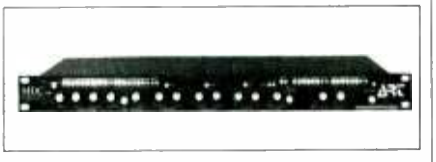


The Studio Duster works like a dust magnet because thousands of soft, plastic bristles create static electricity, which attracts and holds dust. It will not scratch surfaces like a traditional feather duster and can be rinsed clean after use. Suggested retail price is $7.50.

Circle 126 on Rapid Facts Card

Applied Research & Technology MDC-2001

The MDC signal system controller offers two channels of stereo processing, with more than 45 LEDs to monitor all functions and level variations. The compressor allows independent control of all functions, including input gain, slope, attack and release time. The expander and gate functions can be controlled separately or used in tandem. The System Master Limiter/Clipper serves as an absolute gain threshold that cannot be exceeded. Separate left and right output levels control the main balanced output feeds to the tape machine for amplification system.



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Cutting Edge

Media

Radio commercials audiotapes

"How to Produce Great Radio Commercials," written by Brian Battles and available from Porkpie Productions, is an audiotape training program on four full-length cassettes. Information includes how to write copy; prepare jingles and background music; record and edit; use special effects and sound effects; find clients and sell your services; and make organized presentations. Retail price is $99.95.

Circle 143 on Rapid Facts Card

Rane users guide

To support its Flex Series modular signal processors, Rane has published the "Flex Users Guide," which includes detailed diagrams of proven configurations, including church systems, small studios and multizone distribution venues. User tips and shortcuts are also included. CAD drawings are included on a diskette, which enables users to prepare computerized presentations and system designs. The guide is available at no charge.

Circle (153) on Rapid Facts Card

Disc Makers wholesale catalog

Disc Makers has released its full-color 1990-91 wholesale catalog. It describes the company's retail ready packages and includes updated pricing and information on cassette duplication, CD replication, record pressing, video duplication and Disc Maker's mastering, art design and printing services. It is free of charge.

Circle 147 on Rapid Facts Card

Basic Measuring Instruments newsletter

The "Power Monitor" newsletter is written for studio engineers who are concerned about reducing power cost and maintaining reliable operation of electronic recording equipment. It features articles on power quality and energy management applications and products; industrial topics such as harmonic distortion and power shortages; questions and answers about power-related issues; and information on power applications group meetings around the country. It is free of charge.

Circle 145 on Rapid Facts Card

Marshall Electronics catalog

A 1990-91 catalog for the audio, video and broadcast industries is now available from Marshall Electronics. The 48-page catalog features a complete range of component parts for interfacing both professional and industrial audio and video equipment. Items include BNC panel connectors with built-in termination switches, which operate automatically when inserting a mating plug; molded patch cords available in any color; RCA and panel jacks that come in strips of up to eight across; and the company's line of Hi-Definition Video coaxial cable assemblies, which operate up to 100MHz for computer RGB and HDTV.

Circle 146 on Rapid Facts Card

Shure Brothers videocassette guide

The "Guide to Better Audio" is now available on videocassette with VHS Hi-Fi sound. It discusses microphone selection and technique, mixer operation, wireless mic systems and audio accessories. A copy of the original 24-page booklet is included with each order. List price is $29.95.

Circle 148 on Rapid Facts Card

Motionworks Control Protocol

The Control Protocol is for manufacturers and professionals in audio and broadcast product development who want to integrate Motionworks' products with their own. The protocol is simple to implement and is available upon request, with documentation and example applications for either PC-compatible or Macintosh computers.

Circle 149 on Rapid Facts Card

Crown SASS-P CD

A CD featuring recordings made with SASS-P microphones is available free of charge from Crown. The CD, which has a running time of more than one hour, contains an assortment of live music, studio music, stereo sound effects, samples and A/B comparisons with other stereo mics. Live and studio music is comprised of a range of music, from classical to pop. Percussive arts are featured on another portion of the CD. Each CD comes with extensive documentation about how each recording was made. Photos illustrate the actual recording session and mic placement.

Circle 150 on Rapid Facts Card

Vega white paper

The free "Vega Wireless Microphone Application Techniques" white paper, written by Vega president Gary Stanfill, presents information on wireless systems and provides solutions to common wireless problems. The 20-page paper includes frequency selection, interference control and antenna systems.

Circle 151 on Rapid Facts Card

Audio Services catalog

A 115-page catalog of production sound recording equipment and accessories has been issued by Audio Services Corporation. It contains 500 original photographs, commentary, articles and other information about the industry and is available free of charge.

Circle 144 on Rapid Facts Card

Atlas/Soundolier catalog

A two-color, 8-page catalog from Atlas/Soundolier illustrates a selection of microphone stands and accessories for music, recording and performance applications. Contents include: mic and loudspeaker equipment floor stands, desk stands, studio-quality mic booms and attachments, stand accessories, adaptors and fittings. The catalog is free of charge.

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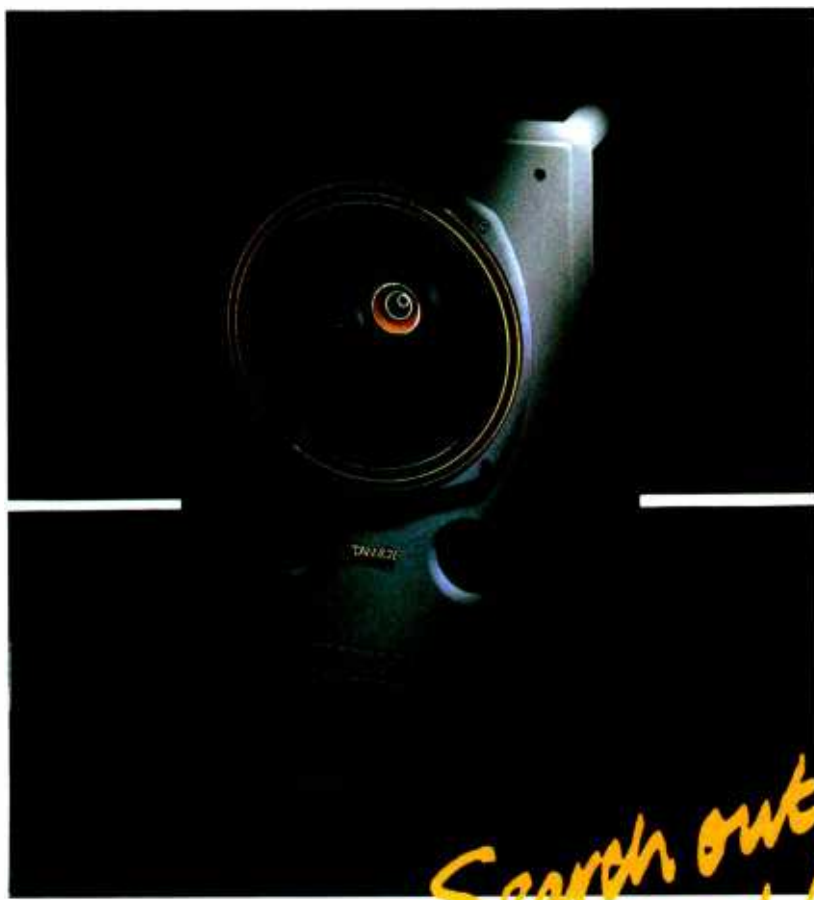

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