

May 1991

Recording  Engineering  Production

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# REP

The Pro Audio Applications Magazine

*Sound Reinforcement  
Special*

AN INTERTEC PUBLICATION

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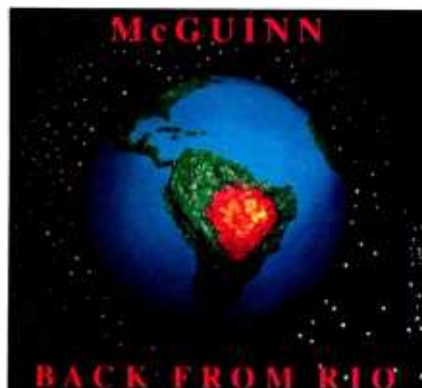
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**On the Cover:** The Electro-Voice MT-4/DeltaMax system used on Arrowsmith's Fall 1990 tour, shown here at The Palace of Auburn Hills, MI. The sound company was dB Sound. Photo by Rudy Arias/Comarts, Chicago.

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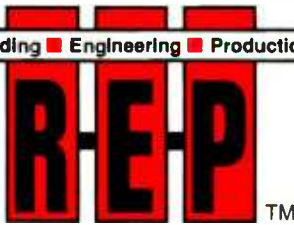
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# From the Top

## Live Ain't Jive

In 1970, when *Recording Engineer/Producer* hit the streets of Hollywood, there was indeed a sound reinforcement industry. Hanley Sound on the East Coast had already done Woodstock, Goose Lake and a handful of other pop festivals. On the Left Coast, Harry McCune Sound Services had fielded the system for the Monterey Pop Festival and others. United covered the Doors and more in L.A. Many smart bands were trucking their own — the only way to insure that quality sound would be there at all, usually, sorta.

Early boxes were crude, often shells chopped out of 4x8 sheets of 3/4-ply, with 2x4 bracing, stuffed with JBL D-Series woofs, JBL or Altec phenolic drivers on a resonant metal sectoral horn. Amps were usually D-300s, or for the high rollers (with strong backs), MacIntosh tubes.

Off-the-shelf systems? Altec, with their various Voice-of-the-Theaters, WEM, with its English column-based smaller packages, JBL with theater systems similar to Altec. Few others.

What the systems all lacked in subtlety, they made up for in SPL — although maybe a little distorted, they were almost always way-loud. But in a time when most sound companies were building their own rotary-potted mixers out of electrical utility panel boxes, loud was an important primary objective. This was especially true in light of the ever-growing masses of people, evoked by a cultural and demographic expediency, to drop out, tune in and dig the vibes.

Even though that pre-R•E•P/*Recording Engineer/Producer* was an L.A. audio production book, the articles on sound reinforcement snuck in early and connected with a thud. They covered all the things you'd expect: system design, grounding schemes, distribution, and cutting edge stuff like using a second board on stage to mix monitors. Product reviews appeared on boards, mics and amplifiers. The early editors acknowledged that audio engineering for live performance was first cousin to studio work, and deserved full and complete coverage.

Some 21 years later, those early insights have proven themselves true. Our own recent random survey of readers, entitled "Moonlighting in Professional Audio," fills in the blanks: Of the audio production and technical readers polled, 44% had an additional audio-related income separate

from their main job. Of this number, the largest group — 44.1% — did live sound. Mobile recording came in second at 18.6%, and outside tech work was third at 15.3%. Among all of our readers, including management and non-production staff, live sound accounted for 34.5% of their extra-vocational activities — more than double the next category. And this doesn't even include the large number of individuals who do sound reinforcement full time!

Whether due to: 1) broad and wide ranging interests on the part of audio production people; 2) the necessity of making a living in a world where most markets don't have enough studio work to sustain a lifestyle; or 3) the coercing and cajoling influences of projects and artists ("Hey man, nice job on the demo, wanna mix sound for the showcase gig on Friday?"), a large number of people who do studio work also do live work.

And yes, we acknowledge that, even as some engineers are splitting their lives between large space and small space acoustics on a per-project basis, so too are the players in major markets becoming more and more specialized. In L.A. or N.Y., it seems that you either do music, editing, FX, looping, ADR or live sound exclusively. But in the B markets on down, if you know sound and can mix, you do audio. Wherever it takes you. On whatever projects.

In this, there is an important consideration for manufacturers: take note! The guy who does the studio work during the weekday and nights, takes his favorite digital rack goody, several compressors, a favored hand-held mic and the porta-DAT, and hits the club or concert hall. Gear leaks over, getting into areas not originally called for in the design engineering spec. Why? Because it works. Because it's available. Because it does a good job. Especially in light of the cleaner and clearer sound systems in evidence around the country in 1991.

So with all of this in mind, enjoy the May sound reinforcement issue. Although on the surface it may seem strange to cover S.R. in an audio production book, we are merely mirroring the reality of what you, our readers, are doing for livelihood, on a regular basis. Enough so that we will continue to grow our sound reinforcement section, allowing David Scheirman and Mark Herman to get into even more trouble out there in the Land of Live. ■

Mike Joseph

Studio Rat/Live Sound Guy

## AES Changes Fall Dates

If you're planning to attend the fall AES Convention, remark your calendars: the dates have changed. The new dates are Oct. 4-8 in New York. The original date, in the middle of October, left only a week between the AES and the SMPTE conventions, hardly enough time for exhibitors that attend both events to move equipment across the continent.

According to Don Plunkett, execu-



tive director of the AES, papers and workshops are scheduled for Friday, Oct. 4; the equipment exhibition will start on Saturday, Oct. 5. This year, the convention will be in the expanded New York Hilton rather than split between the Hilton and Sheraton Centre hotels.

For more information on the convention, contact AES at 60 E. 42nd St., New York, NY 10165; 212-661-8528; fax 212-682-0477. ■

### PRODUCT UPDATES:

• In the February Live & Direct column, the price of the Radio Shack SPL meter was quoted as \$65. The 1991 product catalog lists an even better price: \$31.95.

• Tim Sadler of ABC Watermark, author of "Modern Digital Broadcast Production" in the April issue, has located two additional vendors that have committed to

stock the Dataport Flyaway hard disk enclosure, a zero footprint, 3.5-inch hard drive enclosure with 40W power supply and removable drive carriage.

The vendors are MacZone, Redmond, WA (800-248-0800) and Alliance Peripheral Systems, Independence, MO (800-233-7550). According to Tim, both companies

are mainstream Mac mail order vendors with excellent records in service and support.

ABC Watermark is using the drives in the creation of "American Top 40" and other weekly countdown shows. See his sidebar "Keeping Up With Technology" for details on their application. ■



## CAS Marks Anniversary

**H**ere's a society that keeps a low profile, yet does enormous good for the audio industry: The Cinema Audio Society celebrated its 25th Anniversary in February with its annual awards ceremony.

Noted director Robert Altman, whose latest movie was "Vincent and Theo," received the society's Lifetime Achievement Award, its highest tribute. CAS noted his use of 8-track field recording, and his pioneering use of "overlapping sound" in the 1970s film "M\*A\*S\*H." Altman has used this technique in all of his subsequent films.

Also recognized was Richard Topham Sr., chairman emeritus of Audio Services Corporation. He received a Lifetime Honorary Membership and Special Recognition Award for his longtime support and dedication to the industry. ■

## PEOPLE

Quad Eight Electronics has formed a new management team. **Chuck Kelley**, formerly director of operations, has been promoted to vice president and general manager. **Mark Fleming** has been named chief engineer, and **Buddy Frisbee** has been named director of sales and marketing ... BASF Audio Video Professional Products has restructured its staff to incorporate the recently acquired Agfa Magnetic Tape Division, and has announced the following appointments: **Terry O'Kelly**, director of national sales; **Joe Tibensky**, key account manager, audio duplication tape products; **Bob Zamosciany**, eastern regional manager; **Joe Ryan**, western regional manager; **John Matarazzo** and **Peter Piotrowski**, technical services managers; **Jeff Brown**, marketing manager, professional audio video products; **Joanne Aliber**, manager, professional audio video products; **Teri Sosa**, communications manager; and **Dean Pellegrini**, manager of sales and marketing support ... **Bob Haigler**, chief electronics engineer at Renkus-Heinz, died Feb. 5. A memorial service was held on March 2 ... **Lloyd W. Dunn**, a co-founder of NARAS, died March 8. ■

# TRENDS

**Home Video:** If your facility is doing audio-for-video work, you're contributing to the growth of a hot market. Recent estimates of home video sales and rentals in 1990 range from \$9.75 billion to \$17.43 billion.

**Broadcast Audio:** The radio industry continues to discuss how much processing should be added to its audio signal before it's transmitted. At the recent Country Radio Seminar, according to *Billboard*, most audience members favored natural processing. However, one consultant favored making stations as loud as possible, saying, "They don't put ugly girls on the cover of *Cosmo* and *Vogue*."

**Lip-Syncing:** The cassette single of Whitney Houston's "The Star Spangled Banner" has caused some controversy because of its cover labeling. Although the cover says the song is "as performed at Super Bowl XXV," the single is a combination of live and pre-recorded vocals, according to press reports. A taped version is routinely made, with the decision on whether to use it depending on gametime conditions. For the Super Bowl, Houston sang along with the taped version, which was fed to the audience. The heightened awareness of lip-syncing is in response to the Milli Vanilli flap. It seems to us that the question is not whether lip-syncing should be allowed at all, but rather in what situations is it permissible. ■

"It's becoming more obvious that the wonderful technology that was developed to make pop music easier to record and clearer to the ears has tricked us. Instead of enriching our collective musical palette, it is controlling that palette. Who could deny that the synthetic sound of the latest studio instrumentation — at least the way it is used in the bulk of commercial pop — is not as human as the sound of an acoustic orchestra or ensemble? Who could deny that oppressively ear-shattering music has spread, from rock concerts to clubs, movie theaters and even to Broadway?"

— Stephen Holden, New York Times music columnist.

# Random Access

## STUDIO UPDATE

Facility/Location	Details
<b>NORTHEAST</b>	
Oz Recording Studios/Baltimore	New 24-track facility for album projects; equipment includes a Studer A827, an automated TAC/Amek Matchless console and a Macintosh IIx with 1.2GBytes storage. Located at 310 E. Biddle St., Baltimore, MD 21202; 301-234-0046; fax 301-539-2835.
<b>SOUTHEAST</b>	
Disc Mastering/Nashville	Newly remodeled digital mastering and editing suite features a Neve DTC-1 digital console and Tannoy System 15 DMT monitors.
<b>SOUTHWEST</b>	
Reelsound Recording Company/Manchaca, TX	Facility's remote truck has installed a Panasonic SV-3700 DAT recorder, two API 525 limiters, two B&K 4006 mics and a pair of Meyer Sound Labs HD-1 monitors.
<b>SOUTHERN CALIFORNIA</b>	
EFX Systems/Burbank	Jordan S. Friedberg has joined the digital audio post-production facility as controller. He will supervise accounting and financial departments.
Lindsey Productions/Huntington Beach	Now operating a full MIDI pre-production and audio-for-film and -video suite; equipment includes a Roland S-770 sampling system. Located at 16761 Viewpoint Lane, Suite 83, Huntington Beach, CA 92647-4757; 714-842-3684.
NRG Recording Services/North Hollywood	Expanded at new 7222 Hinds Ave. location to include a pre-production/rehearsal sound stage. The Neve-equipped room has been upgraded with an Otari 100A, two Avalon E5 equalizers, two Tannoy System DMT monitors and Klaus Hein-modified U67, M49 and C12 mics.
<b>NORTHERN CALIFORNIA</b>	
Soma Sync Studios/San Francisco	Kyle Johnson has assumed the duties of management and booking.
<b>NORTHWEST</b>	
Sage Arts/Arlington, WA	Acquired an Apple Mac II with Digidesign Sound Designer II software; a Demeter stereo tube pre-amp; two Demeter tube direct boxes; a Lexicon LXP-15; two Summit EQF-100s, 4-band tube EQs; and an Adams-Smith Zeta-Three synchronizer.
Spectrum Sound Studios/Portland, OR	Announced an arrangement with Sosumi Productions in which Sosumi will market Spectrum's studios to the local, regional and national music communities. Sosumi will continue to perform artist management and record production duties.
<b>CANADA</b>	
Wellesley Sound/Toronto	Added a second Studer Editech Dyaxis DAW.
<b>MANUFACTURERS</b>	
Audio Kinetics	Sounds Interchange (Toronto) has ordered 16 ES.Lock 1.11 units.
Hill Audio	Future Sound Studios (Soest, Holland) has purchased a Hill Concept 8400 series mixing console fitted with Audio Kinetics Reflex automation.
Mitsubishi	Sales of the X-880 digital recorder: T&R Trilogy (Somerville, NJ); Javelina (Nashville) and Crystal Sound Recording (Hollywood). Sales of the X-850: New River Studios (Fort Lauderdale, FL); Advanced Audio (North Hollywood); Mockingbird (Burbank, CA) and Urban Sounds of America (Los Angeles). Sales of the X-800: Axis Studios (New York). Sales of the X-86E editing and master recorder: Eastman School of Music (Rochester, NY) and 321 Studios (New York).

## NEWS NOTES

**Shure's** Stereosurround was used in broadcasting this year's Grammy Awards, marking the third straight year that the surround sound system was used for the awards broadcast.

More awards news: **Panasonic Pro Audio** underwrote an Oscar-night celebrity benefit for the Childrens AIDS Center at Childrens Hospital, Los Angeles. The company provided a large-screen video environment and the sound system.

**Roland** has formed a pro audio/video division as part of its strategic plan to develop products for the professional industries. Curtis Chan was named general manager of the division.

**Digidesign's** DECK software was recognized as the "Best Music Product" of 1990 by *MacUser* magazine, the third consecutive year the company has been recognized. The previous product winners were Sound Accelerator and Audiomedia.

## ADDRESS CHANGES

**Euphonix** has relocated to 220 Portage Drive, Palo Alto, CA 94306; 415-855-0400; fax 415-855-0410.

**Audient Marketing Services**, which provides public relations and marketing to the audio industry, has relocated to 5525 San Fernando Road W., Los Angeles, CA 90039; 818-547-1952; fax 818-240-1915.

## SALES NOTES

**Mitsubishi** has delivered the 200th X-86 2-channel digital mastering recorder to 321 Studios, New York.

Sales of **Digital Audio Research's** SoundStation II reached 90 during the first quarter of the year.

**NVision** has installed the first NV2000 High Definition Audio System at KSL-TV in Salt Lake City.

**Allen & Heath USA** presented a number of sales awards at Winter NAMM. GMI New England was named "Rep Firm of the Year." Audio Video Research was named "Dealer of the Year." "Most Improved Territory" went to Starin Marketing and Loppnow and Associates.

*"The Beta 58 delivers maximum SPL, to keep the vocals above screaming fans in a loud rock club — without feedback. Yet it has the sensitivity to reproduce the most subtle, breathy whisper for 80,000 people at an outdoor festival. And for guitar amps, the Beta 57 gives me the isolation I need without sacrificing the warmth and tone I want.*

*For live sound, Shure Beta mics are the state of the art."*

*Steve Folsom*

*Steve Folsom, Sound Engineer for Melissa Etheridge and John Hiatt.*



Beta 58 Wireless

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# Random Access

## MANUFACTURERS (Cont.)

Solid State Logic	Winfield Sound Recording Studios (Toronto) has installed an SL 4000 console with G Series computer and electronics in its new Diffractal control room.
Soundcraft	Rose Studios (Lemont, IL) has installed a 32-channel 3200 console.
Tannoy	Musicon Recording Studios (Portland, OR) has installed two System 215 DMT monitors.
TimeLine	Sales of Lynx KCU keyboard control units and Lynx time code modules: Lillie Yard, Select Sound, Matrix and Air Edel (U.K.); Television South (England); the French Police (Alfortville); the French Navy (Brest); TelFrance and Tele Europe (France); Radio France; FR3 (Toulouse, France); and Teletota (France). Other sales: Image Express (Southfield, MI), Lynx VSI video system interface modules; and TelFrance and Tele Europe, Lynx film modules.

## DESIGNERS

Harris, Grant Associates/London	Contracts: Dierks Studios (Stommeln, Germany), acoustic consultancy and specification for the refurbishment of Control Room 3, and supply RPG Flutter Free acoustic treatments to the side walls of the control room area; Sound Studio 'N' (Köln, Germany), deliver Boxer 5 monitoring system; Red Rooster (Munich, Germany), acoustic consultancy for control room, studio and ancillary areas, and supply Boxer 4 monitors, ceiling-mounted RPG Diffusor clouds and Triffusor treatments for control room and main studio areas; RBS (Rotterdam, Netherlands), redesign The Producers Workshop 24-track studio, and supply RPG Diffusors to control room and recording areas.
Frank Hubach Associates/Richmond, CA	Chips Davis has joined the staff as a coordinator of services.
Munro Associates/London	Completed Logic West (Milan, Italy), a digital audio post-production facility centered on a NED Direct-to-Disk system.
Walters/Storyk Design Group/New York	Designing a multisuite production/recording facility for JSM Music (New York), equipped with an SSL 6056 E console with G computer and a DDA AMR 24 console. Completed renovation of DK Studios (New York), which includes Neve consoles and Sony 3324 digital 24-track recorders.

## DEALERS

Gand Music & Sound/Northfield, IL	Taken delivery of the first Soundcraft Delta 40x12 monitor console in the United States.
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**Sonic Solutions** has delivered the 100th Sonic System to Abbey Road Studios in London.

**JL Cooper Electronics** posted a record year in 1990, with a 22% compound growth rate.

## EVENTS

Organizers for the **APRS 1991** exhibition expect an increase in international attendance from 1990, when 14% of attendance was from outside the United King-

dom. Sponsored by the Association of Professional Recording Services, the convention is scheduled for June 5-7.

**Renkus-Heinz's** System Design Seminar, held just after the Winter NAMM show was attended by more than 125 people from 15 countries.

**Gand Pro Audio** held its first Digital Audio Recording Expo in February. The 2-day event featured equipment displays from major digital audio manufacturers and was designed to give hands-on experience to the attendees. More than 200

Chicago-area audio professionals attended. Gand plans to make the expo an annual event.

A total of 359 people attended the 25th annual **SMPTE** Television Conference, held Feb. 1-2 in Detroit. The event was notable for the first SMPTE/AES session, which was attended by 175 people. The associations are discussing future joint events.

## CLASSES

**The University of Iowa** will host its annual summer audio recording seminar from June 10-21, with Jerry Bruck, Bob Ludwig and Lowell Cross as the principal instructors. Special guests will include Russell Hamm, president of Gotham Audio, and Stephan Peus, head of microphone development at Neumann. For more information, contact Professor Lowell Cross, Recording Studios, School of Music, the University of Iowa, Iowa City, IA 52242; 319-336-1664; fax 319-335-2777.

## REP NEWS

**JL Cooper Electronics** has appointed Midwest Audio to represent its product line in northern Illinois, Michigan, North and South Dakota, Wisconsin and Minnesota.

**Symetrix** has appointed Pro Tech Market as its Rocky Mountain regional representative.

Essential Marketing will represent **Lexicon's** products in Nebraska, Iowa, Missouri, Kansas and southern Illinois.

**Audio-Technica's** "Rep of the Year Award" was presented to Crescendo Associates during Winter NAMM. Rep firms receiving a "Quota Busters Award" were David H. Brothers Co., Cambridge Marketing, On The Road Marketing, Signal Marketing, C.M. Sales, Hanoud Associates, Northshore Marketing, Tenick & Associates, New West Audio, Ludwig Marketing and Jamm Distributing. ■

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# Fresh Tracks

## Gloria Estefan: "Into The Light"



Label: Epic  
Produced by: Emilio Estefan Jr., Jorge Casas and Clay Ostwald  
Engineered and mixed by: Eric Shilling, Phil Ramone, Pablo Flores, Mike Couzzi, Keith Cohen and Patrice Levinsohn, assisted by Doug Grover and Charles Dye  
Recorded and mixed at: Crescent Moon Studios (Miami)  
Mastered by: Bob Ludwig, Masterdisk (New York)  
SPARS Code: DDD

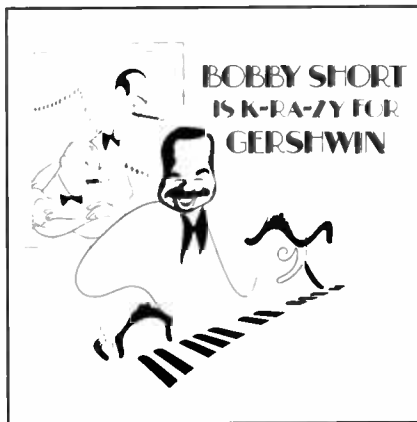
**Comments:** Although the compositions may not live up to your expectations of Ms. Estefan's hiatus from the entertainment field, you will be pleasantly surprised at the technical depth of her new recording. Whether your fancy is tickled by enterprising Synclavier samples; fast-pace, stereosonic FX; or multi-ambient laced soundscapes, "Into The Light" fills the sonic abyss acquired as a result of Estefan's near-tragic touring accident.

**Of special interest:** The all-digital nature of this outing features too many tricks to list here; however, one would be hard pressed to miss the DMP/Tom Jungian influence of the broad dynamic range of this recording. Tracks like "What Goes Around Comes Around" illustrate just about how far you can push this domain before your MSB to LSB readout indicates all 1s. But when you're dancing to this stuff, who really cares about bytes anyway? ■

## Bobby Short: "Bobby Short is K-Ra-Zy For Gershwin"

Label: Atlantic  
Produced by: Lew Hahn, Nesuhi Ertegun and Bob Porter  
Recorded at: Atlantic Studios (New York)  
Engineered by: Lew Hahn  
SPARS Code: AAD

**Comments:** This two-disc set approaches near perfection. The music lover in you will undoubtedly be impressed by Short's performances on each of the 33 selections. You'll doubtlessly regard this as the definitive and elegant statement from one of America's most gifted composers. The audio expert in you will appropriately be surprised with the equal care that went into producing this recording.



**Of special interest:** Save for the obvious vocal overdub on a 1957 recording entitled "Here's A Kiss For Cinderella," the clarity, ambience and — above all — depth of space is something sorely missing even in today's most sparsely recorded jazz trio sessions. The room is left to breathe rather than be cluttered with DSP and synchronic delays. Dig the music and k-ra-zy about the sound. Highly recommended. ■

## Roger McGuinn: "Back From Rio"



Label: Arista  
Produced by: David Cole and Roger McGuinn  
Engineered by: Peter Doell and David Cole  
Mixed by: David Cole and Roger McGuinn, assisted by Jesse Kanner  
Recorded at: Capitol Recording Studios (Los Angeles)  
Mixed at: Lion Share Recording (Los Angeles)  
Mastered by: Wally Traugoff, Capitol Recording Studios  
SPARS Code: N/A

**Comments:** Delightful collection of tunes updates the now-classic Byrds sound with a '90s sheen. All of the elements are in place — guitars o' plenty, McGuinn's nasal inflections and that electric 12-string. At first, we thought the drums were mixed too low, but could it be that we've heard too many records where the drums were inappropriately prominent?

**Of special interest:** As would be expected, the guitars are well-recorded, the sonic textures interesting and varied. The use of SFX on "Car Phone" is effective without calling attention to itself. "If We Never Meet Again" is a great example of building a mix: start simply, build gradually and keep the mix full but not cluttered. ■



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**PEAVEY**  
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## The Rembrandts: "The Rembrandts"



Label: Atco  
Produced by: The Rembrandts  
Engineered by: Danny Wilde  
Mixed by: Danny Wilde  
Recorded at: Dan's Garage  
Mastered by: Stephen Marcussen, Precision  
Lacquer (Los Angeles)  
SPARS Code: ADD

**Comments:** The Rembrandts sound like this year's Elvis Costello, without Elvis' annoying tendency toward self-reference. This year's model pumps it up with Beatles-like harmonies and clever guitar hooks, surrounding fine and well-crafted songs. The production is vested with enough nice little touches to make repeated listenings rewarding.

**Of special interest:** "Just The Way It Is, Baby" is as catchy and tight a pop song as you'll find anywhere. The voices are immediately likable; the guitar playing is economical and fresh. What really knocks us out is the recording: it easily competes with stuff from the high-priced spreads but was done at home on standard Fostex equipment. We can't decide: "The Rembrandts" either shows that Fostex equipment is not just the home-studio stuff some people think, or it shows that in the hands of an Ansel Adams, even a Kodak Brownie can produce art. ■

## FOCUS:

### DANNY WILDE, Co-Producer/Engineer, "The Rembrandts"

**R•E•P:** This was done in what is basically a demo studio?

**DW:** Yes. We recorded everything on a Fostex 1/2-inch 16-track at 30ips. Four of the songs we started off on 8-track and dumped them over to the 16-track.

**R•E•P:** And this is literally a garage studio?

**DW:** Yeah.

**R•E•P:** What equipment do you have?

**DW:** I have the Fostex console that goes with the machine. I have two AKG 414s which we used for vocals and drum overheads; we used Shure 57s for guitars and snare, and that's it. And we have Yamaha SPX-90s and Alesis Quadraverbs — basically the stuff that any kid has in his house.

**R•E•P:** But this really sounds like a record.

**DW:** We wanted it to. We're hip to compression and so on. The magic guitar sound is the Vox AC30. We used a lot of old vintage gear. I collect a lot of old tube stuff, Fender Bandmaster heads, things like that. My garage is soundproofed, but it's only one room. So we'd be running the tape about five feet from where the drums were and we used mattresses to hide the machine's motor noise.

**R•E•P:** What kind of compressors do you have?

**DW:** The dbx 163s. I rented some ADA noise gate/compressors and a couple of Drawmers. Most of it was fairly low-end, consumer-type stuff.

**R•E•P:** Did Atco finance the tracks?

**DW:** What actually happened was that we got the money from the publishing company, Warner/Chappell, before there was any record company interest. The only overhead we had was the cost of the machine itself and the 414s.

**R•E•P:** Have you and Phil [Solem, co-Rembrandt and co-producer] had engineering experience before this?

**DW:** My dream, other than being a rock star, is to be a producer. And I've always played an integral part in the recording of anything I've done. I had three solo albums out [on Island and Geffen] and I learned a lot from them and from asking a lot of questions. The producer/engineer on the first album was Peter Coleman, the second one was Pat Moran and the third one was Peter again. I learned a lot from both of them.

**R•E•P:** How did you record the drums?

**DW:** We used a Radio Shack PZM on the kick and a 57 on the snare, which also picked up the hi-hat, and then the two 414s as overheads, and maybe an ambient mic. We spent a couple of days getting the sound right and sent them to four or five tracks on the tape machine. The bass was played through a Vox AC30.

**R•E•P:** There's so much layering, of guitars and background vocals on the album, it seems that if you took up five of your 15 tracks for drums there wouldn't be enough left over.

**DW:** Right — we were masters of the fly-in. We'd take a little snippet of a section and dump it onto the DAT machine, then send that over to two tracks of a blank piece of 16-track tape. Then we'd put on 14 tracks of vocals — we did that on "Everyday People," for instance — and send them over the DAT and fly them into two tracks on the 16-track. Record companies were always saying, "Just make the record sound like the demos," so this time I did. ■

—Interviewed by Dan Levitin

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## “Voices: A Compilation of the World’s Greatest Choirs”



Label: Mesa/Bluemoon Recordings/Rhino  
Produced by: Joachim-Ernst Berendt  
SPARS Code: AAD

**Comments:** “Voices” is a choir lover’s field day, a collection of vocal performances that span cultures, musical styles and the world. The recording quality varies (some of the tracks were recorded in the field on a Nagra) but the package works as a whole. A hugely ambitious project that is a great addition to any library.

**Of special interest:** Some of the performances are rare visits to musical worlds we don’t usually experience; for example, the Bona Singers and Dancers of Bali. More traditional, although no less engaging, performances from the London Symphony Chorus and the Choir of Vienna State Opera are delicately interwoven with the exotic, such as Ladysmith Black Mambazo, or Japanese and Tibetan Monks. ■

## FOCUS:

JOACHIM-ERNST BERENDT, Producer, “Voices”

**R•E•P:** On “Voices,” you combine recordings from a number of different sources, including recordings you made in remote locations. When you put this together, how did you decide what you were going to record new and whatnot?

**JB:** The idea overall was not to record things new, but to build this recording altogether like a big suite, and each track is like the movement of a suite. Wherever it came from, I didn’t care. If I had something in my own collection, I used that. In some other cases, I knew what I wanted, but it didn’t make any sense to record it new, because any record company would have had it in its catalog. For example, “The Messiah” by Handel, which opens the first disc — I listened to dozens of different versions. It was very difficult listening to all of them to find the one version that builds up to what I had in mind, artistically and spiritually.

**R•E•P:** What equipment did you use in the field for the tracks you recorded yourself?

**JB:** I used a Nagra. This was in the 1960s and 1970s, before the time of modern, portable equipment. At that time, the Nagra, to my knowledge, was the best. I had a Neumann stereo microphone, and that was it. Sometimes I was travelling six months at a time; I needed to keep down my equipment list as much as I could.

**R•E•P:** You’ve produced many, many jazz records, and received international awards for best production — such as European Producer of the Year and being named No. 3 on a list of the world’s best producers — was it frustrating dealing with just one stereo mic?

**JB:** In all my recordings, I always tended to use as few mics as possible. I was in strict opposition to recording every instrument with a separate mic. Eric Dolphy once told me an engineer put three mics on the bass clarinet: one at the bell, one in the middle and one up near the top. I always tried to use the fewest number of mics in order to avoid too much mixing; to have as much of a natural sound as possible.

**R•E•P:** What were the technical problems in assembling this?

**JB:** I had an excellent studio, Audio Fidelity, in Frankfurt. There were no problems. We stayed about a week in the studio. The only problems I had were musical ones. This is not so much a compilation, but, in the latent sense of the word, a composition; putting together the different movements of a suite. The keys of the different tracks are in a relation to each other. I did exactly what a composer does in this regard. Also, the distances [in time] between the tracks was carefully planned, to get this ideal of a great musical dream across continents and cultures and times. ■

— Interviewed by Dan Levitin

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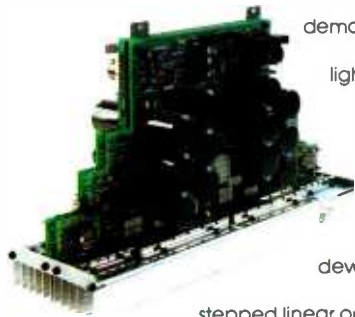
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## The Middle Echelon Shrinks

By Chris Stone

**H**ow times have changed in 20-odd years!

When we built the first Record Plant in 1968, the total cost of construction, equipment and peripherals for our studio in New York was \$85,000. The day we opened, we were booked for three months at \$85 an hour for 12-track recording. There was no such thing as a lockout. It was assumed that after a day of tracking, the setup would be torn down to make way for the evening sessions, and then set up again the following morning. We averaged six days a week, 16 hours a day. It was quite profitable!

As the years passed and we built many more studios, the cost of construction and operations went up almost logarithmically. However, the hourly rates rose marginally. In 1986, when we opened the new Los Angeles operation, the cost was \$1.5 million per room; we were getting \$200 per hour. The math did not compute.

Also during this period, analog moved toward digital, audio and visual merged with an increased emphasis on sound-for-picture, and recording budgets went down. Suddenly, it was not profitable at all. In fact, following our own axiom of "diversify or die" we entered into equipment rentals, pro-audio equipment sales, increased remote recording and film/television scoring. It was the only way we stayed alive.

Profound change in the audio industry has led to problems for the middle echelon recording studio. The 2- or 3-room complex just can't stay profitable like it used to, which means there will be fewer and fewer studio complexes like Record Plant. This does not mean that the multi-room facility has become a dinosaur; it only means that our inescapable free economy is shaking the tree as it always does to get rid of the weaker entities.

It also means fewer studios can afford new top-of-the-line equipment, more lower priced and used equipment will become available, and that the retrenching which is the result of this has forced us all to de-

mand "more bang for the buck." The quality of the equipment has also improved, so now it is less expensive to get to the mastering room or layback facility for minimum cost with "acceptable" quality.

### FILL A NICHE

To remain a player today, the cutting edge multi-room facility should consider becoming a "Mothership" to its clients, and fill a particular niche in our diverse marketplace to service, service, service those clients. As I look around at this industrywide shakedown, I see several methods by which to accomplish this new form of survival and success.

- Size: One studio complex I know of has 12 rooms available, with an awesome collection of equipment and low prices. You might call it the one-stop supermarket approach.

- Specialization: One hot studio with three rooms does only records for superstars. Another facility does only audio for video with two recording rooms and four hard disk editing rooms.

These are examples that indicate a key factor: a change in marketing philosophy and the crying need for more sophisticated niche marketing and purchasing analysis. There will be fewer, better run and well-equipped multi-room studios that will be the magnet to service the growing number of project studios, boutique visual sound operations, and other specialists who need a major audio complex to furnish them the services they either cannot afford or have no knowledge of how to provide.

The manufacturers have already responded to this new vision by providing us with an unheard of number of choices to make. As an example, there were more than 50 hard disk editing systems at the last AES Convention. In the latest buying guide from a major trade publication, there were 24 manufacturers of recording consoles listed, each with a full line of model choices. Those manufacturers that are planning to continue to service the middle echelon must understand the changes taking place throughout the audio industry.

There are now simpler, less expensive ways to accomplish the same tasks with comparable end results. Digital is in, and suddenly many masters are being presented for CD mastering or layback in DAT. The result? Less need for reel-to-reel 2-track digital in many studios. You can edit in a Mothership location if it is necessary.

The pressure in the console market is

really on. Why spend a half million on a traditional battleship console when there are new cost-effective and streamlined alternatives? I'm not saying the new smart consoles are better or equal, but I am saying that they will do the job in a manner in which the end user will be hard pressed to determine the difference between the more expensive and the mid-range consoles.

### THE EQUIPMENT QUESTION

The question facing facility owners, producers and artists is: How to buy a major piece of equipment for the minimum amount necessary to get the job properly done? And, if that well-considered compromise is not good enough for your client, you must develop a relationship with a Mothership studio, which can provide you with the more expensive equipment necessary to give you the bells and whistles your client demands.

Of course, there will be differences in hourly rates between the sensibly and more expensively equipped studios. Isn't it time to learn that if you don't need it to keep your clients, and/or you cannot justify that it will pay for itself by providing additional revenue to your studio, then you no longer can afford to buy it?

The smart studio operators of the 1990s will be those who recognize the difference between style and success. What is important is that you provide your client with a finished product that you are proud of and, at the same time, doing your best to maximize the bottom line of your financial statement. This means you can no longer afford to keep up with those Joneses who have to be the first on the block with the newest toy. Let someone else prove how it will pay for itself.

The end of one era is only the beginning of a new, more exciting, more demanding one. We must accept the problems of the middle echelon and the opportunities for the Motherships and the satellites of today's recording studio industry. This will always be a business with risks — it goes with the territory and its creative opportunities and chances for entrepreneurial gain. But, these risks can be minimized by affiliating with an organization like SPARS, which reflects the changing profile of the industry through networking, education, seminars, conferences and friendship.

If you don't bet, you can't win. Today's smart bet demands an accurate assessment of the odds and a new determination at the gaming tables of your future. ■

Chris Stone is the former president of SPARS, the founder of the Record Plant and president of Filmsonix, Los Angeles.



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## Building a Better (Digital) Mousetrap

By Rick Schwartz

### WHAT'S THE PROBLEM?

**R**eal-world tests have shown not only that tapeless production is cost-effective compared to traditional analog techniques, but that it's also potentially faster (in the hands of an experienced operator).

Some of you are probably thinking that if digital audio workstations are really so great, why doesn't every studio own one? Good question. I'm sure some manufacturers are asking themselves the same thing. Others are probably asking themselves what it will take to make this new technology so irresistible that everyone will make the switch.

There are many reasons why workstations haven't yet achieved the same market penetration as 2-track analog recorders. Most of them have been widely discussed: Things like the lack of a universal interchangeable storage media and steep learning curves. Let's not forget that digital technology is still relatively young. Analog methods have been proven for many years. Digital is still evolving at a rapid pace. As products continue to mature, users will find it harder to resist the temptation. We've given thought to some of the things that we see as potential areas of development, items which have not been widely discussed.

### ONE SIZE FITS ALL

Workstations have made very limited penetration into industries like film because not all users are willing to change the way they work to learn a new system, even if the new system has certain advantages. Although some software designers would like to believe that all audio engineers have the same needs, engineers come in many different varieties: music mixers, audio-for-video people, sound designers, film sound editors, mastering engineers and broadcasters. All speak a slightly different language and have unique needs.

If software companies can port their products over for French and Spanish

users, why can't they make their software speak post or film? In the future, expect to see more application-specific software like SoundDroid from LucasArts. By purchasing additional software, NED users working on film can greatly expand the functionality of their current hardware.

Another good example of a vertical market application is Master List from Digidesign, which is specifically targeted for CD pre-mastering. Because digital workstations are software-based, many of the changes could be cosmetic in nature. This could allow programmers to reuse much of the same code in different versions of the same program. The user interface is obviously a key issue for many users. Although software is capable of much of the user's visual needs, hardware is a very important and often overlooked part of the user interface.

### THE IDEAL INTERFACE

Many of the workstations on the market provide nothing more than a keyboard, monitor and a mouse, which are unsuitable for many audio applications like mixing. Audio engineers need multiple faders, user-defined knobs, jog wheels and good external metering to properly do their jobs. Users should not be expected to memorize special key commands in order to operate a system, or fudge with a sloppy mouse-driven scrub emulation.

Lexicon, AMS, AKG and Otari are good examples of companies that have thought seriously about their user interfaces, with excellent results. Good interface design can do wonders to improve productivity. On the other hand, instead of just emulating analog paradigms, why not go beyond the tape transport mentality to create new features not possible with traditional analog methods?

### A HELPING HAND

Computers don't get bored, which makes them ideal for performing repetitive tasks. Why not have the computer assist you with some of the busy work, so you can concentrate on more creative things. This area is virtually ignored by every workstation manufacturer.

For example, if you are a sound recordist, the computer could tag individual sounds so that you could later delete the space in between them to reclaim disk space. Because this auto-truncation process is totally non-destructive, even if the computer makes a wrong guess, you can still change it.

Computer algorithms also make it pos-

sible to include features like noise reduction, de-glitching and de-hissing. In addition, software is capable of precise level matching and can maximize gain to optimize the signal-to-noise ratio without clipping. The computer could even help an editor sync sounds to picture by sliding one sound against another until they phase, a la Digital Audio Research's Wordfit program. This could be an incredible time-saver.

### BACK TO SCHOOL

Workstation manufacturers need to think seriously about training and instruction. Few, if any, of the products on the market are what I would describe as easy-to-operate. If manufacturers can't make their products more intuitive, they need to think seriously about providing better training and support. Perhaps basic training could be included in the purchase price. After-hour phone support is another badly needed area. What about offering a hypertext program to assist in training and debugging?

### THE BIG SQUEEZE

If you ask most people what the biggest problem with digital audio workstations is, they will probably respond with one word: backup. The reason for this is the large amounts of data required to store high quality digital sound. Although 600Mbytes is an incredible amount of storage for spreadsheets and letters, it holds only about an hour of high quality stereo audio. What if you need to edit a documentary with 10 hours of audio?

Because hard disks seem to have reached a performance and storage plateau, we need to look elsewhere for solutions. Some think data compression is the answer. Data compression effectively doubles or triples the size of your hard disk and cuts load times in half. Data compression has come a long way from the early experiments in the 1970s and could be instrumental in solving storage and backup problems.

### MULTI-USER MAKES SENSE

One of the main reasons that the entry of digital workstations into film environments has been limited to specialized areas like sound design is because it takes many editors working simultaneously to cut all of the sounds that go into a feature film. The solution is simple — either the cost of workstations needs to decrease to the price of a Moviola, or multiple users

*Continued on page 72*

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



# We built our woofer and tweeter a better home.



## DMT AND TRANSDUCER HOUSINGS —

All Cabinets used in the new Tannoy Monitor Series represent considerably more thought and design than the average 'chipboard cabinet of the correct volume'.

Cabinets are constructed from a high density space-frame with rounded corners and edges, supporting MDF/high pressure twin laminated walls

Rounded corners and edges greatly inhibit sound reflections and diffractions from cabinet boundaries. These can be major sources of irregularities in the reproduced sound, particularly in terms of the perceived placement of instruments within the sound stage. For the high frequency unit to make an effective job of launching all the detail that it can generate into the listening space, it must be held rigidly in the cabinet throughout its operational frequencies.

This is the key to the Tannoy cabinets. If a 'rigid' cabinet

is used, the redundant energy from the rear of the bass unit and frame cause endless resonance problems within the cabinet. Differential Material Technology provides the answers by using a variety of different adhesives between the rear of the drive unit and brace, the cabinet walls and the brace and within the layers of the MDF laminate.

The lossy couplings effectively transmit and absorb energy in a frequency selective way. Put more simply, at low frequencies the drive unit sees the cabinet as a rigid structure and at higher frequencies as a resonance absorbing/damping structure.

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## Not your average woofer and tweeter.

Circle (14) on Repld Facts Card

By David Scheirman



*Photo 1. The center overhead speaker array included three of Apogee's 3x3 full-range enclosures, and three Apogee AE-5s, for down-thru coverage.*

# THE 1991 GRAMMY AWARDS

**Burns Audio and Apogee Sound's CORREQT guarantee success for the greatest music awards ceremony ever.**



*The main mixing position, showing Steve Kibbons (left), Leslie Ann Jones (center) and Patrick Baltzell (right), at Gamble consoles.*

**T**he 33rd Annual Grammy Awards Show was staged on Feb. 20 at New York's renowned Radio City Music Hall. The world-famous facility, declared a national landmark in 1979, has hosted this prestigious music industry event twice before. But never in history has the telecast (produced by Pierre Cossette Productions and aired live on CBS-TV) been seen by so many viewers: a record 60 different foreign country licensing agreements were arranged.

With such a wide-ranging audience, the National Academy of Recording Arts &

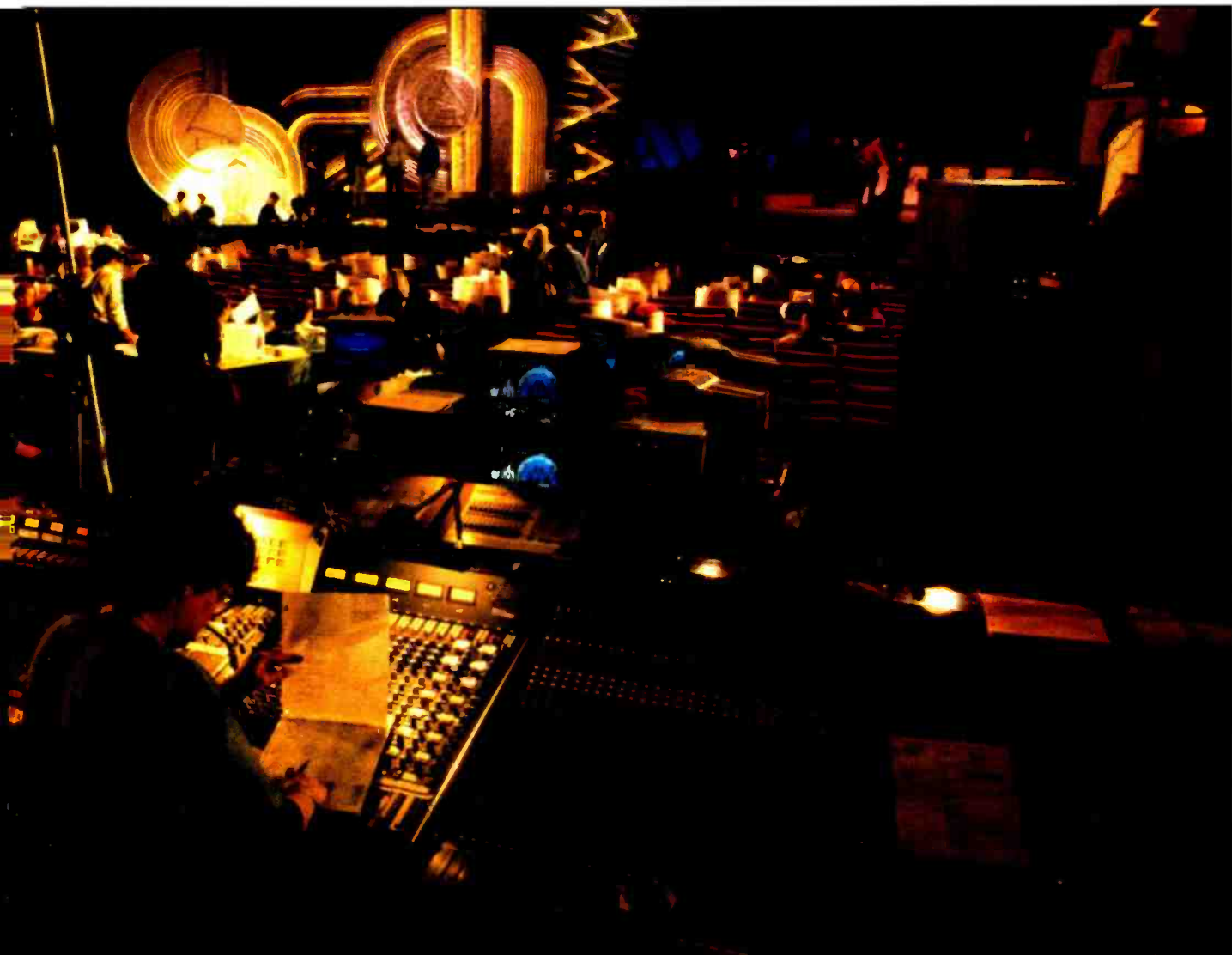
Sciences was intent on fully realizing its goal of having the best possible sound for this year's production.

"We of course are always extremely concerned about the broadcast of the event," says Murray Allen, chairman of the NARAS Technical Education Committee, who has taken a personal interest in improving the sound production of the Grammy Awards during the past few years.

"But, we have to remember that our audience is made up of recording artists, producers and industry executives. We want the live audience to experience the best possible sound for the show that we can give them."

The sound reinforcement contract for this year's Grammy Awards was let to

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



Burns Audio of Sun Valley, CA.

"We've had the pleasure of working on this event before," says owner Bruce Burns. "But this year, we've seen a real commitment to making the show the best ever." Burns Audio technicians Robert Brogden and Alan Henning, working under the direction of Patrick Baltzell, installed a custom system designed especially for the event.

#### SOUND SYSTEM DESIGN CONCEPTS

Upon doing a site survey and determining possible loudspeaker array locations, Burns Audio project manager Baltzell decided to incorporate a central overhead loudspeaker array in addition to the stage-level Apogee Sound 3x3 tri-amped, full-range enclosures used for the left and right speaker stacks. The overhead array would feature three 3x3s with three additional

Apogee Sound AE-5 speakers splayed underneath, the former enclosed by a unique sound-deadening structure to control the sound radiated toward the critical podium microphones. (See Photo 1.)

"We first used this array technique for the Kennedy Center Honors show in December 1990," says Baltzell. "It's based on measurements that I did in our shop, trying to come up with a way to prevent the podium mics from picking up reflected energy from the overhead speaker array.

"A central array gives you a really good point source, which can be good for system vocal intelligibility. However, it can also create problems for the podium mic sound, depending on its placement. Because the broadcast audio truck depends on the podium mic for important parts of the show, we have to be very careful about

how our temporary sound reinforcement system affects their efforts."

Baltzell used an IQS FFT spectrum analyzer to examine the effects of 4-inch Sonex sound-deadening panels on the triple-cabinet array's output. "We measured the room reflections that enter a typical podium mic with and without the Sonex treatment," he says. "There was a considerable difference. With the Sonex in place, I found that we had to notch out much less of the usual 200Hz, 300Hz and 400Hz low-mid frequencies to make the podium mic sound natural. We actually get a 10dB or 12dB advantage with the Sonex panels."

The Sonex was held in place by a specially constructed housing made of a composite building material. The resulting baffle was assembled onsite once the Apogee 3x3 enclosures were hooked up to a pair

of one-ton C/M Loadstar chain hoists. A trio of compact Apogee AE-5 enclosures, used for center downfill, completed the center array. Apogee's MARS (Modular Array Rigging System) supported the 3x3 enclosures. Unlike other rigging systems that use a heavy, rigid bar or frame, the MARS system gives each speaker enclosure its own integral clip-on frame.

The left and right side stacks each included four of Apogee's 3x3 full-range enclosures stacked and played in pairs on scaffolding sections. Each side of the stage also featured a subwoofer array consisting of four Apogee AE-12s, each of which housed a pair of fluid-cooled 18-inch drivers.

Compact AE-5s were placed on the deck and used as frontfill speakers. A ring of six unobtrusive AE-5s and smaller AE-1s made an arc that provided front-row coverage across Radio City Music Hall's broad proscenium stage.

The all-important podium microphone, used mainly by host Gary Shandling, was a hypercardioid Schoeps condenser unit. (See Photo 2.) For the show introduction, including the first dialogue heard by broadcast viewers, a Tram omnidirectional lavalier R.F. system was used, from a position directly beneath the central cluster.

At other times during the program, a pair of special hydraulic lifts raised two Schoeps microphones up to pre-set, adjustable heights to accommodate various presenters. For example, if two people of varying height stepped up to the microphones, the two mic stands could immediately be raised by a remote lift operator to match each presenter's height.

"This situation is where the Sonex panels really cleaned things up," says Baltzell. "Even though the lavalier and other presenter mics were right below the array, we got no complaints from the broadcast truck. There was no low-frequency 'boxiness,' the typical sound that you might expect in this situation. I'm pleased with how this idea has solved a specific problem that plagues most system users."

To provide high-quality, present sound to audience members seated in Radio City Music Hall's multi-tiered balconies, a sophisticated and effective fill system com-

prising 15 of Apogee's AE-2 specialty wide-dispersion speaker systems was installed.

The AE-2 speaker system complement with associated rigging apparatus was supplied to Burns Audio through an arrangement with Pro-Mix, New Rochelle, NY. Each AE-2 offers an exceptionally wide horizontal coverage angle (165° as stated by the manufacturer), and comprises a pair of 8-inch high-power, long-excursion cone drivers with two 1-inch-throat high frequency horn/driver combinations. Within each enclosure, the drivers are played to provide the widest coverage pattern.



Photo 2. The podium, used by host Gary Shandling, featured a Schoeps hypercardioid microphone.

#### SOUND REINFORCEMENT MIXING

With the primary loudspeaker subsystems mapped out and in place, attention was paid to organizing the dialogue and music inputs, consoles and board operators into a coherent system that would enable the show to flow smoothly.

### *A diverse musical program, the Grammy Awards featured every style of music.*

A front-of-house mixing team headed by Steve Kibbons (Steve Kibbons & Associates, North Hollywood) divided up input chores. Working in close proximity to each

other, Kibbons, along with Leslie Ann Jones (an engineer for Capitol Records) and Patrick Baltzell of Burns Audio structured the console area so that each person was responsible for mixing specific aspects of the show.

Kibbons, who has worked on the Grammy Awards Show for 15 of the past 16 years, has seen the sound reinforcement aspects of the event improve dramatically.

"We're trying to give the viewer at home the best possible audio," he says. But the sound has to be right in the room first. If what we do with the live sound has a negative effect on the broadcast sound, it doesn't work for anybody. You can't have

the best-quality broadcast audio if the sound reinforcement is getting in the way. There is a tremendous amount of technical support on this show, and the entire audio team has put out a really dedicated effort to get things to sound as good as possible. NARAS has really gotten interested in featuring world-class audio."

Starting on the far right, Patrick Baltzell commanded a pair of Gamble EX-56 mixing consoles for music mixing, along with a total of nine Yamaha M-406 submixers. This gave a total of 166 inputs just for live music that were laid out during the various sound-

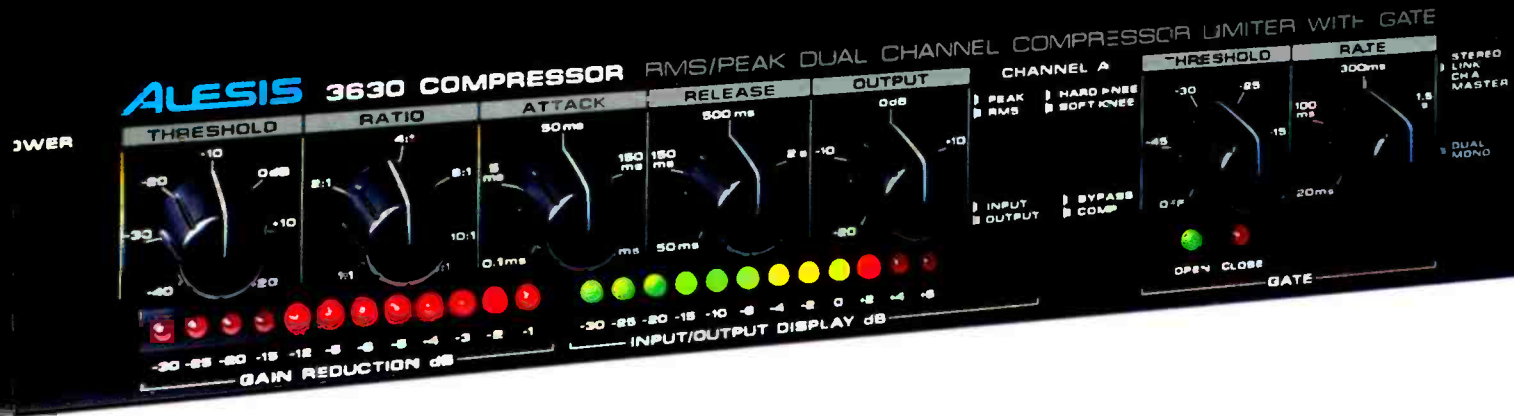
checks to enable music mix pre-sets for the different acts that would perform. Artists like Aerosmith, Bob Dylan and Mariah Carey did pre-production sound checks with a full band. Other entertainers worked with presentations featuring minimal inputs (Tracy Chapman, playing a grand piano) to Tony Bennett (accompanied by a full stage orchestra).

"I laid things out so that we could do a soundcheck a day or two early, and then have things ready to go for the show, even though the stage sets were changing every few minutes," says Baltzell. "For example, I took all trumpet, trombone and French horn inputs for Tony Bennett's orchestra and sub-mixed them through M-406 mixers to a single channel on one of the Gamble boards that was marked 'Bennett Brass.' The soundchecks were complicated, but that made the live show run as smoothly as possible."

In the center, Leslie Ann Jones handled

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all performance vocal microphones (including 16 different wireless microphone systems) on one half of a Ramsa WR-S840, which functioned as the primary sound reinforcement production console. All music mix outputs from the Gamble consoles, podium and lavalier mics, as well as taped music playback feeds from the production truck were inputted to the Ramsa.

### APOGEE'S CORREQT EQ PROCESS

High-profile special events like the Grammy Awards feature both live music and playback presentations to a very discriminating audience. In recent years,

has developed a method of acoustical analysis and system equalization that has been given the name CORREQT (Computer Optimized Room Resonant Equalization Technique) [see "Computerized EQ Systems" by Ken DeLoria, in the June 1990 issue—Ed.] DeLoria was present at Radio City Music Hall to implement Apogee's CORREQT EQ process for the Grammy Awards.

"Most of the major shows that are using our gear are starting to request CORREQT EQ," says DeLoria. "Whether it's a Broadway show, an important live music concert or an awards show like this one,

equalized separately. Ken has been able to optimize this complex system's performance in a relatively short amount of time."

Apogee's CORREQT EQ system combines three essential elements: a specific type of spectrum analyzer, narrow-band tuneable parametric equalizers for each output zone of the sound system, and a sophisticated digital switching router designed specifically for the CORREQT EQ system. "A sophisticated EQ system like this should function in a supportive role for the system operators and soundmixers, as opposed to trying to use the analyzer for a strict, rigid 'by the book' tool,"

explains DeLoria. "We have found that a very crucial part of making this type of technique work really well for live shows is to base our room observations on signals input from a high number of measurement microphone positions. It may take a dozen or more calibrated mics set in various parts of the room to give you the type of realistic data you need, so that EQ changes actually work for the better in the many different audience listening areas."

DeLoria used a Hewlett-Packard 3582A dual-channel FFT spectrum analyzer to identify room response non-linearities in the different sound system zones.

"What this means is that we can quickly identify room resonance modes, zeroing

in on the exact center frequencies, and then use high-resolution parametric EQ inserted into that signal path to effectively cancel out the acoustical environment's response irregularities as it is being energized by that portion of the sound system," DeLoria says.

Apogee's custom switching matrix router enabled the CORREQT system operator to select room analysis input from various microphone locations. A brand-new, prototype 35665-A dynamic signal processor FFT analyzer from H-P, with built-in floppy disk drive, was also linked into DeLoria's system. This was set up in tandem with the 3582A, as he did in-the-field evaluation of the new product, observing how it might be applicable to the measurement/equalization system already



*Photo 3. Ken DeLoria, president of Apogee Sound, was present at the event to implement the CORREQT room analysis and equalization system.*

sound reinforcement specialists have seen a need to custom-tailor a temporary sound system installation to the acoustical space in which it will be used. Requiring more than just careful loudspeaker placement, this usually will entail the delicate equalization of the various speaker systems so that optimum sound is created for each different zoned audience area throughout the room.

This requires the careful design of the system, with proper signal path controls available to the system operator. More importantly, it requires sophisticated analyzers and signal processing so that the room in question can be examined with the sound system in place, and adjustments made that can be documented.

Apogee Sound President Ken DeLoria

sound reinforcement operators want to be able to work with the greatest possible advantages for their major clients. A sophisticated room analysis and implementation of high-resolution equalization makes a big difference."

Steve Kibbons commented that DeLoria's efforts made an important difference in the sound of the Apogee system installed for the Grammy Awards. "What Ken is doing is working out great," he says. "It's a good feeling to have someone paying close attention to the various parts of the sound reinforcement system and how it is working out in different parts of the room. We have the main floor area, the far sides, the under-balcony zone, and the upper balconies. Each has its own dedicated speaker units, which can be

# In an age of disk and digital, why buy analog?

We know there are some applications where our 32-channel digital machine, the DTR-900, is the only answer. But if your business is such that you can do anything you want to do in the analog domain, and at the same time do less damage to your budget, then our brand new analog 24-channel MTR-100A may be the perfect machine for you.

When you consider that the MTR-100 will literally *change forever* the way engineers interface with audio machines, and



The MTR-100's auto-alignment saves you hours of time by eliminating constant tweaking and re-tweaking between sessions.

that this new way will save you hours spent in non-productive time, the analog choice begins to make even more sense. You see, the MTR-100 features full Auto-Alignment that allows total recalibration of the record and reproduce electronics. This means you can compensate for different tapes in a *fraction* of the time that it previously took, and your studio is not bogged down with constant tweaking and re-tweaking between sessions.

And if you think digital machines have a corner on high performance transports, think again! The MTR-100's new transport incorporates reel motors that approach one horsepower—you'll get fast wind speeds of up to 474 inches per second! Of course, the

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What's more, with its optional EC-103 chase synchronizer, the MTR-100 maintains frame-lock in forward and reverse from 0.2X to 2.5X play speed, and will typically park with zero frame error.

Then, there's the sound. New cylindrical-contour heads built by Otari especially for the MTR-100 result in remarkably low crosstalk and outstanding low-frequency performance. Pre-amps are located directly beneath the heads to further improve frequency response, and HX-Pro\* is built-in for enhanced high frequency headroom. (An optional internal noise reduction package houses Dolby\* SR/A.) Add all these features to gapless, seamless, punch-in, punch-out, which is also built-in, and your

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assembled. (See Photo 3.)

DeLoria advised that a typical CORREQI setup for a temporary system installation might employ as many as 50 or 60 filter points when all of the different loudspeaker zones are taken into consideration. For the Grammy Awards, a total of 17 Klark-Teknik DN-410 parametric equalizers was available for the 12 different loudspeaker zones in use.

"Some of these zones differ only in terms of their delay time, or their EQ requirements," says DeLoria. "The Ramsa console's eight matrix outputs are driving the different loudspeaker zones, with multi-output digital delay units (six Klark-Teknik DN-716s) giving us an even dozen zones to work with for equalization adjustments."

#### STAGE MONITOR SYSTEMS

Operated by independent engineers Mike Abbott and Kevin Wapner, a complex stage monitoring control system was hidden away from audience view behind theatrical draperies. (See Photo 4.)

"We've found that things work out well when there are pre-set inputs for each artist's set that will be a part of this show," says Abbott, who has handled stage monitors for the Grammy Awards for the past several years. "While it takes up a lot of real estate, you just can't chance using a single console and trying to re-set everything ... the show goes by too fast. There is no room for error."

***For the first time ever, the Grammy Awards were seen behind the Iron Curtain, in Poland, Hungary and Czechoslovakia.***

Burns Audio supplied a Ramsa WR-S840 40x18 mixing console as the primary monitor control board. Two more Ramsa desks and a smaller Soundcraft were

available as submixers, to allow pre-set channels that could be engaged at the flip of a switch on the main console. Crest amplifiers powered a multitude of high-powered stage monitors, including Apogee AE-3Ms and Electro-Voice DeltaMax wedges.

Smaller, compact stage monitors were available at the downstage edge to be

the Judds' and Garth Brooks' country laments to Aerosmith's Lennon-tribute rocker, "Come Together"). Program transitions were smooth, and audience response was positive. Throughout the course of the program, Ken DeLoria made repeated room response measurements and implemented subtle EQ adjustments.

"A few years ago, it would have been



Photo 4. Engineers Michael Abbott (seated, in dark sweater) and Kevin Wapner were responsible for the stage monitor system at the Grammy Awards Show.

used whenever monitor coverage was needed; other units were pre-positioned on risers for different live music acts, and rolled into position with the different stage sets.

#### SHOWTIME

This was no "one-nighter." An entire week was spent before show day loading in, setting up, adjusting and checking the sound reinforcement system with all artists who would appear on the program. Although the pre-telecast awards portion of the show meant that the sound crew had already been working for hours before to the broadcast program, the detailed pre-planning by Burns Audio and the careful crew selection process paid off. Not only was the televised audio production (handled by trucks from Green, Crowe & Co., Record Plant and Effanel Music) smooth, but the live sound sparkled.

A diverse musical program, the Grammy Awards featured every conceivable style of music (spanning the range from M.C. Hammer's rap-dance extravaganza to

pretty difficult to set up and work with this type of sophisticated system in a live format," says Bruce Burns. "The gear wasn't there yet, and neither was the budget. The different pro audio manufacturers like Ramsa, Crest and Apogee have really been giving us some good tools to work with. Apogee's modular enclosures and dedicated signal processing units let us spec out and then implement a special-event sound design that works as well during the show as it does on paper. And, our systems give us the ability to knock the socks off a live audience while not getting in the way of the broadcast needs.

"As live sound reinforcement has improved, so has the televised sound that the viewer is treated to. I'm really happy with the way things have turned out here, and proud that we could help participate in making this year's production the best it's ever been." ■



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By Mark Herman

# COHERENT TRANSFER

**Clair Bros.' proprietary new crossover/limiter design stretches the envelope of large sound system performance.**

**C**lair Bros. Audio Enterprises is well known for its distinct sound reinforcement achievements, such as the S-4 full-range loudspeakers, the Clair 32-channel folding mixing console and the T.C. Electronic/Clair TC6032 Remote Controller system, based on the TC1128 programmable equalizer. Never one to stand still, Clair has recently implemented its new Coherent Transfer System (CTS) analog drive rack into many of its large concert touring systems.

The CTS is a proprietary 37-pound, 3-rack space crossover/limiter system designed to complement the S-4 Series II 4-way loudspeakers. The first production CTS system debuted on Robert Plant's 1990 fall tour. CTS-equipped systems are currently on the road with Sting and Paul Simon.

The company's engineering department spent several years and a good deal of money designing the CTS. Project leader Greg Oshiro had responsibility for all of the filter sections, the input stage, the output stage, much of the circuit layout, mechanics, and most of the testing and quality assurance. Ron Borthwick, Clair chief engineer, mainly dealt with the limiters and helped with the overall scheme. Rick Lehman designed the power supply,



Each of the CTS units has three bands: high, mid and low. There is a size reduction advantage gained with the CTS system because Clair formerly used one unit this size that just drove three RM 160 limiters. Now the limiters are included internally with the CTS. Each CTS frame has seven modules: three crossover sections, three limiters and a power supply. Because the CTS is modular, it is possible to move modules around in the case of a failure. Every module is gain trimmed

so that one module can be replaced with another without the overall frame changing gain.

The CTS is designed specifically for Clair's S-4 Series II-F short throw and the S-4 Series II-P long throw cabinets. The two systems are configured differently and therefore require alternate filter shapes in the crossover. Clair carries four CTS controllers for each touring system: there are separate left and right units for both types of S-4 cabinets.

Oshiro says, "A loudspeaker system really starts at the input to the crossover. Because the loudspeakers aren't perfectly flat, they have magnitude and phase variations. We have accounted for those magnitude and phase variations in our own speaker systems and in designing the overall system.

"We had to invent some circuits for the CTS. The time delay circuit is interesting in that we managed to get close to 130dB

*The company's engineering department spent several years and a good deal of money designing the CTS.*

According to Clair, the CTS provides a dynamic range of more than 121dB and exceeds 130dB over most of the audio spectrum (the performance equivalent of a 22-bit digital system). With all limiting circuits engaged, the CTS has harmonic distortion specs of less than 0.003%, from 20Hz to 20kHz, measured from the device input to the transformer isolated output. System bandwidth is more than 100kHz.

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



## ROGER MASTERED DIGITAL TEN YEARS AGO, AND THE DD1000 OVERNIGHT.

Roger Nichols has been a premier proponent of digital recording since engineering his first digital master in 1981. Today, Roger's blessing on new digital technology is considered by many as the ultimate approval. That's why he extends his blessing sparingly.

It only took an evening for Roger to embrace the power and potential of the DD1000 magneto-optical digital mastering recorder. He discovered how quickly and easily the DD1000 constructs songs, combines sound effects with music, edits dialogue with total precision and syncs cues to video as easily as manipulating text in a word processor.

According to Roger, "The DD1000 combines all of the benefits of tape with the operational advantages of a hard drive. Its removable 5¼" optical disk holds an incredible 650Mb of digital audio information. You get instant random access to as much as 90 minutes of stereo audio with 3 sampling

rates, a noise-free dynamic range of 96dB and immeasurable wow and flutter."

Roger's word to the wise? "From music composition and recording to audio post, from film scoring to broadcast, the unmatched capabilities of Akai's DD1000 will play an important role in my digital future. And if you're as serious about the business as I am, you will audition it for yourself."

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of dynamic range. Other people's 16-bit digital or bucket brigade time delay circuits deliver 96dB at best. We were able to get much greater resolution in the analog domain. Any filter implementation can be better done in analog than digital; otherwise we would have gone digital. We came up with a set of electrical filters that, when combined with the magnitude and phase behavior of our loudspeakers, gives smooth superior performance.

"The most amazing thing about the CTS is probably the limiters. We have managed to improve the system distortion and noise specs somewhere in the range of 30dB. The old Clair crossover designed over 10 years ago was always very quiet and clean, so I think most of the improvement is due to the limiter."

### *The CTS's input stage is a true instrumentation amplifier.*

Oshiro commented more on the CTS's dynamic range. "Noise is sort of evenly spread out over the audio band, if you measure from that noise level at a particular frequency to the point where the circuit clips. The 130dB comes from a measurement taken at 5kHz; it is a convenient number and that is roughly where the ear is most sensitive. We take a  $1/3$ -octave wide bandwidth noise level measurement at 5kHz and then measure the clipping point of the circuit at 5kHz. The difference between those two is what I use as an indicator of dynamic range."

The CTS's input stage is a true instrumentation amplifier. Oshiro says, "We wanted a balanced input. After we managed to make the transformer isolated output stage achieve low distortion, we didn't want to put a transformer on the input because it would have wrecked our distortion performances." Oshiro put an instrumentation amplifier on the front end in order to achieve a CMR on the order of a good transformer. Expensive 0.01% metal foil resistors were put in the front end.

The outputs are transformer-isolated but have much less distortion than conventional transformer outputs. Clair Bros. preferred not to elaborate on the details. "We managed to arrange the circuitry so that it has 20dB less distortion than any other transformer we know of," says Oshiro. There is another set of amplifier outputs to drive meter feeds for cases where engineers like to use video monitors like the Audioscope. There is also a separate

set of buffered electronically balanced outputs that come off of the 9-pin connector on the back panel. They are fully capable of driving an audio line in case the main line amp were to go away.

A quick look at the CTS front panel shows an input gain switch with -10/-5/0/+5/+10 settings. Each of the three input crossover modules have a 31-position attenuator. Directly below the attenuator is a big, red mute switch. Each limiter module contains two 22-segment bar graphs for level and limiter gain reduction. Next to that is the threshold knob scaling from -11 to +11. The level meter is switchable between the input and the output of the limiter.

The power supply module has two large vents that take in air. "Because we are running some heavy duty class A circuitry in there, every square inch of front panel space we could spare is for the air vents. We pump a lot of air through there to make sure we don't go thermal," says Oshiro. According to Clair Bros., the power supply will stay in regulation down to about 70Vac input. There is a row of seven LEDs on the power supply module. Two on the left indicate if the frame is switched for the F or P S-4 cabinets. The remaining five LEDs are for the five different power supply voltages supplied.

To quote from Paul Simon's independent FOH engineer, David Morgan, currently on tour with the Clair CTS, "They have come up with a really marvelous product in the CTS. There is no audible distortion; I have never even heard the unit, and it has a tremendous amount of maximum input gain headroom.

"The step changes on the front panel are in  $1/2$ dB increments, and you can really hear minute changes on the CTS. It's working great, and I'm really happy with it; I haven't had any problems. Clair's 'problem' of combining 18s, 10s, 2-inch drivers and tweeters is solved. The frequency response gaps and the need for power compensation curves has certainly been addressed." ■

#### **INTERVIEW: RON BORTHWICK, CLAIR BROS. HEAD ENGINEER**

**R•E•P:** What are some of the audible differences between the new and old Clair drive system?

**RB:** The low end is the biggest thing that sticks out straight away, both before and during limiting. It is less colored. Even though the overall system only measures about 1dB different at the low end, it sounds a lot different than that — even with a small quantity of S-4s. The CTS has less rolloff and fewer

poles on the low end because of a minimized audio chain.

We took the approach of limiting the number of low frequency coupling capacitors in the chain. Even the output transformers are in a proprietary kind of feedback loop. They have been sort of flattened out and removed. There is cross coupling between ranges to try to keep things more in balance for the actual protection circuits.

Before the CTS, 4dB-6dB of limiting in any range sounded terrible. It always sounded limited and squashed, out of balance and wierd. Now we can get up to 20dB of limiting and it sounds a lot more natural and less artificial. In fact we are having to re-educate some of our engineers. Mixers are used to running into limiting, hearing it and knowing to stop. Now the guys sometimes find that they are into heavy limiting before they know it.

**R•E•P:** What are the designed-in advantages?

**RB:** The CTS is designed to minimize any thermal effects that cause drifting and any performance deviations. It is definitely more repeatable for a given setting — frame-to-frame — than anything we have ever done. The image shift stays right; so that when the guys go from tour A to tour B it is not something different. Our panel calibrations are all the same on our systems. By averaging tours and mixers we are trying to come up with settings so straight up is about right. This way any engineer could start the show at that setting and be close. To adjust the CTS just click around a little depending on what the line voltage is that day and how hot the air is, etc. The potentiometers are actually very accurate stepped attenuators so that you can repeat what you want to do.

**R•E•P:** Why did Clair Bros. choose analog rather than digital for the CTS?

**RB:** What people fail to realize with the current digital technology is that with the sampling rate and number of bits being what they are, you get a certain amount of nasties, in terms of phase response, from the anti-aliasing filter. It turns out that anti-aliasing filter has more phase errors than an analog delay line. So you are already off and run-

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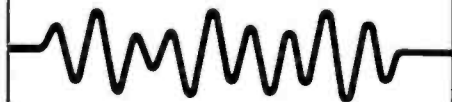
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# SPARS



ning with analog instead of digital. You need control of phase, time, frequency response, and some sort of protection and limiting type function to keep parts from going away unnecessarily.

The problem of achieving time delay in the analog domain is that it takes a lot of parts, and you get a certain amount of deviation from ideal phase shift. It is that way with everything. But the more sections you use, the better you can make it, and the more attention you must pay to distortion and noise. This extra circuitry gets real expensive. In one resistor, a certain amount of distortion could be negligible, but if 100 resistors are in a chain you had better pay attention to what is going on.

The analog and digital worlds aren't as different as you might think in terms of problems like aliasing. You know what over-shoot in the square wave looks like? It's ringing on the leading edge. You can actually get it on the trailing edge if you are not careful; which is similar to aliasing. You have to get rid of it the same way. Because we had to delay the lows and mids and not the high frequencies, there is a band-limiting helpfulness there too. That is what got us off and running in the analog domain.

The current digital technology just doesn't justify the expense. The sampling rate is not high enough, and there aren't enough bits to satisfy us. It could happen sometime in the future. It seems that the people who set the current digital standards did so because of finances. In the case of CDs, if you want 20kHz — theoretically, if everything is perfect — you need a 44kHz sampling rate. If it was 96kHz-100kHz and 32 bits then you'd be getting somewhere, but it is not at that level now.

**R•E•P:** How much did part selection play in the CTS project?

**RB:** We had to pay real big quantities of attention to circuit design, circuit topology and passive parts. Passive parts are the dominating factor in distortion and noise. Resistors and capacitors — not just types, but their sources — are very important. It is generally known that some parts are better than others, but beyond that they are not all created equal. You also have to narrow it down to sources. You have to apply the right dielectric in the

right spot, plus make sure that you buy it from the right source, because all polypropylene and foil capacitors are not equal. All  $\frac{1}{4}W$  metal film resistors are not equal either. Ten years ago most problems were associated with solid state components, but nowadays look at the resistor.

**R•E•P:** What is special about the limiter?

**RB:** The limiter was the biggest area of nasties that was indentifiable. A typical limiter in no gain reduction is 0.1% THD if you're lucky. That's pretty nasty stuff; it has intermod components and the such. One of the requirements from the road engineers out there was that they wanted it, before limiting, to be as much like a line amp as possible; they didn't want to be able to hear the limiters when they weren't in effect before limiting. Before limiting it is only the VCA that stops it from working right. A lot of the nasties that come out during limiting are not understood by a lot of people. We were able to achieve 0.002% mid-band THD and 0.003% at the extremes with everything engaged and going. It's not that other people aren't doing good things in the VCA world, but they are doing it for a price to mass market and broad application, by definition. For us the price restraints were removed, and it was a very targeted thing. It didn't need to do gain makeup, for example. Because of the nature of our business we were able to target it better and narrow the field.

**R•E•P:** What were some of the limitations you had to deal with when designing the CTS?

**RB:** There was definitely some size consideration, but mainly it was designed for what it needs to do for a living. One of the beauties of the CTS project is that we were not building it for a profit. It is an integral part of the total sound system design. Money was not a factor. A lot of times when making an engineering decision it is: what fits, what can you get, what is reliable, how does it perform and how much does it cost? Well in this case, remove how much does it cost.

It is science that we were allowed to do right; it is not black magic. The TEF machine was definitely involved. ■

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# AMPING UP:

## Figuring Power Requirements

By Pat Quilter

Whenever power amplifiers are installed in a large sound system, the system designer or operator inevitably runs into two basic questions:

- How much ac service is required?
- How much cooling will be needed?

The problem is, there is no exact answer to these questions, because power amplifiers are variable-consumption devices whose needs depend on the audio level. However, we can provide a table of typical values for the normal range of audio loads.



### DETERMINING POWER CONSUMPTION

Table 1 shows ac current consumption in amperes, at 120Vac, per 1,000 installed watts, at several output levels for six different types of amplifiers.

To use Table 1, first determine *total installed watts*. This is the easy part. Determine the rated power of each amplifier channel at its actual load impedance and add up the combined total.

**Example:** Four stereo amps are installed, each rated at 200W, 8Ω or 300W, 4Ω per channel. Four of the eight channels are loaded at 8Ω for a total of 800W (200×4=800W). The other four channels are loaded at 4Ω for a total of 1,200W (300×4=1,200W). The total installed watts is 800+1,200=2,000W.

Next, determine the *average audio power*. This step is trickier because the signal level can vary. However, the important thing is to estimate the maximum foreseeable power for a period of some seconds,

### Here's a quick method for determining the ac current consumption and cooling requirements of power amplifiers.

because ac wiring and breakers are designed to carry short overloads. Use the following guidelines:

- The "full power" column in Table 1 is shown only for reference purposes, unless the system is to be used for emergency siren or similar full-power purposes. This column can be used to determine the momentary peak ac power, to see if there will be such problems as lamps dimming at peak output.
- The "1/3-power" column should represent the worst-case load for a speech or music system. This column shows the amount of current used when the amps

are driven into audible clipping. This value could be considered for systems exposed to very hard service, where distortion is tolerated.

- The "1/8-power" column represents *normal service* as determined by North American and European safety standards (UL, CSA and IEC). This column also corresponds to the maximum average power you can obtain in a high-quality system in which some attempt is made to minimize clipping. This should match the ac current rating shown on the back of the amplifier, when

loaded at the minimum impedance shown at the speaker terminals or jacks (although some manufacturers show a higher ac rating for extra safety margin). Older amplifiers may show the 1/3-power ac current because UL and CSA tested at 1/3-power until 1989.

- The "idle" column shows the minimum current at idle, which is normally much less than the 1/8- or 1/3-power currents. This column is of interest for emergency backup power because it shows the minimum power required to keep the amps on for a specified period of time.

The next step is to determine the amplifier type. Power amplifiers are available in a range of efficiencies. Therefore, we need to determine the efficiency class of the amplifiers installed. If you cannot determine the type of amplifier from the description below, contact the manufacturer.

- *Class A or vacuum tube outputs.* This classification is not shown in Table 1 because Class A circuits are extremely inefficient and, therefore, are impractical for

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Amplifier type	Full-power	1/3-power	1/8-power	Idle
Linear	17.5	11	7.5	2
2-step linear	16	8.5	4.3	1.5
3-step linear	15.5	7.5	3.6	1
3-step magnetic field	21	11	5.9	0.75
4-step magnetic field	20	10	4.5	0.6
Class D	15	6.6	3.6	1.5
Theoretical limit	8.33	2.77	1.04	0.0

**Caution:** These values are based on actual measurements of representative amplifiers. Amplifiers using the same technology may vary by 10% or more because of design differences. Check actual units or check with the specific manufacturer for current information before using this table.

Table 1. Amplifier current consumption per 1,000 installed watts.

large jobs. No pro-audio amplifier company supplies amps using this technology. The same applies to vacuum tube amplifiers.

- **Linear.** This is the familiar Class AB or Class B type, the basis for most solid-state designs. These amplifiers have conventional ac power transformers. (A switching supply will reduce weight, but does not normally reduce the ac consumption, and therefore represent the same efficiency.) Output stages may be quasi-complementary or fully complementary, half-bridge or full-bridge; all have comparable

efficiency. Cooling requirements and ac current are relatively high at 1/3- and 1/8-power.

- **2-step linear.** This technique is used by several manufacturers to improve the efficiency of linear amplifiers, especially at the "typical" power levels of one-third and one-eighth. These designs are also known as Class G or Class H. The results are reduced ac current and cooling requirements for a given amount of power.

- **3-step linear.** This technique takes the same principle one step further (to coin a phrase) and further reduces ac current

and cooling requirements, especially at 1/8-power.

- **3-step magnetic field.** A proprietary light-weight power supply is coupled to a 3-step output circuit. Cooling requirements are reduced, especially at 1/8-power. The design of the power supply may cause ac current requirements to exceed those for a similar-size linear-design unit. The losses at 1/3- and full-power indicate that the amplifier may experience heating problems if used for severe service requirements without proper attention to cooling needs.

- **4-step magnetic field.** An even lighter power supply is coupled to a 4-step design. Cooling requirements and ac current are both somewhat reduced.

- **Class D.** This type has long been touted as the "technology of the future" and is, indeed, capable of very high efficiencies. Table 1 shows the performance of a good available design. Cooling requirements are dramatically reduced at 1/3-power, but relatively high idle losses prevent much progress at 1/8-power. Also, ac current consumption is not much better than the 3-step linear designs because the power supply has a similar ac power factor.

- **Theoretical limit.** This shows the limit of performance for a perfect amplifier.



which has 100% efficiency (no heat loss) and a perfect ac power factor (perfect conversion of ac energy in the power supply). This is listed only to indicate how much progress is still possible.

Once you know the amplifier type, you can read across that row until you reach the appropriate "average power" column and note the ac current per 1,000W. We multiply this value by the total installed watts divided by 1,000 to find the actual ac power.

**Example:** You determine that the four amplifiers noted before are ordinary linear types and are installed for playback use, where the signal level will be controlled by the peak level from the playback source. Therefore, the  $\frac{1}{8}$ -power column is appropriate. We see that ac power shown per 1,000W is 7.5A. We multiply by a factor of 2 (2,000 divided by 1,000) to arrive at a total requirement of 15A.

If these amps were to be used in a rock touring system or possibly a disco club, the  $\frac{1}{3}$ -power column might be a safer choice, yielding an ac current of  $11A \times 2 = 22A$ .

All of these numbers represent a minimum value, and you are still faced with the problem of distributing individual ac branch circuits to each amplifier or group of amplifiers. The total installed power can be determined for each amplifier group

Amplifier type	Full-power	$\frac{1}{3}$ -power	$\frac{1}{8}$ -power	Idle
Linear	700	750	600	80
2-step linear	550	450	250	60
3-step linear	500	375	200	60
3-step magnetic field	1,000	550	250	45
4-step magnetic field	500	475	185	40
Class D	425	210	180	65
Theoretical limit	0	0	0	0

Table 2. Amplifier cooling requirements per 1,000 installed watts.

to establish the appropriate number of amplifiers for each power branch circuit.

Almost all amps have a momentary in-rush current that is much higher than the normal current draw shown in the table. If all of the amps are turned on simultaneously, the ac breakers will probably trip even though they meet the requirements listed in Table 1. Unfortunately, amplifier in-rush currents and ac breaker sensitivity to surges vary over a wide range. Unless the amplifiers are individually or sequentially turned on, the ac current shown under the " $\frac{1}{3}$ -power" column will probably be the minimum requirement.

Table 2 shows watts of waste heat per 1,000 installed watts at several typical output levels for six different types of am-

plifiers.

The first step is to determine the total installed watts, the average audio power and the amplifier type as you did for Table 1. Read the watts of heat loss under the appropriate "average power" column. The conversion factor for converting watts to BTU per hour is  $1W = 3.413$  BTU per hour.

**Example:** Read across from the amplifier type to the "average audio power" column, just as you did in Table 1. At  $\frac{1}{8}$ -power, linear amps dissipate 600W per 1,000W total installed power. The same four amplifiers will, therefore, produce 1,200W of heat and will require 4.095 BTU per hour of cooling. ■



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## Tools Of The Trade

By David Scheirman

All audio professionals have their own ideas about what belongs in a personal toolkit.

For some, it may be just a few hand tools and a trusty pair of stereo headphones in a canvas gym bag. For others, it may be a complete 400-pound Snap-On mechanic's toolbox with eight drawers, shock-mounted and housed in an Anvil-type flight case, complete with Makita power tools, oscilloscope, drill press and "the works." Some folks even approach things with only a pair of white gloves and a Haliburton briefcase (containing a magazine or two and maybe an address book). It's safe to say, however, that you won't always have exactly what you need to do your job unless you take personal responsibility for some of the simple, basic tools needed to practice your craft on a daily basis.

In large part, what you carry with you will depend on your job function for a particular project. If you are a crew member who loads trucks and lays out ac cable, your needs are different from the person who operates a console. If your project includes reel-to-reel decks or tape carts, you'll do something different each day, compared with a system repair tech in charge of changing out compression drivers and climbing into bass bins. Not everyone needs specialty items like rigging belts, MIDI cable testers and Allen wrenches. But there are some basic tools that can make your job as an audio technician/soundmixer go more smoothly, and enable you to work faster and with more confidence.

### SYSTEM INPUT

Nothing is more frustrating than standing around waiting for your buddy to say "test, 1, 2!" into a microphone just because you need to check an input channel on your console. Having a simple, beat-up old dynamic mic with a switch is a good idea. Something not too expensive that you would miss it ... and something with an on/off switch for using as a stage talkback device if need be. Engrave your name on it; and use whenever you need a mic. Don't rely on the sound company stage

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

mic inventory to solve your own line test problems.

For constant, reliable system input, use a tone generator. This can be something simple like Shure's A15TG, which puts out a 1kHz tone, is hardly 5-inches long and looks like an oversized XLR connector with a tiny mercury battery inside. There is also the popular pocket-sized TT-15 from Fostex, a device that has selectable frequencies (40Hz, 400Hz, 1kHz, 10kHz and 15kHz), and three different switchable output levels, driven by a 9V battery.

### MINI TEST GEAR

The most basic piece of test gear will be your electrical meter. Depending on your needs, you may be able to get by with an inexpensive, plastic-cased meter like the one from Micronta (about \$15) that measures about 2"×3", yet gives fairly reliable resistance and voltage readings. Another compact device is made by Beckman Instruments ... The Circuitmate DM73 uses two tiny calculator-type batteries and has both a built-in test probe and a useful continuity beep tester.

For more critical applications, particularly if you are responsible for monitoring high-voltage ac levels, use a rugged, digital multimeter from Simpson, Fluke or another reliable manufacturer.

A handy device for measuring both system output and for checking audio frequencies is the TS-1 from Loftech. This lightweight unit incorporates a sine wave generator and a digital frequency counter in a single box; 1/4-inch connectors allow for input and output hookup, and the unit requires ac power. The tone generator is sweepable from 20Hz-20kHz, while the digital meter gives a reading of the exact frequency of the tone being generated. The counter also reads input signals, in either frequency or decibel level.

If you need a compact oscilloscope, the market is full of small, precise units from a variety of manufacturers. Perhaps the handiest 15MHz device available is made by NLS (Non Linear Systems). Hardly larger than a paperback book (only 3-inches high!), this mini-scope is battery-powered and features a tiny screen, yet it's easy to read in low-light situations. It's good for most on-tour situations where a scope might be needed for quick trouble-checks (such as for high frequency oscillations) and calibrations (such as crossover output frequencies).

### LINE MONITORING

Few things are more frustrating than

wondering what's coming down a line. Whether line level or mic level, it's often important to verify what signal is present. During troubleshooting, the isolation of potentially bad cables may require separate line monitoring devices that are not a part of the audio system in use.

An indispensable tool is the FP12 headphone bridging amplifier from Shure Bros. Its applications include headphone feeds, audio line troubleshooting and musical instrument checking. It can even be used as an instant listen-only intercom or as an emergency direct box. It is equipped with a mic/line switch, and a headphone level control. The unit is 9V battery-powered.

A simpler listening device can be made with an old, sturdy telephone handset. Install the proper value of resistor, depending on what voltage level you will be exposing the device to, and add clip-on test leads to the coil cord. You now have a quick, cheap, sturdy line monitoring device.

A compact, more complex device is Shure's FP31 field production mixer. Powered by three 9V batteries, this small, handy mixer has three XLR inputs and can be carried in the palm of your hand. Its three discrete inputs are ideal for checking crossover outputs quickly.

An indispensable device for testing the cables and connectors is a Cable Tester such as the CT-1A, manufactured by Sescom. This little blue box tests both 1/4-inch and XLR connectors, and gives an LED readout showing continuity and pin configuration. Because most sound system problems are actually caused by cables and connectors, this is one of your first lines of defense against the gremlins.

### HEADPHONES

What's a sound mixer without headphones? Everyone has different tastes, but Sony seems to have cornered the market on this one. Find a set that has a resistance level able to give you plenty of volume from typical console and tape player outputs, yet is not so sensitive as to risk blow-out from high level input. Watch out for impedances which are too low, as they'll load the device output down.

Many working professional music mixers carry two pairs, a high-fidelity set for show mixing that is pampered and protected in its leather case, and an old standby utility set for line checks, etc. My personal favorites are a like-new pair of Sony MDR-V6s (the Studio Monitor version), and a 15-year old set of Sony DR-6Ms, which have metal cans and real leather pads, and

are still working after all these years of line checks.

Ideally, what you have available for on-the-job work will also do double-duty with your own personal music system for use in listening to live mix tapes from day to day.

#### MEDIA SYSTEMS

It's very beneficial to record your mixing efforts for personal use only, and then be your own worst critic. If cassette tapes are the medium that you have access to, use the highest-quality recording/playback deck that you can find. Once again, Sony has some products that are hard to beat.

The TC-D5M deck features Dolby noise reduction, and has metal tape capability. Easy to read level meters with a built-in light and battery status monitor are important features. The newer, professional version of the TC-D5M features XLR connectors at the input so that standard mic cables can connect the deck directly to console bus outputs. These decks use D-cell batteries, which last for several hours, but be sure to carry an ac adaptor anyway.

For high-quality, archival recordings, select DAT as your medium of choice. The Panasonic SV-255 portable DAT recorder features XLR inputs, and offers performance comparable to many more expensive, rack-mounted units. Sony's TCD-D10 comes with nicad batteries and a hand-held controller. DAT is replacing cassette tape as the personal recording medium to use for professional work whenever the budget allows.

It's often handy to have a small mic system for input to your deck, if you want to tape the room sound rather than the console output. Sony's small ECM-939LT electret condenser stereo mic works well with the above deck, but more sophisticated microphones can also be used.

There are a variety of portable, battery powered compact disc players manufactured by companies like Sony, Toshiba and Aiwa. One of these and a selection of favorite compact discs will give you pre-show playback music and off-duty entertainment.

#### HAND TOOLS

Even if you are not responsible for overall sound system maintenance and repair, it's good to have your own basic hand tools available. This need not mean a heavy metal toolbox; small straight blade and Phillips screwdrivers, an adjustable wrench, a soldering iron and a few hex

keys for rack-mount screws will fit into a small, zippered pouch such as is provided by microphone manufacturers. Select your own needed items, and keep track of them. They will be a true time-saver.

If space permits, expand your hand tool selection to include nut drivers, channel-lock and vise-grip pliers, a rubber mallet, and various other specialty items that may be required from time to time as you work with road cases, electronics racks, mixing consoles, power amps and loudspeaker enclosures. The Jensen Tools catalog is famous for its broad selection of tools, with different selections available in a variety of road-worthy carrying cases.

#### MISCELLANEOUS AMENITIES

Although some major tour sound system suppliers send a road package out with everything, including the kitchen sink, it's good to always think about what expendable supplies you may need to do your job effectively.

Marking tape to label your console? 3M supplies an excellent non-stick tape in many different colors that is used by draftsmen and graphic artists. Your sound company may supply things like tape, marking pens and such, but pity the soundmixer who is caught at a festival with 38 bands to do and only a mangy half-roll of masking tape left in the bottom of the drawer.

Pay close attention to your stock of batteries for your various on-tour devices; it's wise to buy several when you buy a replacement. Some specialized batteries can be hard to find at the local shopping mall when you are in a hurry, so don't get caught without spares.

Another important item that is often overlooked is paper goods. What sort of format will help you keep track of your show cue changes, mic charts and other information? Whether index cards, spiral notebooks or pre-printed forms, make sure that you leave for a project supplied with whatever you need to keep track of your own information flow.

Next time you have some off days between audio projects, take stock of your own personal road kit. Do you have what you need in the way of simple tools, test devices and other items to do the best job possible? Whether you do or not can mean the difference between a done job, and a job well done. ■

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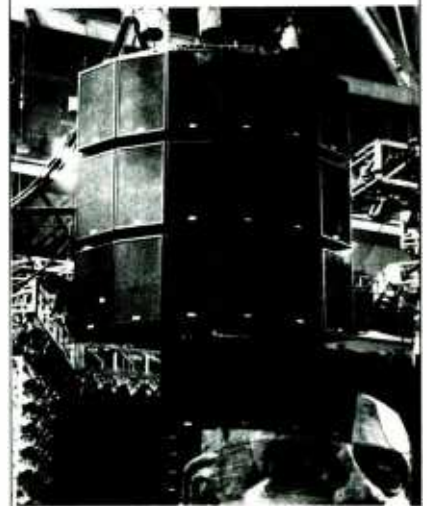
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Circle (23) on Rapid Facts Card

# Roadwork

By Mark Herman

**Business As Usual:** The concert touring market was rather bleak throughout the winter and early spring. In fact, it was so slow that many of us were wondering if the entire sound reinforcement year was doomed because of the recession and war. However, things changed right about the third week of March. Most of the leading sound reinforcement companies reported the phones started ringing that week. It's as though all of the lawyers, accountants, promoters and agents finished their winter vacations and decided that because the war was over and the recession was leveling off, maybe it was time to make some money. Touring is finally on the upswing, corporate shows are down a little and no one seems to be buying much equipment. However, the worst appears to be over. In fact, many smaller companies report be-

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

ing only slightly affected by the recent slowdown.

Chicago's **dB Sound** (Des Plaines, IL) has been getting its share of the touring market. M.C. Hammer was out touring with a 72 cabinet MT-4 main system (see this month's All Access) ... George Thorogood began the first of his three separate 8-week tour legs in late March ... AC/DC played Europe with 72 MT-4s powered by Crest 8001 amplifiers. Another U.S. tour leg began in April, and the group is scheduled to tour throughout the entire year. Engineers are Robbie McGrath (FOH) and Paul Owen (monitor). Crew chief is Scott Pike. Consoles are a Ramsa stage WR-S840 and a TAC SR9000 42-channel FOH with a 20-channel extender. Monitors are E-V DML wedges with E-V MT-2 sidefills. The main system is flown with dB's new Super Grid rigging system.

Both the Chicago and Orlando offices of

**On Stage Audio** continue to be quite busy with large corporate shows and special events. OSA handled the sound for the corporate party tents and the outdoor Towne Square stage at this year's Super Bowl. Corporate giant IBM contracted OSA to supply a large system for a 3-month run in Miami and Palm Desert, CA. The winter season in central Florida was full of corporate one-offs. Shows with Prudential, Northern Telecom, IBM and Baxter kept OSA running through the normally slow winter season.

U.K./European Tour Update: **SSE Hire Ltd.** (Birmingham, U.K.): AC/DC (U.K./Europe), March-April; Big Dish (U.K.), Feb-March; Iggy Pop (Europe), March; Little Angels (Europe), March; Megadeath (U.K./Europe), March-April. **Tasco** (Camarillo, CA/London): Poison (U.S.), Feb-June; Nelson (U.S.), Feb-March; Judas Priest (U.K./Europe), Jan-April. **Concert Sound** (Watford, Herts): Eric Clapton

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The high frequency rolloff of a *Jensen Transformer* is optimized, by computer analysis, to fit the *Bessel Low Pass Filter* response. This means *minimum overshoot and ringing* and *flat group delay* for best *time alignment* of all spectral components of the musical waveform.

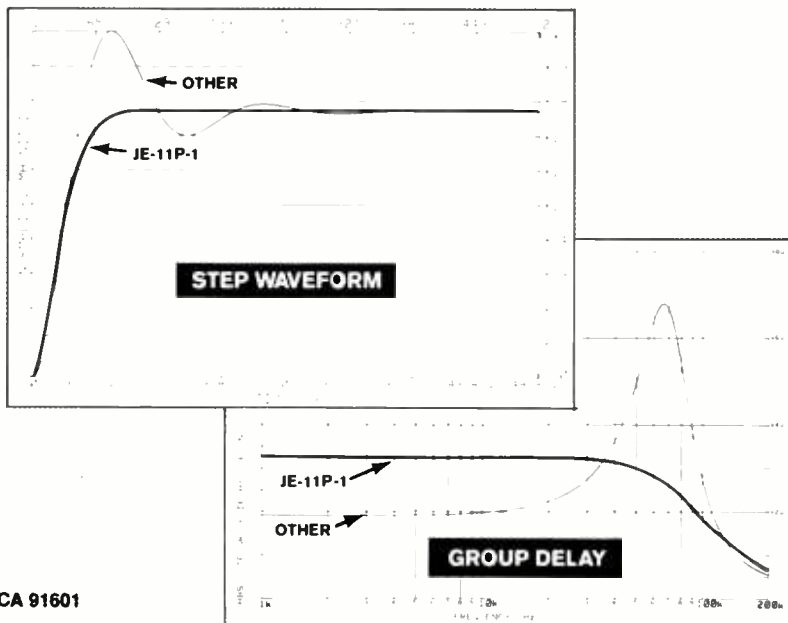
In other words, the harmonics arrive at the same time as the fundamental frequency.

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**jensen transformers**  
INCORPORATED

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(world) Feb.-March; Tom Jones (U.K.), March-April. **Encore Entertainments Ltd.** (London): Jesus Jones (U.K.), Feb.-March. Also, Encore bought the new Midas XL3 high-end mixing console and opened a Martin F2 main system stocked facility in Glasgow, Scotland. **Audiolease** (London): Motorhead (U.K.), April. **Palaco**: Saxon (U.K.), March. **MHA Audio** (Hagerstown, MD/Maidstone, Kent): Gary Numan (U.K.), March. **Canegreen Ltd.** (London): Deep Purple (U.K./Europe), March. Nigel Kennedy (Europe), Feb.-March; Freddie Jackson (U.K.), March. **Britannia Row Productions** (London): David Lee Roth (Europe), Feb.-April, the LAs (U.K./Europe), Feb.-April. Gloria Estefan (U.K./Europe), March-June.

Canadian SR company **Jason Sound Industries** (North Vancouver, British Columbia) is having a busy spring. Says owner Jeff Lilly, "Business was excellent this winter. Our best month all last year was in


November and it has remained good ever since." JSI has a 10K theater-size system out with Canadian Juno Award winner the Northern Pikes (see this month's All Access). Another system toured Southern California in January and is covering the rest of the U.S. in April-May with a theater/large club system for Gino Vannelli. JSI is scheduled to tour Canada with the Nitty Gritty Dirt Band in May. Recent equipment purchases include a Yamaha PM3000 FOH console and the new White 4700 programmable equalizer.

**Ram Sound** (Mary Esther, FL) is now located in northwest Florida after moving from Tuscaloosa, AL in fall 1989. Ram started in 1973 and continues to work the Southeast with its novel Klipsch KP 600 Series P.A. system. Owner Bob McTyeire reports that Ram has been very busy doing a variety of block dates and one-offs, along with a considerable amount of theater, symphony and corporate work. The

company used to tour in the past but has largely abandoned long hauls. "About 80% of our work is repeat business with regular clients," McTyeire says. "It looks like we won't be touring much anymore because we're working hard to build up more steady, permanent work. We're doing the same show, in the same place, at the same time every year. The last time I toured we made good money, but in the process we lost two good clients of six years, which we were unable to cover."


Ram Sound has one main 20-box FOH system for coverage up to a maximum 10,000 people. Loudspeakers consist of the lightweight, high-power Klipsch KP 600 Series enclosures, composed of composite construction KP 650 high and low-mid boxes and KP 680 subwoofers. McTyeire cited the superior wear and tear resistance as well as the sonic performance of the KP 600 Series: "They've held up extremely

*Continued on page 72*



# Chameleon

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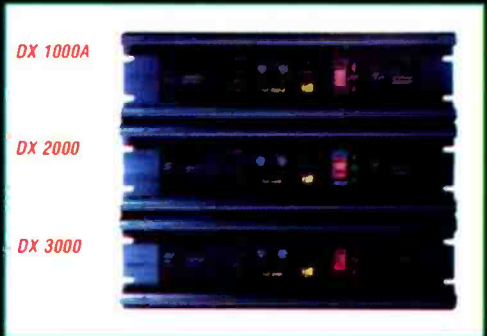
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TOTAL PROGRAM POWER* (RMS 10ms/100ms):	8: dual channel	1200W
	4: dual channel	2000W
	8: bridge mono	2000W
SINEWAVE POWER PER CHANNEL (RMS):	8: single channel	500W
	4: single channel	800W
	8: both chs. driven	400W
	4: both chs. driven	600W

DX 1000A

DX 2000

DX 3000



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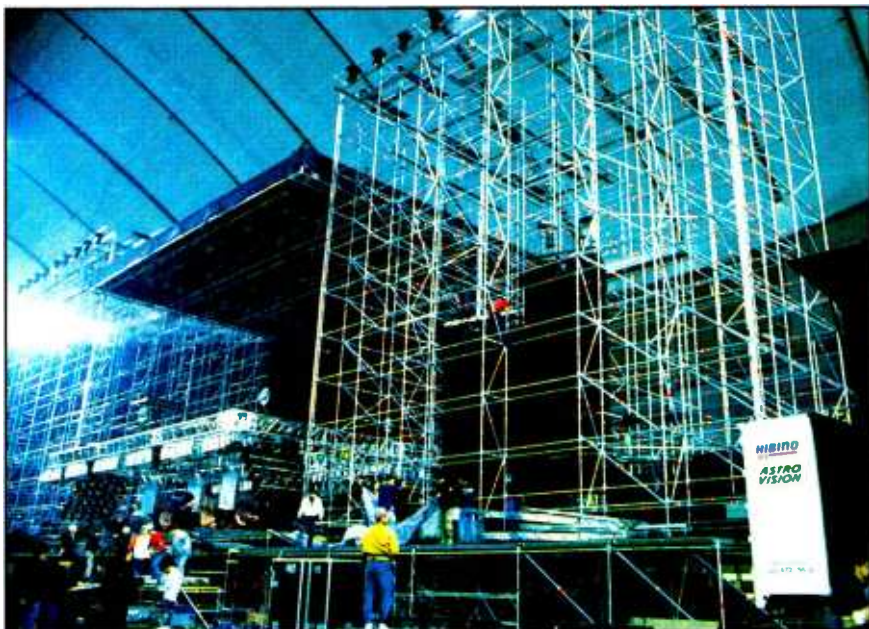
# All Access

By Mark Herman

DB SOUND, DES PLAINES, IL

Headline Act:  
**M.C. Hammer**

Dates: May 1990—1991  
Region: World Tour



## PERSONNEL

**House Mixer:** Tim Colvard (band engineer)  
**Monitor Mixer:** Trey Klien (band engineer)  
**Crew Chief:** Harry Witz  
**System Engineer:** Jim Iturietta  
**Technician:** Bill Kurtz

## CONSOLES

**House:** (2) Yamaha PM3000 40-channel (with dB patchbay)  
**Monitor:** Ramsa WR-S840 40×18, Midas Pro 4 36×10

## AMPLIFIERS

**Main FOH:** Crest 8001  
**Lows/Subs:** Crest 8001  
**Monitors:** Crown MA1200, MA2400, PSA-2  
**Sidefills:** Crest 7001

## FOH MAIN CABINETS

**Manufacturer/Model:** (36) Electro-Voice MT-4

## FOH LOW END CABINETS

**Manufacturer/Model:** (36) Electro-Voice MT-4L

## ONSTAGE MONITOR WEDGES

**Manufacturer/Model:** (22) Electro-Voice FS212 and CPM 1130  
**Crossover:** Electro-Voice FSEQ

## HOUSE SIGNAL PROCESSING

**Equalizers:** Klark-Teknik DN300  
**Crossover:** Electro-Voice MTX-4 (modified)  
**Gates:** dbx 904  
**Compressor/Limiters:** dbx 903  
**Effects:** Lexicon PCM 70, Super Prime Time, SPT97 and LXP-1; Yamaha REV-7 and SPX-90

## Intercom System:

ClearCom MS200

**DAT Machine:** Panasonic SV-3500

**Cassette Deck:** Yamaha

**Headphones:** Sony V6

## ONSTAGE SIDEFILLS

**Manufacturer/Model:** (6) Electro-Voice DeltaMax DML-1152  
**Crossover:** Electro-Voice DeltaMax DMC

## ONSTAGE SIGNAL PROCESSING

**Equalizers:** Klark-Teknik DN360  
**Effects:** (2) Yamaha SPX-90 II  
**Gates:** dbx 904  
**Compressor/Limiters:** dbx 903  
**Solo/Cue monitor:** (2) E-V FS212

## MICROPHONES:

**Vocals (wireless):** Samson Standard Broadcast Series  
**Vocals:** Shure Beta 58  
**Guitar:** DI  
**Bass:** DI  
**Keyboards:** DI  
**Direct Boxes:** Countryman, Director, BSS

## CABLING

**House snake:** 50-pair Belden  
**Multi-pair Connectors:** Coaxicon  
**Stageboxes:** dB Custom  
**Splitter:** 3-way with transformers

JASON SOUND INDUSTRIES LTD.,  
NORTH VANCOUVER, BRITISH COLUMBIA

Headline Act:  
**The Northern Pikes**

**Support Act:** The Leslie Spit Treeo

Dates: Feb. 15—May 6  
Region: Canada/Northeast U.S.

## PERSONNEL

**House Mixer:** Dean Roney (band engineer)



**Monitor Mixer:** Dean Friesen (band engineer)  
**Support House Mixer:** Glen Collett  
**System Engineer:** Glen Collett  
**Rigger:** Tracey Ploss

**Bass:** DI  
**Keyboards:** DI  
**Direct Boxes:** Countryman FET85

**Multi-pair Connectors:** AMP QL  
**Splitter:** Jensen Transformer 52-channel, 3-way ■

**CABLING**

**House snake:** Blake 52-pair, 275-feet

**CONSOLES**

**House:** Yamaha PM3000  
**Monitor:** Soundcraft 800B

**AMPLIFIERS**

**Main FOH:** Carver PM1200, Monobloc  
**Monitors:** Carver PM1.5A

**FOH MAIN CABINETS**

**Manufacturer/Model:** (6) JSI J63 (4 × JBL 2202H, 3 × JBL 2445J/2380, 4 × JBL 2402/05), (6) JSI J62 (2 × JBL 2240H)

**FOH SUBWOOFER CABINETS**

**Manufacturer/Model:** (6) JSI J61 (2 × JBL 2240H)

**ONSTAGE MONITOR WEDGES**

**Manufacturer/Model:** (12) JSI J-17  
**Crossovers:** BSS FDS320, Carver PM-CX4

**ONSTAGE SIDEFILLS**

**Manufacturer/Model:** JSI J-14  
**Crossovers:** Carver PM-CX4

**HOUSE SIGNAL PROCESSING**

**Equalizers:** White 4700 Programmable, Klark-Teknik DN300  
**Crossover:** BSS MCS200 (5-way)  
**Compressor/Limiters:** BSS DPR402, dbx 166  
**Effects:** Lexicon LXP-1, Yamaha REV-7 & DL1500  
**Intercom System:** ClearCom  
**CD Player:** dbx DX-5  
**Cassette Machine:** Technics

**ONSTAGE SIGNAL PROCESSING**

**Equalizers:** Klark-Teknik DN300  
**Effects:** Yamaha SPX-90  
**Gates:** BSS DPR 504

**MICROPHONES:**


**Main Vocals:** Shure Beta 58  
**Background Vocals:** Shure Beta 58  
**Kick:** Electro-Voice RE20  
**Rack/Floor Toms:** Sennheiser 409  
**Overheads:** AKG C460  
**High Hat:** AKG C460  
**Guitar:** Shure SM57

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

# When is 4 greater than 9?

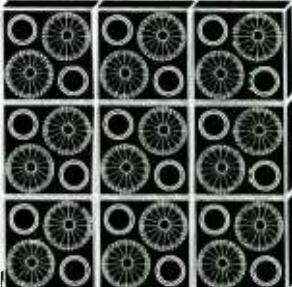
Four ServoDrive Bass Tech 7 Servomotor-Driven, Horn-Loaded Subwoofers

Required Power: 1600 Watts



Nine High-Quality Dual-Driver Vented-Box Subwoofers

Required Power: 5400 Watts



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Power Cooling system. Plus, you'll get flatter response, more low end and the lowest harmonic distortion of any professional subwoofer on the market.

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# DAT IN THE REAL WORLD

By Ron Streicher

**F**rom Part One: SCMS dictates that a tape be encoded — at the time of production — with one of three copy protection status codes: "Copy Free" (status "00"), "No further digital copies allowed" (status "10"), or "One more digital copy allowed" (status "11"). This encoding is buried deep within the digital information recorded on the tape, specifically sub-code ID6 (byte 0, bits 6 and 7) of the Channel Status Block, and affects direct digital copying between recorders using the IEC (or S/PDIF) digital interface (see Part One in the April issue).

## THE PROFESSIONAL APPROACH

Panasonic's professional audio products division recently introduced the model SV-3700, an excellent new DAT machine. It has an improved 1-bit 64× oversampling analog-to-digital converter and an 8× oversampling digital-to-analog output converter. The sound quality and functional facilities of this unit boast a significant improvement over its previous model, the 3500.

The analog inputs and outputs are the professional XLR-type (+4dBu, with the outputs also switchable to -10dBu), and the 3700 also provides for both AES/EBU and IEC-958 "consumer" digital interfaces. Clearly, this recorder is intended to work equally well in a wide variety of studio applications — interfacing with both professional as well as semi-professional equipment.

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

Analyzing the methods and techniques of SCMS copy code protection in the land of pro audio, and who's doing what....



*The Panasonic SV-3700 was the reference machine to test other DAT players and their treatment of the SCMS scheme.*

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

What the owner's manual doesn't tell you is that the switch intended for selection of AES/EBU or IEC-958 digital interface (SW-1, a mini-DIP switch located on the rear of the machine) selects not only the format, but also the input/output connectors (XLR-type or phono-type respectively) to which the machine will respond. Thus, if you wish to use the SV-3700 in the

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

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

However, another fact the operations manual does not tell you is much more significant. This same SW-1 status switch also affects the SCMS status on recordings made via the analog inputs. The SCMS sta-

The image shows the interior of a grand, ornate theater. The ceiling is high and features a large, circular mural surrounded by decorative moldings and a grid of recessed lighting. Two large, multi-tiered chandeliers hang from the ceiling, casting a warm, golden glow. The stage is visible in the foreground, with a red curtain backdrop. The audience seating is arranged in a semi-circle, with red seats and metal railings. The overall atmosphere is one of classic elegance and grandeur.

**Being Community Minded Is A Sound Idea  
In Cincinnati, London, Houston, Milwaukee,  
Detroit, Taipei...**

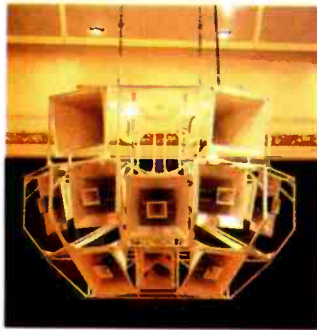
# Community Has The Perfect Sound System

## M4

The M4 Midrange Compression Loudspeaker goes to bat in the big leagues. When 100,000 screaming fans pay hard cash for a major rock concert, or a big league baseball game, they want to hear it live, with crystal clear dynamics, full clarity, and solid volume. That's called getting your money's worth. And nothing delivers like the M4 Midrange Loudspeaker from Community.

This loudspeaker system offers low distortion, precision directivity control, high sound pressure levels, weather-proof durability, even coverage, remarkable dynamic range, and no

crossover in the critical range where the ear is sensitive. Best of all, the M4 System offers substantial cost savings at reduced power requirements. M4's are on the job everywhere from the U.S. Navy, which uses them for non-radio communications with offshore ships, to grand concert halls which require high intelligibility in highly reverberant spaces.



Above & Cover: Cincinnati Music Hall's single cluster array of M4 CoAx™ Jevices as installed by Charles Baxley of Midwest Communications Corp.



Left: The Houston Astrodome was state-of-the-art when it opened in 1965, and thanks to a recent revamping with a Community M4 system, it's out in front again.

## RS220

The RS Series is a hit wherever it horn loading of the RS 220. Community achieves a level of sensitivity and directivity that is unmatched by direct radiator systems. Engineers around the world find that the RS Series just plain outperforms the most complex systems, every single time. The RS Series offers a seamless transition to the next element.

The equal signal path lengths of the components in a Wavefront Coherent™ design allows a more synchronous signal arrival at the ear of the listener versus the unequal signal path lengths apparent in other loudspeaker designs.



Above: Milwaukee's Bradley Center where Community's M4 is the driving force behind a 3-way sound system that delivers "front row center" to every seat in the house.



# For Any Job, AnyWhere, AnySize, AnyTime.

## RS 880

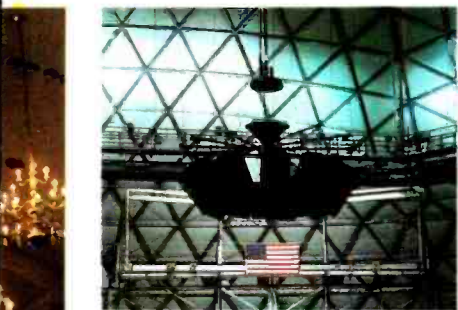
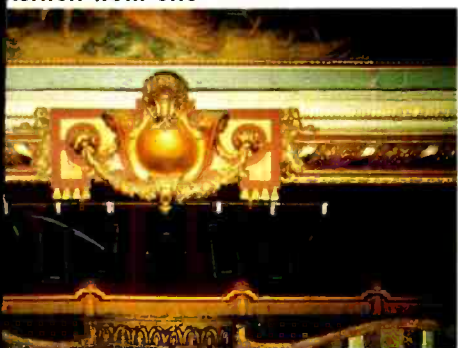
performs. The full  
or RS 880 from  
of uniform high  
simply can't be  
ns. Sound design  
that Community



Above: RS 220 VBS 210 MicroArray™ as installed by Advanced Production Services for Tucson's City Council Auditorium.

expensive, more

transition from one



Top: The grandeur of London's famous Alhambra Theater is enhanced with Community RS 220 sound dispersion accuracy controlling longpath echos by directing sound to the audience, not the walls.

Above: From rock concerts to graduations the Bell County Expo and Convention Center in Belton, Texas is finding the cluster mounted Community RS 880 delivers.

Left: The singing at the First Baptist Church in West Monroe, Louisiana is jubilant, and thanks to Community's RS 220, everybody knows it.

## CSX · CSV

Ready to get down? The CSX · CSV Lines from Community will take you there. Hot nightclubs...road show reinforcement...churches...DJ's...public speaking...when it comes to sonic accuracy, uniform wide angle dispersion, low distortion, and vocal clarity, engineers know where to go. The Community CSX/CSV Lines deliver sound so big and so true, you'll not only hear a great difference, you'll feel it.



The CSX Line offers eight ways

to go, from the compact CSX 25, to the full range CSX 70. Each is built for rough handling, and the wear and tear of the road. Out front is a heavy duty mesh grille, fabricated from 16 gauge expanded steel and anchored in place with a rugged aluminum extrusion. Not only are they rattle-free, they're practically "bullet proof". With steel corner protectors and durable black carpeted exteriors, these enclosures are almost indestructible. And because we know what you'll be facing out there, Community builds these systems with high current, quick disconnects in the crossover, and PowerSense™ fuseless circuitry for instantaneous over current and thermal protection, with ferro-fluid cooled low and mid frequency drivers (except the CSX 25 and CSX 28M).

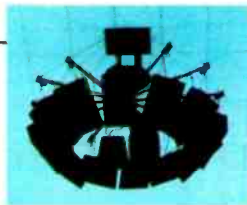
The CSV Line offers the same compact high quality sound for permanent installation. And with its oak grained Formica cabinetry, it looks every bit as sharp as it sounds.

Above: In Taiwan's Lai-in River disco, 1200 people gather nightly to move with 100 dB from 40 Hz to 20 kHz of music from the Community CSX loudspeaker system. Close your eyes and listen hard...you can almost hear it from here.

Below: Joe Louis, the legendary heavyweight, stands ready in the lobby of Detroit's famous Cobo Conference / Exhibition Center. And now, the new sound system based on Community's CSX 35 loudspeakers delivers with the same kind of on-target clarity and knockout precision.



# Community



# What Are Your Sound Requirements?

M4	RS	CSX • CSV									
<p>A midrange compression loudspeaker designed specifically for faithful high power sound reproduction in the midrange decade. The heart of the system is Community's M4 Midrange Compression driver. Community Pattern Control horns feature rigid, balsa reinforced, hand laminated fiberglass construction, and either exponential or hyper-exponential flare rates. With the appropriate choice of horns the M4 driver can be loaded for full power operation down to 200 Hz for incredibly high fidelity output at full power.</p> <p><b>M4 MIDRANGE COMPRESSION LOUDSPEAKER</b>  <b>Frequency Range:</b> 200 Hz to 2000 Hz  <b>Output:</b> Extremely high power (100 acoustic watts)  <b>AES Power Capacity:</b> 200 Watts Continuous 500 Watts Program  <b>Approximate Size:</b> 9 3/4" x 9 3/4" x 13"  <b>Weight:</b> 41 lbs., 18.7 kg.</p> <p><b>M4 PATTERN CONTROL HORNS</b>            Low distortion, high power pattern control horns that remain stable over a wide frequency range (250</p> <p>Hz to 4 kHz)  <b>Model PC1594M:</b> 90 degrees x 40 degrees  <b>Model PC1564M:</b> 60 degrees x 40 degrees  <b>Model PC1542M:</b> 40 degrees x 20 degrees  <b>Size:</b> 28 1/2" x 28 1/2" x 35" except for PC1542M which is 28 1/2" x 28 1/2" x 49 1/4"</p> <p><b>ADDITIONAL M4 PRODUCTS</b>  <b>SH2064M and SH1894M Compact Array Horns:</b> Designed to be used with the M4 loudspeaker, these horns produce high fidelity sound and the ability to load the M4 down to as low as 270 Hz.</p> <p><b>New M4CoAx™:</b> Great new product for professional contractors. M4CoAx™ allows for the coaxial mounting of any PC400 Series high frequency horn in a PC1500 Series horn with an M4 Loudspeaker to improve polar response, adjacent horn performance, and signal alignment.</p> <p><b>Model PCMX</b>            Horn mouth extension for loading PC1500 Series horns to 200 Hz  <b>Size:</b> 44" x 44" x 7"</p>	<p>The RS Series is an electronically controlled Wavefront Coherent™ system that provides excellent power handling capacity with true high fidelity reproduction.</p> <p><b>RS220 WITH 220 SYSTEM CONTROLLER:</b>  <b>Frequency Range:</b> 100 Hz to 18 kHz ± 3 dB  <b>Power Capacity:</b> 200 Watts Continuous 500 Watts Program  <b>Sensitivity:</b> 105 dB SPL 1W/1M  <b>System Impedance:</b> 8 ohms  <b>Cabinet Size:</b> 26 3/4" x 14 1/4" x 14 1/4"  <b>Cabinet Weight:</b> 60 lbs., 27.1 kg.  <b>Controller Size:</b> One Unit EIA 19" rack  <b>Controller Weight:</b> 7 lbs., 2.9 kg.</p> <p><b>RS880 WITH 880 SYSTEM CONTROLLER:</b>  <b>Frequency Range:</b> 45 Hz to 18 kHz ± 3 dB  <b>Power Capacity:</b> 400 Watts Continuous 1000 Watts Program  <b>Sensitivity:</b> 107.5 dB SPL 1W/1M  <b>System Impedance:</b> 8 ohms  <b>Cabinet Size:</b> 49 1/2" x 30" x 22 1/2"  <b>Cabinet Weight:</b> 210 lbs., 95 kg.  <b>Controller Size:</b> One Unit EIA 19" rack  <b>Controller Weight:</b> 7 lbs., 2.9 kg.</p>	<p>Unparalleled sonic accuracy, low distortion and high power capacity are the hallmarks of this new line of compact loudspeaker enclosures. CSX and CSV (oak Formica veneer) are the perfect value choice for concerts, nightclubs, churches and public speaking engagements. Flying hardware is available for most models.</p> <table border="0"> <tr> <td data-bbox="793 709 993 966"> <p><b>THREE WAY SYSTEMS</b>  <b>CSX70</b>  <b>Frequency Response:</b> 45 Hz to 18 kHz  <b>Power Capacity:</b> 600 Watts (RMS) 1500 Watts Program  <b>Impedance:</b> 4 ohms  <b>Dimensions:</b> 26 3/4" x 33 1/2" x 18"  <b>Weight:</b> 135 lbs., 61.3 kg.</p> </td> <td data-bbox="1016 709 1216 966"> <p><b>TWO WAY SYSTEMS</b>  <b>CSX35</b>  <b>Frequency Response:</b> 60 Hz to 18 kHz  <b>Power Capacity:</b> 150 Watts (RMS) 375 Watts Program  <b>Impedance:</b> 8 ohms  <b>Dimensions:</b> 23 3/4" x 17 1/4" x 13 1/2"  <b>Weight:</b> 43 lbs., 19.5 kg.</p> </td> <td data-bbox="1255 709 1439 966"> <p><b>CSX60B</b>  <b>Frequency Response:</b> 35 Hz to 800 Hz  <b>Power Capacity:</b> 600 Watts (RMS) 1500 Watts Program  <b>Impedance:</b> 4 ohms  <b>Dimensions:</b> 33 1/2" x 33 1/2" x 22"  <b>Weight:</b> 150 lbs., 68.0 kg.</p> </td> </tr> <tr> <td data-bbox="793 976 993 1207"> <p><b>CSX57</b>  <b>Frequency Response:</b> 40 Hz to 18 kHz  <b>Power Capacity:</b> 300 Watts (RMS) 750 Watts Program  <b>Impedance:</b> 4 ohms  <b>Dimensions:</b> 33 1/2" x 26 3/4" x 18"  <b>Weight:</b> 110 lbs., 49.9 kg.</p> </td> <td data-bbox="1016 976 1216 1207"> <p><b>CSX25</b>  <b>Frequency Response:</b> 70 Hz to 18 kHz  <b>Power Capacity:</b> 100 Watts (RMS) 250 Watts Program  <b>Impedance:</b> 8 ohms  <b>Dimensions:</b> 18 1/4" x 15" x 13 1/2"  <b>Weight:</b> 32 lbs., 14.5 kg.</p> </td> <td data-bbox="1255 976 1439 1207"> <p><b>FLOOR MONITORS</b>  <b>CSX28M</b>  <b>Frequency Response:</b> 70 Hz to 18 kHz  <b>Power Capacity:</b> 100 Watts (RMS) 250 Watts Program  <b>Impedance:</b> 8 ohms  <b>Dimensions:</b> 14" x 15" x 22 1/4"  <b>Weight:</b> 29 lbs., 13.2 kg.</p> </td> </tr> <tr> <td data-bbox="793 1218 993 1459"> <p><b>CSX52</b>  <b>Frequency Response:</b> 40 Hz to 20 kHz  <b>Power Capacity:</b> 200 Watts (RMS) 500 Watts Program  <b>Impedance:</b> 8 ohms  <b>Dimensions:</b> 33 1/2" x 18" x 18"  <b>Weight:</b> 82 lbs., 37.2 kg.</p> </td> <td data-bbox="1016 1218 1216 1459"> <p><b>BASS SYSTEMS</b>  <b>CSX50B</b>  <b>Frequency Response:</b> 35 Hz to 500 Hz  <b>Power Capacity:</b> 200 Watts (RMS) 500 Watts Program  <b>Impedance:</b> 8 ohms  <b>Dimensions:</b> 33 1/2" x 26 3/4" x 18"  <b>Weight:</b> 100 lbs., 45.4 kg.</p> </td> <td data-bbox="1255 1218 1439 1459"> <p><b>CSX38M</b>  <b>Frequency Response:</b> 60 Hz to 18 kHz  <b>Power Capacity:</b> 150 Watts (RMS) 375 Watts Program  <b>Impedance:</b> 8 ohms  <b>Dimensions:</b> 17 1/2" x 17 1/2" x 25"  <b>Weight:</b> 41 lbs., 18.6 kg.</p> </td> </tr> </table> <p>CSX products can be ordered in an oak Formica finish for the following: CSV28M, CSV25, CSV35, CSV38M, and CSV52</p>	<p><b>THREE WAY SYSTEMS</b>  <b>CSX70</b>  <b>Frequency Response:</b> 45 Hz to 18 kHz  <b>Power Capacity:</b> 600 Watts (RMS) 1500 Watts Program  <b>Impedance:</b> 4 ohms  <b>Dimensions:</b> 26 3/4" x 33 1/2" x 18"  <b>Weight:</b> 135 lbs., 61.3 kg.</p>	<p><b>TWO WAY SYSTEMS</b>  <b>CSX35</b>  <b>Frequency Response:</b> 60 Hz to 18 kHz  <b>Power Capacity:</b> 150 Watts (RMS) 375 Watts Program  <b>Impedance:</b> 8 ohms  <b>Dimensions:</b> 23 3/4" x 17 1/4" x 13 1/2"  <b>Weight:</b> 43 lbs., 19.5 kg.</p>	<p><b>CSX60B</b>  <b>Frequency Response:</b> 35 Hz to 800 Hz  <b>Power Capacity:</b> 600 Watts (RMS) 1500 Watts Program  <b>Impedance:</b> 4 ohms  <b>Dimensions:</b> 33 1/2" x 33 1/2" x 22"  <b>Weight:</b> 150 lbs., 68.0 kg.</p>	<p><b>CSX57</b>  <b>Frequency Response:</b> 40 Hz to 18 kHz  <b>Power Capacity:</b> 300 Watts (RMS) 750 Watts Program  <b>Impedance:</b> 4 ohms  <b>Dimensions:</b> 33 1/2" x 26 3/4" x 18"  <b>Weight:</b> 110 lbs., 49.9 kg.</p>	<p><b>CSX25</b>  <b>Frequency Response:</b> 70 Hz to 18 kHz  <b>Power Capacity:</b> 100 Watts (RMS) 250 Watts Program  <b>Impedance:</b> 8 ohms  <b>Dimensions:</b> 18 1/4" x 15" x 13 1/2"  <b>Weight:</b> 32 lbs., 14.5 kg.</p>	<p><b>FLOOR MONITORS</b>  <b>CSX28M</b>  <b>Frequency Response:</b> 70 Hz to 18 kHz  <b>Power Capacity:</b> 100 Watts (RMS) 250 Watts Program  <b>Impedance:</b> 8 ohms  <b>Dimensions:</b> 14" x 15" x 22 1/4"  <b>Weight:</b> 29 lbs., 13.2 kg.</p>	<p><b>CSX52</b>  <b>Frequency Response:</b> 40 Hz to 20 kHz  <b>Power Capacity:</b> 200 Watts (RMS) 500 Watts Program  <b>Impedance:</b> 8 ohms  <b>Dimensions:</b> 33 1/2" x 18" x 18"  <b>Weight:</b> 82 lbs., 37.2 kg.</p>	<p><b>BASS SYSTEMS</b>  <b>CSX50B</b>  <b>Frequency Response:</b> 35 Hz to 500 Hz  <b>Power Capacity:</b> 200 Watts (RMS) 500 Watts Program  <b>Impedance:</b> 8 ohms  <b>Dimensions:</b> 33 1/2" x 26 3/4" x 18"  <b>Weight:</b> 100 lbs., 45.4 kg.</p>	<p><b>CSX38M</b>  <b>Frequency Response:</b> 60 Hz to 18 kHz  <b>Power Capacity:</b> 150 Watts (RMS) 375 Watts Program  <b>Impedance:</b> 8 ohms  <b>Dimensions:</b> 17 1/2" x 17 1/2" x 25"  <b>Weight:</b> 41 lbs., 18.6 kg.</p>
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tus switches (SW-2 and SW-3) operate only when SW-1 is set in the AES/EBU position. Thus, even if SW-2 and SW-3 are set for "copy free" operation "00," if SW-1 is set for IEC-958 digital format mode, the recorder reverts to a default status. Any recording made via the analog inputs will be made with a "One copy allowed" "11" status — whether you want it that way or not!

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

Knowing this about the SV-3700, it is worth conducting a survey of several other current DAT recorders to determine what they do — or don't do — with regard to SCMS. The survey was made by playing a specially prepared test tape, containing six tracks: three recorded at a 48kHz sampling rate with "00," "10," and "11" status codes and three recorded at a 44.1kHz sampling rate with the same status codes. This test tape was copied via the digital interfaces of each of the recorders tested. The copy tape was then read (by the Panasonic 3700) to determine the new status codes.

To begin, I tested the Panasonic SV-3700 itself, as this was my "reference standard" for all other tests.

#### PANASONIC SV-3700

Via the AES/EBU interface, the program material on all tracks was copied. Initially, as expected, no start IDs or program numbers were transferred; once the Auto ID mode was switched on, new start IDs were recorded, apparently triggered by the first sound on the program track. As is known by anyone who has ever used the Auto ID mode on any DAT recorder, this is not a viable procedure, because it frequently results in start IDs also being written within program material when a loud passage follows a quiet one.

These start IDs could then be numbered using the Renumber function. All SCMS status codes were recorded "00." This means that this mode of transfer could be used to "strip" the SCMS codes from a protected tape for further copying.

Via the IEC interface, all tracks were copied as well; SCMS status codes were also copied, without changing. With the Auto ID switched on, the start IDs and program number were transferred exactly as they had been on the original test tape, triggered by the ID mark on the original tape. With the Auto mode off, these IDs were not transferred.

It seems rather ironic that this machine, in its "consumer" mode, is capable of making a "perfect clone" of all of the data on the source tape, despite the SCMS, while in its "professional" mode, because of the limitations inherent in the AES/EBU standard, it is unable to do so.

As mentioned above, the status of a recording made via the analog inputs depends on the settings of the mini-DIP switches on the rear of the recorder. When in the AES mode, any SCMS code may be written, while when in the "consumer" mode, only the "11" status code can be written.

#### TASCAM DA-30

Via the AES/EBU interface, this unit copied the program material on all tracks without difficulty. As expected, no start

IDs or program numbers were recorded unless the Auto ID was on — with the aforementioned problem related to this function. Unexpected, however, was the fact that all tracks were recorded with a "11" status code! Apparently, the designers at Tascam have decided to set this as the default status and, unlike the Panasonic SV-3700, it is not changeable.

Via the IEC interface (labeled "coaxial" on the selector switch), the DA-30 would not copy the "10" status tracks. The tracks which had been "00" remained "00" and the "11" tracks were upgraded to "10" status. Thus, in this mode, the DA-30 implements SCMS just like an ordinary consumer DAT recorder.

Recordings made via the analog inputs were also recorded with an "11" status code; this is like the IEC mode on the



Contestants in the SCMS comparison tests: 1) Tascam DA-30; 2) Sony PCM 2500; 3) Sony TCD-D10 Pro; 4) Tascam DA-50; 5) Technics SV-DA10; 6) Fostex D20; 7) Panasonic SV-3500.

*Handwritten note:* very

Panasonic 3700 in the consumer mode, except that there is no way to change the status to "00."

### SONY TCD-D10 PRO

The TCD-D10 Pro "will record/playback from/to AES/EBU at all three standard sampling rates. However, the machine as delivered from the factory will not allow digital dubbing from an S/PDIF source at 44.1kHz. The machine knows what you're trying to do, even if you unbalance the AES input and feed it from an S/PDIF source." Because my personal D-10 Pro has been modified by Bob Katz, it is capable of copying at 44.1kHz via the S/PDIF interface; this was the unit I tested.

Via this interface, it copied the test tracks bearing the "00" SCMS status, but would not copy start IDs or program numbers. (With regard to the latter, this is no surprise, since it doesn't write them even when it records from its analog inputs — in my view a serious shortcoming of this otherwise fine recorder.)

However, the recorder would not copy the tracks with "10" or "11" codes: it would monitor the audio as though it were recording, and enter into record, but muted the audio and recorded only blank tape! Despite Bob's modification, the recorder still obeys the "copyright protected" code in the S/PDIF mode.

An interesting turn of events developed when I attempted to test the AES interface of this recorder: it would not recognize the signal from the SV-3700! The audio was fully muted, and the recorder would not enter into the record mode. To determine if this was just a quirk of my modified machine, I tested a stock unit, with the same negative results.

Apparently, there is some incompatibility in the digital "language" spoken by these two recorders through the AES interface. (I understand from conversations with colleagues that the D10 Pro has similar problems communicating with other outboard processors via the AES/EBU interface. So much for standards. Hello, Sony?)

As an experiment, I connected the SV-3700's S/PDIF output to the D10-Pro's AES/EBU input; finally, it recognized that a signal was present. (Curiouser and curiouser.) However, the attempt to copy the test tape was disappointing: the "00" status tracks, at both 48kHz and 44.1kHz sampling rates copied properly, but the tracks encoded with "11" and "10" codes caused the D10 Pro to mute the audio, even in the monitor, although they did continue to record blank tape.

Finally, as a follow-up to this, I connected the AES/EBU output of the SV-3700 to the S/PDIF input of the D10 Pro. In this configuration, the program material on all six tracks was copied without

problem, and each was written with a "00" SCMS status code; however, no start IDs or program numbers were transferred. (Thus, there is at least one mode where-by this machine will perform a digital copy of another DAT tape, even though it is a rather roundabout method.)

Another interesting quirk of the D10 Pro is that although it had no difficulty playing any of the recordings made at the 48kHz sampling rate, it would not even play a recording made at 44.1kHz bearing a "11" status code! Apparently, Sony felt that doing so would be looked upon as violating someone's rights, and they are correct. However, that someone is the owner of the D10 Pro.

Conversations with some people at Sony Professional Audio's Digital Products division indicate that they are aware of this problem, and are "working on it."

### SONY PCM 2500

This was Sony's first "professional" DAT recorder available on the U.S. market and is essentially a "consumer" recorder (the TC-D1000) with a supplemental package that provides all of the digital interfaces, balanced +4dBm inputs and outputs, and control over some of the other parameters of the digital recording which are not normally available on a conventional DAT recorder.

***If SCMS is to be with us for the foreseeable future, professional equipment manufacturers should more thoroughly consider who their users really are.***

Via the AES interface, the 2500 copied the program on all six tracks of the test tape, writing them all with a "00" status code. Start IDs and program numbers were only written in the Auto mode, with the usual problems mentioned earlier. So far, this is exactly what I had expected from this "professional" format DAT machine.

Via the S/PDIF interface, however, I was quite surprised, as the presence of the consumer TC-D1000 became quite evident. In this mode, only the 48kHz sampled "00" status code track could be copied. The other two 48kHz tracks ("11" and "10") would not record, and the "Copy Prohibit" indicator came on. Matters were even less

### SKIMMING THE SCMS OFF DAT

It is not illegal to strip the consumer copy protection codes off of the serial bitstream on a professional DAT systems transfers. Pro audio manufacturers who include the protection code interpretation have chosen to do so, unbidden.

In fact, nothing about the Serial Copy Management System itself has anything to do with current laws, only the threat of lawsuit by the RIAA. Theoretically it shouldn't even be an issue for professionals.

To get around most of these problems, you need a DAT recorder that will do what you want, when you want it. From the tests I conducted of current DAT recorders, the Panasonic SV-3700 seems to offer the best array of features and sound quality for the price; it also provides unequaled flexibility with regard to writing and copying SCMS status codes.

For these reasons (unless you need SMPTE time code capability), the Panasonic SV-3700 appears to be a good machine to modify, in order to get around some of the copy code protection schemes (for professional applications only, of course!) And — gasp! — this technically voids the warranty.

By installing an additional switch on the front panel, wired in parallel with the rear panel protection status switch SW-1, you can more readily change setting of SW-1, and have a switch that will physically withstand the frequent operation to which it will be subjected. Installation is not all that difficult either; with simple care it can be performed in less than an hour.

First, disconnect the power cord and remove the top cover. Locate the almost square blank panel immediately to the left of the tape drawer (see Figure 1). You will note that there is a molding mark on the inside, near the center of this panel. If you carefully locate the center of this molding mark and drill a 1/4-inch hole there, you can then mount a miniature toggle switch there (such as the ALCO MTA-106D). But before you do, solder about two feet of single-conductor shielded cable to the wiper and one leg of the switch.

Next, remove the five screws holding the digital interface circuit

*Continued on page 52*

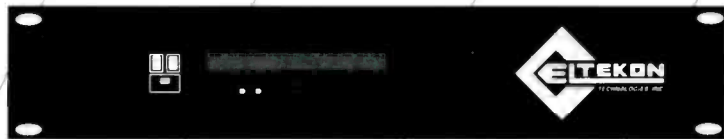


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productive with the 44.1kHz tracks, as none of the tracks — not even the “00” status code track — could be copied.

The recording made using the analog inputs on the 2500 was written with a “00” status code, at both 48kHz and 44.1kHz sampling rates.

#### TASCAM DA-50

This was Tascam's first professional DAT recorder marketed in the United States, and may still be found in some stores. Because it was manufactured before the imposition of the SCMS, it pays no attention to these codes. However, it does read the “copyright” codes as meaning that copying is prohibited, so that it will not go into the record mode if the source tape is so marked. (For example, if there is a “0” in bit 2, as previously mentioned. Apparently, this bit is automatically set to “0” for a SCMS status of “10” or “11.”) Thus, only original recordings bearing the “00” SCMS status code could be copied. Program numbers and start IDs were copied as well.

Because this unit has no AES/EBU interface (only coaxial and optical S/PDIF) it may be used only in the “consumer” mode. As was expected, recordings made via the analog inputs were written with a “00” SCMS status code.

#### PANASONIC SV-3500

This recorder was also manufactured before SCMS, and has only the S/PDIF interface. Two versions seem to be in circulation: the earlier version, which I tested, is capable of recording at only a 48kHz sampling rate, while a later issue is provided with an internal switch (convenient!) that allows it to record at 44.1kHz. I did not have an opportunity of testing the later unit.

The machine I tested would copy only the track of the test tape encoded with the “00” status; the copy was coded “00,” and the program number and start ID were copied as well. With the tracks encoded “10” and “11” the unit continued to record, but muted, so that there was no audio on the tape. (On the recording made via the model 3500's analog inputs, the SCMS status code was “00.”)

It seems likely that the reason for the 3500's inability to record the “11” and “10” tracks is that, although these two bit codes were assigned “reserved status” in the earlier (i.e. pre-SCMS) digital interface standards, their presence in the Channel Status bits is being interpreted by the recorder as indicating a “copyright protected” status.

Thus, the recorder is simply refusing to copy the DAT material, just as it would refuse to copy a similarly protected compact disc. (The matter of “copyright protection” vs. SCMS codes was referred to in Part One of this article in the April issue.)

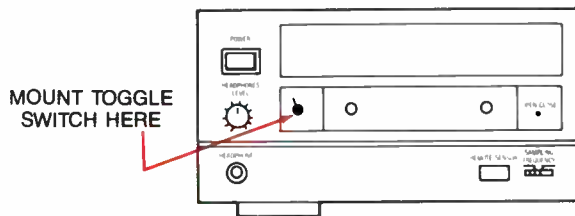


Figure 1. Location for mounting the toggle switch for changing the SW-1 settings from the front of the SV-3700, rather than the back.

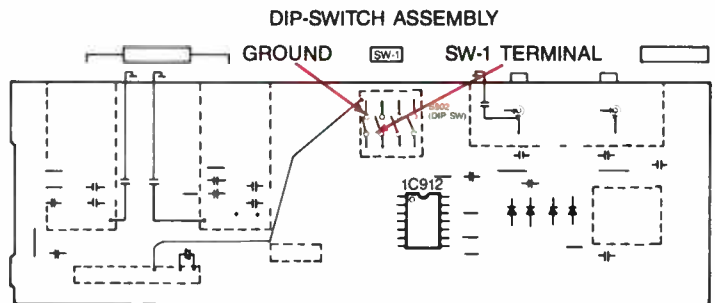


Figure 2. Schematic showing the location of the ground, DIP switch assembly and the SW-1 terminal.

Continued from page 50

board onto the rear panel of the recorder and carefully remove this circuit board from the rear panel. Locate the mini DIP switch unit; this module of four switches merely switches ground to the logic circuitry on the main circuit board. Turn the circuit board over and notice that the switch pins closest to the edge of the circuit board are switch ground, and the pins directly opposite carry the appropriately switched ground back to the main circuit board via a four-conductor ribbon cable.

Locate the pins associated with SW-1 (see Figure 2). Next, using the shielded single-conductor cable, connect the newly installed toggle switch in parallel with SW-1. Remember to connect the shield to the ground side, and the center conductor to the other leg of SW-1. The space is crowded, so be careful not to create any solder bridges.

Dress the cable carefully away from the ac power supply circuitry and secure it with a couple of cable ties so it won't interfere with the transport mechanism. Check your work and then reassemble the recorder. The mod is complete.

Leave the rear panel SW-1 switch in the off (down) position, and use the new toggle switch to reliably se-

lect between AES/EBU and IEC-958 digital formats as needed, and from the front panel. Unless you intend to change the SCMS code frequently, switches SW-2 and SW-3 can be set once and generally left alone on the rear panel. I leave to the more adventurous experimenter the project of adding additional switches to remote these as well.

Although this modification doesn't solve all of the problems associated with the SCMS scam (note that you still cannot change the SCMS status of recordings input via the IEC-958 input!), it will allow you to more readily switch between analog and IEC digital interfaces and modes of operation.

Just remember: to record from an analog source, set the switch for AES/EBU mode and set SW-2 and SW-3 for recording whatever status code is desired; setting them for a “00” status code will prevent unwanted muting problems that might occur when copying these tapes to another DAT or PCM recorder via the IEC interface.

This latter setting of the SW-1 surrogate is also required for recording or playing a tape via the AES/EBU interface. When recording or playing via the IEC-958 interface, set the switch to the IEC position. ■

### TECHNICS SV-DA10

Although I had not intended to test any specifically "consumer-model" DAT recorders, this "kissing cousin" to the Panasonic SV-3700 was readily available. Plus, I had a little extra time, so why not? Besides, it has only the S/PDIF (coaxial) interface, and admits to following the SCMS rules, so it gave me an opportunity to test what a truly "consumer" recorder would do when trying to copy my test tape.

Results were identical for the 48kHz and the 44.1kHz sample rate test tracks. As expected, the test tracks encoded "00" were copied without problem, and written with "00" status codes. The test tracks encoded "11" were also copied, and upgraded (or should I say degraded?) in status to "10." The test tracks coded "10" could not be copied at all. The recorder simply muted, although it did continue to record — blank tape. The start IDs and program numbers were all transferred properly (except on the blank recordings). The recording made via the analog inputs was written with a "11" status code.

### FOSTEX D20

Although I did not have an opportunity to test this machine personally, I discussed its operations with the Fostex regional

sales manager. He informed me that the D20 does not have the S/PDIF interface, but does have AES/EBU. Via this interface, the recorder ignores all SCMS codes and, as would be expected from the foregoing discussion, does not pass start ID or Program Number information. Because the D20 also has the capability of writing a "copy prohibit" flag into the Channel Status Block, it will observe this flag if copying another tape so marked.

Because this machine will record SMPTE time code (both the IEC and Fostex's own proprietary formats), it is also provided with a special multi-pin interface so that when two D20's are connected together, all data on the tape can be copied: program material, start IDs and program numbers, as well as subcode and time code information.

Thus, this appears to be the only DAT recorder capable of making a complete digital copy of this special information. Although this is not a "standard" interface (such as would connect to recorders of other makes or types) this seems to be a well thought out solution to a problem generally ignored by other manufacturers.

### REAL WORLD APPLICATIONS

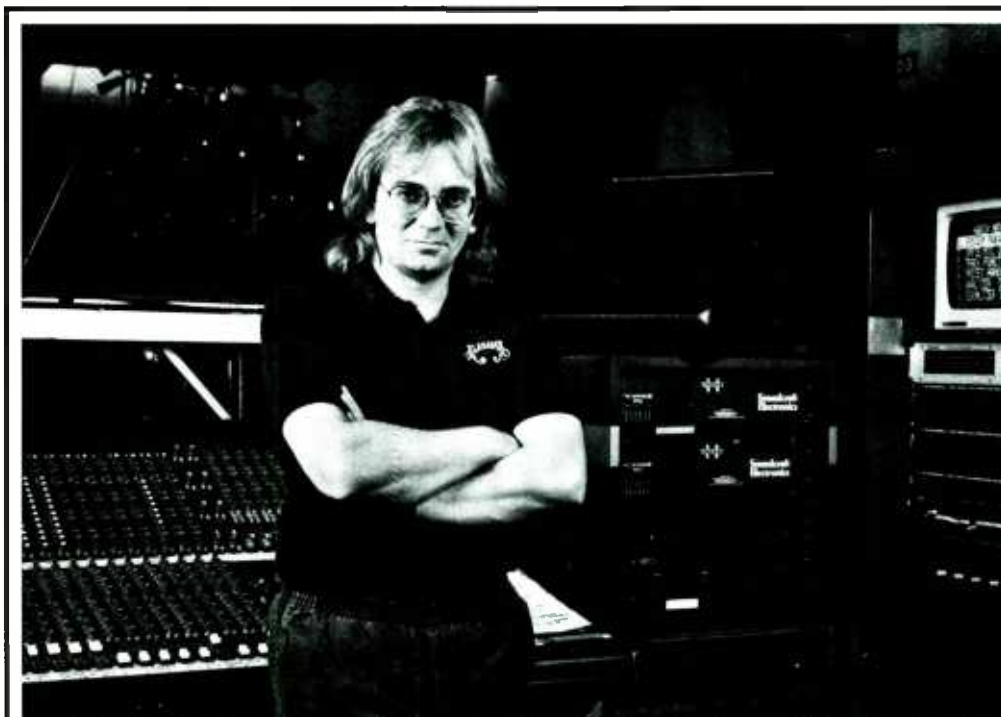
Now, what does all this mean to you, the

real world user? Not much, if you always intend to interface a DAT recorder via the AES/EBU interface to the rest of your studio. Except for their inherent inability to transfer start IDs or program numbers via this interface, most professional DAT recorders will get along just fine.

However, if you wish to make a dub in the digital domain to or from any other equipment that implements the IEC-958 (S/PDIF) format — such as PCM-F1-type processors, consumer DAT decks, CD players, some computer interfaces, digital editing systems or music synthesizers — you might find that the recording will be blocked by the SCMS status codes, even with devices which were never intended to implement SCMS (as was evident with the earlier model DAT recorders tested) but are nonetheless interpreting these codes as "copyright protection" indicators.

Furthermore, if you want to use the DAT's analog inputs for recording (i.e. for mixdown or direct-to-2-track recording) you may have to deal with the fact that it is written with a "11" status code — depending on the recorder you are using.

Clearly, the Panasonic SV-3700 offers the best flexibility in this regard, because it is the only DAT recorder that allows you to determine the SCMS codes for each re-



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coding. Remember, however, that you will need to change the status of SW-1, depending on the digital interface you are using (because the default status in the IEC mode is "11").

And, because SW-1 is a mini-DIP switch located on the rear panel (intended, essentially, to be set and left alone), it is a physically non-robust switch, set in a very inconvenient location to access when the recorder is installed in an equipment rack (see the sidebar "Skimming the SCMS off DATs" for a solution).

According to the SCMS rules, you cannot modify the SCMS status coming from a digital source via the IEC-958 interface, even if you want to. Therefore, you cannot even increase the level of SCMS protection (say from "00" to "11" or "10") in this mode. Changes of the SCMS status can only be accomplished when operating in the AES/EBU format. Thus, with some of the S/PDIF format devices listed earlier, the status of SCMS bits may prevent further copying of recordings that were never intended to be protected from any such copying.

This is because some earlier S/PDIF equipment simply set these data bits on — well before they were ever defined as "copy prohibit" codes by the SCMS. So you

want to digitally transfer between older PCM-F1 format tapes and DAT? Sorry, but you may not be able to do so — or work with them once you do.

The same labels in the SCMS code may be interpreted as "copy prohibit" flags by the PCM processor, or vice-versa. It seems, therefore, that the semi-professional users (whomever they are) have been treated like mere consumer users in this regard. Pity there are so many of them out there in this hybrid, semi-pro world.

#### A PARTING THOUGHT

Sadly, this is not "the best of all possible worlds." That, of course, would be too much to ask for. But if SCMS is to be with us for the foreseeable future, professional equipment manufacturers should more thoroughly consider who their users really are and what other kinds of equipment can be found in their studios. It's not all Studer and Neve, by any means.

IEC-958 is not just for consumers anymore, and those professionals who do use equipment that operates in this domain should not have to be penalized by limiting the options available to them. If a recorder is intended for the professional market, it should afford full, unrestricted use — in all formats, by all its users, with-

out artificially imposed technical limitations or irrelevant threats of legal action! (RIAA, are you listening?)

True, consumers can purchase a professional DAT recorder (there is still a free market, after all) and use it to copy CDs for their cars, but I rather doubt that the expense and inconvenience of doing so will make this a widespread practice. And, of course, unscrupulous bootleggers will always find a way to ply their trade. These are the realities of the world.

The recording industry, by definition, is comprised of a variety of professional people, not just songwriters or performers, but engineers, technicians and producers, as well. These professionals demand reliability and dependability from the equipment they use in their daily trade. Standards are intended to ensure some sense of this reliability — as well as interchangeability between various elements within the studio environment.

The RIAA and the manufacturers of DAT recorders intended for the professional market need to remember who all of these people are. And is it too much to ask that future generations of "professional" DAT recorders not plague their legitimate users with the scam of SCMS — whatever the source or interface being used? ■

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# HANDS ON:

# Crown SASS

By Tom Mardikes

**T**wo years ago, Crown debuted the SASS-P "Stereo Ambient Sampling System," a stereo PZM microphone system as an improvement to what many recording engineers were doing on their own: arraying a pair of PZMs into a "V"-shaped wedge and recording everything from music concerts, sound effects and outdoor ambience.

Tom Mardikes is director of recording for the Conservatory of Music at the University of Missouri-Kansas City, the resident sound designer for the Missouri Repertory Theatre, and the owner of City Spark, a 24-track music production facility in Kansas City, MO.

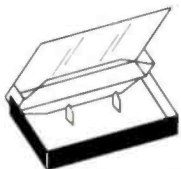


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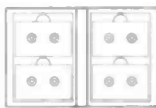
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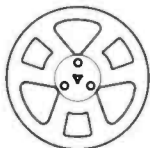
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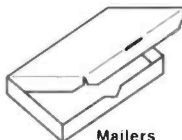
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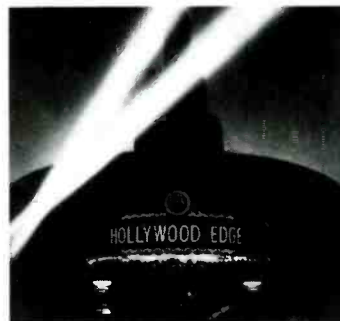
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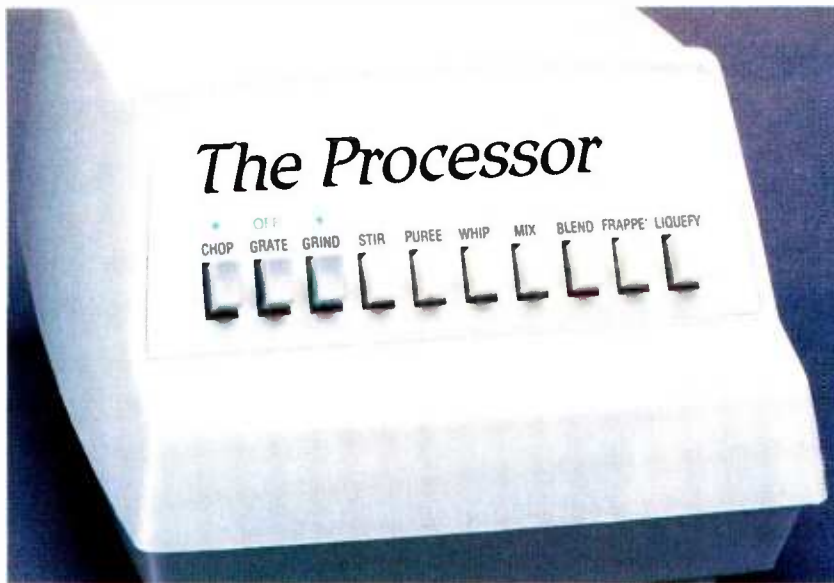
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## Processed?

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  $\pm 4$  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.

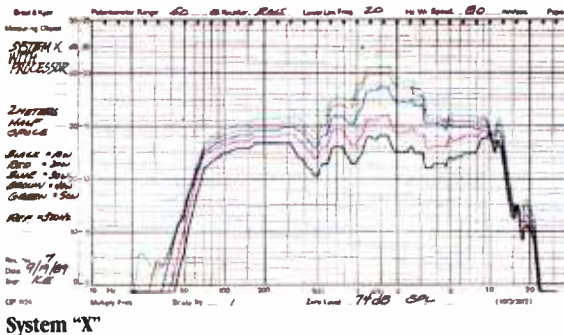
At these modest levels, the LF and HF overlap, rather than cross-over. Because the LF and HF sum coherently where they overlap, dynamic expansion results. For a 7 dB increase in input level, the lows increase 4 dB, highs only 2 dB, but the mids increase 13 dB.

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?



Crown's SASS (as in sassy) is a complete system that reduces the size of the cumbersome homemade wedge into a much more attractive and diminutive package. Invented by recording engineer Michael Billingsley, the SASS seems to emulate the human head for hearing, much as the dummy heads do that are available from companies like Neumann or Sennheiser. Without looking like a "Fritz" or an "Oscar" (no eyes, lips or nose) the SASS does have about a 7-inch spacing between its two PZM elements (ear to ear?); the space between the elements is filled with a dense gray foam (no difference there!). Instead of an intricate pinnae, however, the SASS offers the ever-important PZM prerequisite; the boundary plate. That is where comparing the SASS to dummy head systems ends, because, to me, the SASS sounds so much better.

### TECHNICAL SPECS

The SASS version I reviewed uses two standard-issue PZM electret condenser elements. (Also available is the SASS-B setup for B & K 4000 series mics.) The frequency response (as published in Crown's specifications), runs from 20Hz up to 18kHz (see Figure 1). The polar response for each channel operates as omnidirectional at low frequencies below 500Hz and is directional above 4kHz (see Figure 2). The noise level of each mic is typically 20.5dB SPL. A 150dB SPL at the diaphragm produces 3% THD.

The polarity of the mics is such that a positive pressure on the diaphragm produces a positive voltage on Pin 2 with respect to Pin 3 of the output XLR connector. Powering mics can be accomplished with simple phantom power, 12Vdc to 48Vdc, or by using two 9V alkaline batteries (one per mic).

The SASS uses two standard professional mic cables, 2-conductor shielded. A 4-position rotary switch allows you to choose battery or phantom powering, with either a flat frequency response or a preset low-cut (see Figure 1).

Accessories include a swivel mount, hand grip, a black windscreen that covers the entire system, two auxiliary foam wind protectors for heavy wind protection, a mic stand thread adapter and an effective foam-lined crush-resistant case that contains the SASS, its accessories and more.

The SASS is constructed as a near-coincident stereo mic array, where the stereo imaging is formed by time-of-arrival and intensity differences between the two mics. The two elements of the SASS are spaced about 7 inches apart and angled about 35° off-axis. This array yields good stereo imaging with a strong mono compatibility.

The SASS improves upon the typical

crossed cardioid near-coincident array (ORTF) by filling the space between the two mics with a dense foam. This foam protrudes about five inches in front of the mics, creating a barrier, or baffle, that causes strong intensity differences between the two capsules. This has the net effect of reducing phase cancellations that can cause audible dropouts or sound coloring when the stereo recording is played in mono.

The tradeoff here is that anything closer than three feet to the SASS will sound as if there is a hole in its middle; the sound is "blocked" and the capsules cannot "hear" it. Crown recommends the SASS with a working distance of three feet to 15 feet.

#### APPLICATION: MUSIC

I have used the PZM 30GPs for at least 10 years, but rarely for music events. I find no true low end, unless something unsightly is rigged that the audience has to watch. I love these mics for outdoor sound effects recording and stage miking for theater. I believe that a PZM is one of the best mics to use in a terrible acoustical environment. Being two PZM elements in stereo, the SASS gave me some cause for concern when recording classical music in a concert hall. I was to be surprised!

Immediately, I noticed an amazing amount of low end and deep bass. The SASS was smooth into the high end — a smooth and flat frequency response, as opposed to the apparent rising brightness one gets with a condenser from Neumann or AKG. The top end sounded more like a Sanken CU-31. Interestingly, it seemed that wherever I put the SASS in front of a music ensemble, the sound was good. I could get 30-40 feet away and still have good clarity and intelligibility.

What seemed lacking from any location was a diffuse ambient sound; I always heard a need for a pair of ambient mics. The SASS uses PZM mics, and PZMs make bad ambient mics because they produce 6dB more direct sound over ambient sound compared to free-field microphones.

Hanging the SASS in a concert hall can be accomplished quite easily with a nylon line extending down from the catwalk along with two mic cables. The SASS will hang upside-down with no difference in its sound pickup. Its overall pickup pattern is hemispherical and the swivel mount attachment on the bottom provides an excellent eye-hook for tying-off the nylon line. The SASS itself (without cables, connectors or batteries) weighs just over a pound.

A concern I have with the SASS has nothing to do with its sound, but its aesthetic impact in the concert hall. It's not



## Non-processed.

True Sound, on the other hand, requires a speaker system that will render an accurate acoustic replication of its electrical input. No less, but no more.

A truly accurate speaker system does not interpret electrical signals. It has no personality, no characteristic sound. It neither adds, nor detracts from the program input. It doesn't compensate for anything—accuracy isn't negotiable at various sound levels. A speaker system is either accurate, or it is not.

Accuracy in a loudspeaker system calls for transducers that are manufactured to precise tolerances, to be sure. But it also demands that the loudspeaker systems be configured so that the transducers operate within their inherent electro-mechanical limitations.

In the Ramsa 500 Series Speaker Systems, there are no processors that compensate for frequency response deficiencies at low levels, only to remove the compensation at high levels so that the components can survive. Performance deficiencies have been avoided by designing within realistic capabilities of high quality transducers.

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For more information contact: Ramsa, 6550 Katella Ave., Cypress, CA 90620. 714-373-7278.



Ramsa WS-A500/550 system

# RAMSA

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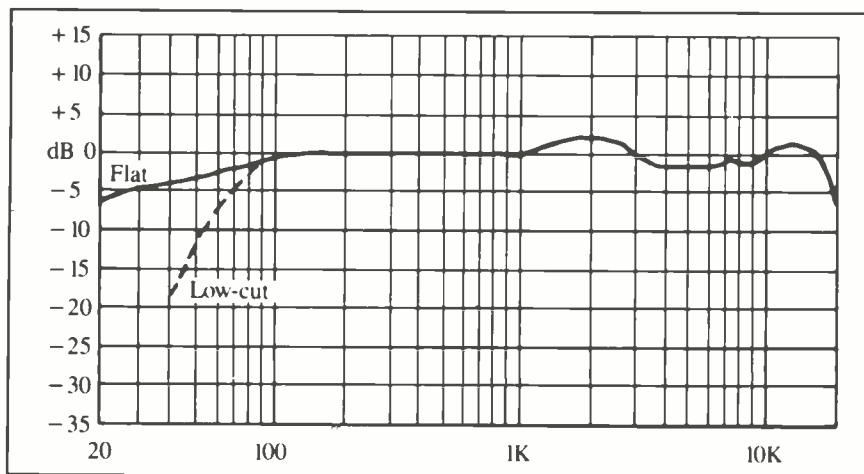


Figure 1. SASS-P frequency response. Sound incidence perpendicular to boundary. Response up to 1kHz is the effective diffuse-field response with stereo listening.

as sleek, silver and low in profile as a Neumann SM69; the SASS is boxy, large and black with cables coming out of its back. Crown recommends a hanging height of 15 feet above the stage for a major ensemble, enough out of the way to cause no problems with sightlines. Smaller groups have a recommended miking of "head height" that would let the audience see

the SASS in place of the face of the lovely soprano giving tonight's recital.

I think the mic works well with an even lower height of several feet above the stage floor or several feet over the performers' heads. It is a distracting appearance when it is in front of performers.

For churches, colleges/universities, and many public concert halls, the SASS sys-

tem would be a godsend to have. The poorer the hall acoustics, the more this mic is needed. The semi-professional or young recording engineer can do no wrong. Students performing concert recordings could not ruin a recording with bad placement and could not offer a recording out-of-phase unless handed a polarity reversed mic cable. The SASS sells for less than \$900, so any organization can more easily afford this system compared to a \$2,500-\$4,000 stereo microphone or a miking system.

Would the SASS replace the concert recording system I currently use? No, it would not. I like MS recording as my first choice and as my main pickup. I usually use a Neumann SM69 and always use an oscilloscope to monitor phase and mix in the S mic or the width of the recording. The SASS is comparable in the amount of width I like to hear in my recordings, but the blend of the SASS is fixed; in MS it is variable. The Neumann is much brighter than the SASS, and overall I like having the brightness there for radio or album projects. I'd rather throw it away than have to add it in with board EQ, which I almost never do.

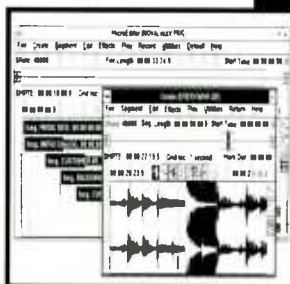
I do not always use MS, and my second choice is always the ORTF system of near-

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coincident crossed cardioids — a pair of KM84s or a pair of AKG D-220s when phantom power is unavailable. Would I use the SASS in this case? A definite yes. It is an excellent stereo miking system.

#### APPLICATION: SOUND EFFECTS RECORDING

My favorite SFX mics are the PZM 30GPs. They have an excellent clarity, almost no bass pickup when held by hand, little microphonic noise, and are crispy bright. No bass means no rumble and little filtering, no handling noise means much freedom of movement, and the brightness makes the recordings special because they cut through and sparkle with clarity.

The SASS wins in only one of three categories here. The excellent low frequency response causes problems for me with ambient sound effects; the recordings sound dull compared to the PZM 30GPs. But boy is the SASS easy to handle. A sponge-rubber grip attaches to the bottom of the system and makes holding it a dream. The light weight of the SASS allows you to hold it forever in a fixed position without fatigue. The PZM capsules

have excellent reach and a natural sound. Put the SASS with a portable DAT and you have a great recording system.

Care must be taken when recording sound effects with the SASS to watch the distance from the sound source; stay more than three feet away from the source for a good stereo pickup without a "donut" sound. That should be no problem for a field of crickets, but you would need a quiet background to record the lonely cricket.

The lack of handling noise with the SASS is amazing. Glide in and out of different acoustical environments, walk along and hear the change from indoor to outdoor, into the concert hall, racquetball court, basketball court, small room, wherever, and you will never hear any thumping, rumbling, ticking or scraping. If the mic is shaken *violently*, the spring-clips of the XLR connectors can be heard to rattle and will go to tape. Consider yourself warned.

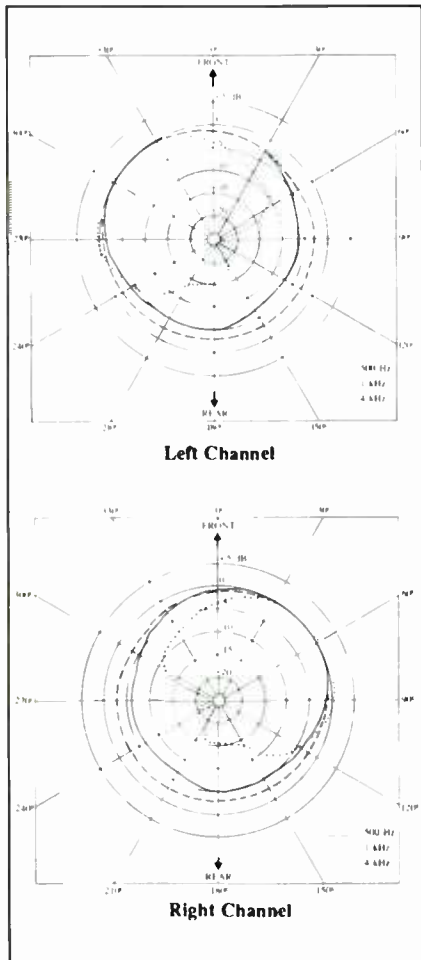


Figure 2. Left- and right-channel polar response.

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Crown deserves a round of applause for its consistent efforts to support its products and product users. The newsletter *PZM Mic Memo* has served as a clearinghouse for ideas and has introduced a variety of applications. It may even be partially responsible for inventing the SASS.

The packaging of the SASS is well thought out, with its foam-lined case, and comes with a set of instructions unlike any other mic I have worked with. Crown has a free CD available featuring recordings done with the SASS by its inventor. A greatly expanded user manual is scheduled to be published soon.

The SASS comes with a three-year unconditional guarantee from the date of purchase. The acoustic system comes with a lifetime guarantee; if you don't abuse it, Crown will fix it.

Although it might be said that there is no such thing as a bad micro-

*City Spark engineer Scott Gregory shown with a quick, clean and portable stereo recording system: the Crown SASS-P stereo microphone, a Panasonic SV-255 portable DAT and a pair of AKG K240-DF headphones. Two hours of untethered fun!*



phone, the Crown SASS is a great microphone. As a near-coincident stereo mic array, it exhibits a fine phase integrity with a wide field of pickup. Stereo localization and imaging are excellent. A dense foam barrier increases the level of separation between the two capsules. The use of PZM elements mounted on boundary plates adds to the clarity of the mic system. The SASS has excellent reach, and will render a clear recording from almost any distance. At distance, I do not consider the mic to be particularly diffuse or ambient.

Because it operates from phantom power or 9V batteries, this mic will travel and work anywhere. And with an excellent road case, a comfortable and steady hand grip and no microphonic noise, the SASS is suitable for many rugged environments. If you weigh the quality of this stereo miking system against the price one has to pay for ownership, the SASS is truly a bargain hard to beat.

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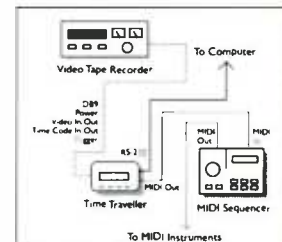
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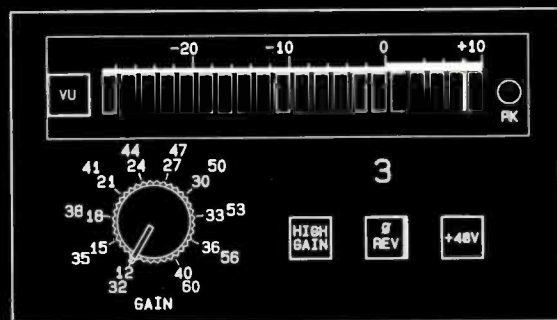
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# UPGRADING THE DOLBY 363 SR

---

Modifying Dolby's stereo noise reduction package to match the performance of its 24-channel big brother.

By Jim Williams

**A**n anyone who has had the chance to use Dolby SR-type noise reduction units has to admit that they are one of the greatest advancements in analog recording in the past 10 years. The capability to get digital signal-to-noise specs while retaining the sound of analog has warmed the hearts of many analog devotees, as well as extended the usable life of analog tape well into the next century. Dolby SR's 24-track version, the XP24, is a first-class engineering marvel, with high-quality components, dc servos and a tight, compact package.

However, the 363 2-track is not. In its stereo mastering version, the SR package is mounted in a standard 1U package, and has provisions for fitting Dolby's SR, A and combination SR+A noise reduction cards. Although the SR circuitry itself is the same on both the XP24 and the 363, the interfacing circuitry is not. Modifying the latter is the subject of this article.

First, a little background. When I originally had the opportunity to install a 363 to a Studer 2-track, I was quite disappointed. Expecting the same crisp, clear sound I had experienced using the XP24, it seemed instead as though someone had put too many layers of tissue paper over the monitors. This was noticed monitoring the 2-track's straight-through return, even with the SR process switched off.

Checking with other users in other studios confirmed my suspicions — there was

something in the interface electronics sucking out the sparkle in my mix. After reviewing the schematic diagrams, I discovered why: Dolby had elected to use what I consider lower quality op-amps instead of the higher-quality chips used in the XP24. Never one to leave well enough alone, I modified the motherboard with low-noise, high-speed op-amps and added some extra stabilizing capacitors. The result was this: I had a 363 that sounded as good as the XP24, if not better.

---

*The result is a clearer transient response and a more open "airy" quality.*

---

Before dealing with the modifications, you should note two items. First, any modifications will void your warranty with Dolby Labs, as the company doesn't take lightly to people turning in modified equipment for warranty service. You may want to wait until the factory warranty has expired before attempting any work.

Second, this work involves de-soldering and removing parts from a double-sided circuit board. This is *not* easy work, as it

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Jim Williams is the owner of Audio Upgrades, a component-level upgrade design and consulting service based in Los Angeles.

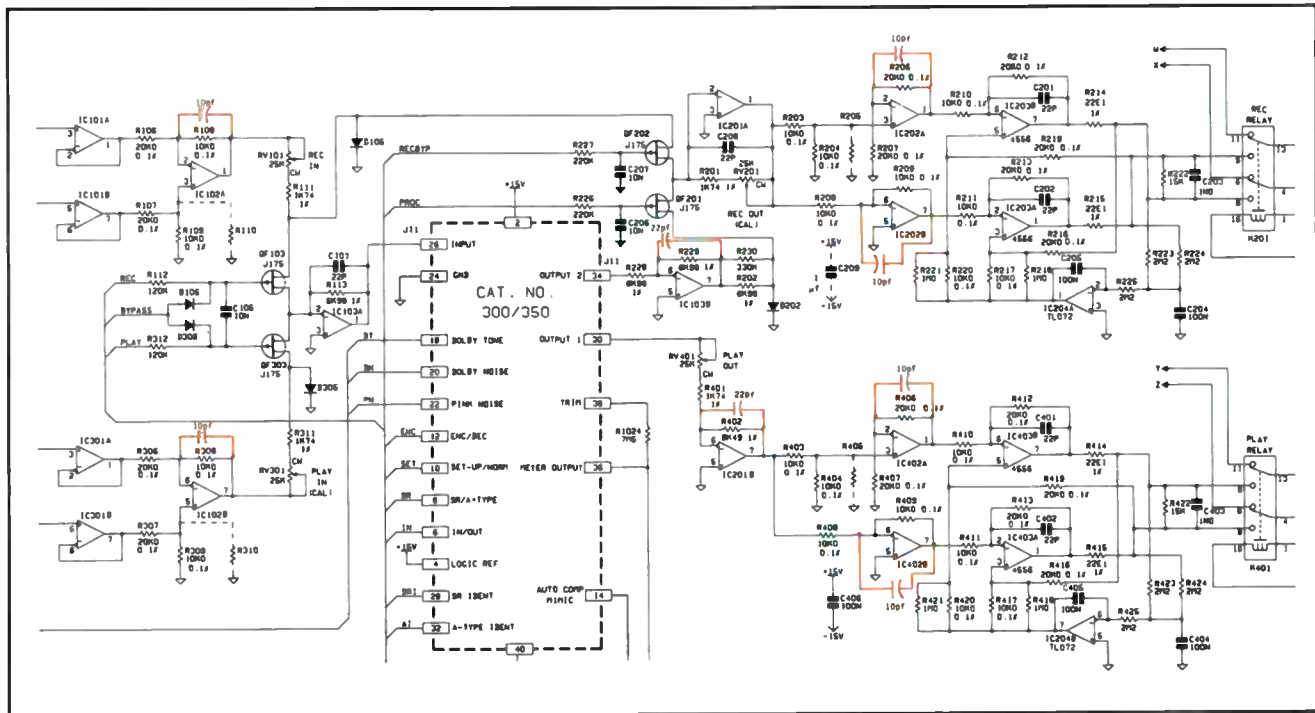


Figure 1. Modified Dolby 363 schematic.

requires considerable finesse. It should not be attempted by anyone unless they have lots of experience in the removal and replacement of components from double-sided circuit boards. A good test bench is helpful in case you might have any difficulty. A decent scope will help in locating any potential soldering errors, bad I.C.s or oscillations.

This mod is for Dolby 363 units with a serial number of 650 or higher, although it may work with the few earlier units around (just be sure you review the schematics carefully before beginning). In addition to the parts, you will need the 363 user's manual. It contains directions on disassembly and the schematic diagrams themselves.

## PARTS LIST

- National No. LM833N dual low-noise op-amps: I.C.s 101/501, 102/502, 103/503, 301/701, 201/601, 202/602, 402/802.
- Signetics #NE5532N: I.C.s 203/603, 403/803.
- 16 8-pin I.C. sockets.
- 12 10pF "NPO-type" disc capacitors.
- 4 22pF NPO disc capacitors.
- 2 to 38 0.1μF monolithic ceramic capacitors (to be installed in case of unstable op-amps).

## GETTING STARTED

First, remove the SR cards by sliding them out the front of the unit. Remove the power cord before following the manual's instructions for disassembly. With the motherboard out, you will notice several I.C.s soldered in place beneath where the SR cards are slid in. These op-amps will be removed first. Because the plated-through holes are small, I've found it easiest to cut the pins of the I.C.s as close to the chip as possible with narrow dykes.

While heating the pins from the bottom, pull the pins out from the top using needle-nosed pliers. Referring to the schematic, (see Figure 1 here, Figure 6.2 in the Dolby manual), remove I.C.s 101, 102, 103, 301, 201, 202, 402, 203 and 403. These part designators are for the left channel; the right channel numbers have 400 added to the part number designators. (For example, I.C. 101 of the left channel is numbered I.C. 501 on the right channel.)

Once the I.C. pins are removed, you must remove the leftover solder using a de-soldering vacuum pump, or "solder sucker." Use the least amount of heat possible to suck the solder up, as excessive heat can damage the pads on the motherboard.

## INSERTING THE CHIPS

Once all the pads are clear of solder, the I.C. sockets can be fitted into place. Before soldering the sockets, check the orientation of the parts, so that the "notch"

is oriented as marked on the motherboard. An incorrectly installed I.C. will burn and smoke, and may damage the socket and power supply regulators, so it is worth the time to carefully check your work. After soldering the sockets into place, the replacement I.C.s can be installed. I.C.s 101, 102, 103, 301, 201, 202 and 402 are replaced with LM 833 op-amps. I.C.s 203 and 403 are replaced with the NE5532N op-amps.

Now it's time to install the small disc caps. Again, although only the left channel numbers will be described, don't forget the right side. Fortunately, the left and right side layouts are similar, so once you've done the left, you will have a model for the right channel.

Solder a 10pF cap across resistor R108. I've found it easier to solder the cap on the bottom side of the motherboard, as long as the capacitor is thin. You might check the clearance by placing the motherboard back onto the chassis and viewing the amount of clearance with a flashlight. Solder the remaining 10pF disc caps across resistors R308, R206, R209, R406 and R409. Solder the 22pF caps across R229 and R402. The last remaining cap, the 0.1μF, is soldered where Dolby had intended C209 to go. It is not marked on the motherboard, but the holes for it are there. It is located below the row where I.C. 203 is mounted. Just to check, the holes are located along the traces that carry the + and - 15 volt power buses to pins 4 and 8 on the op-amps. It is intend-

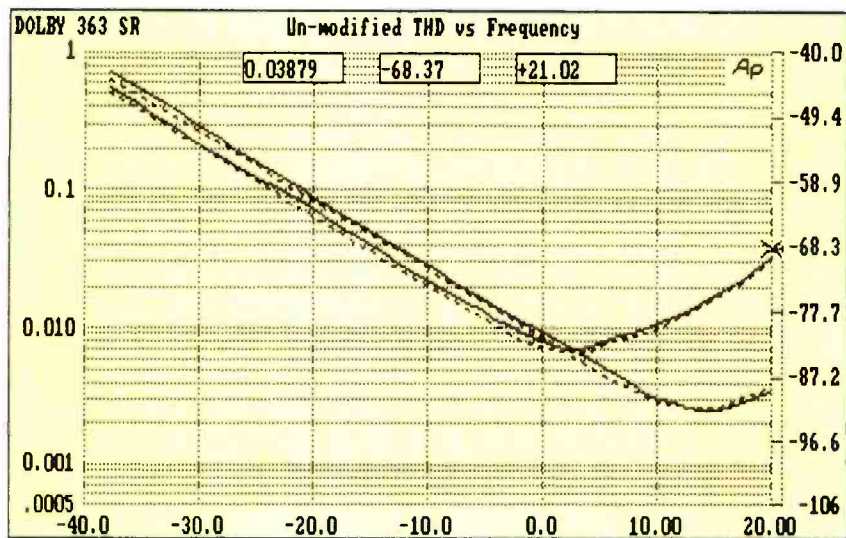


Figure 2. THD plus noise vs. amplitude of an unmodified Dolby 363, console out to recorder in. The bottom trace is 1kHz; the top trace is 10kHz.

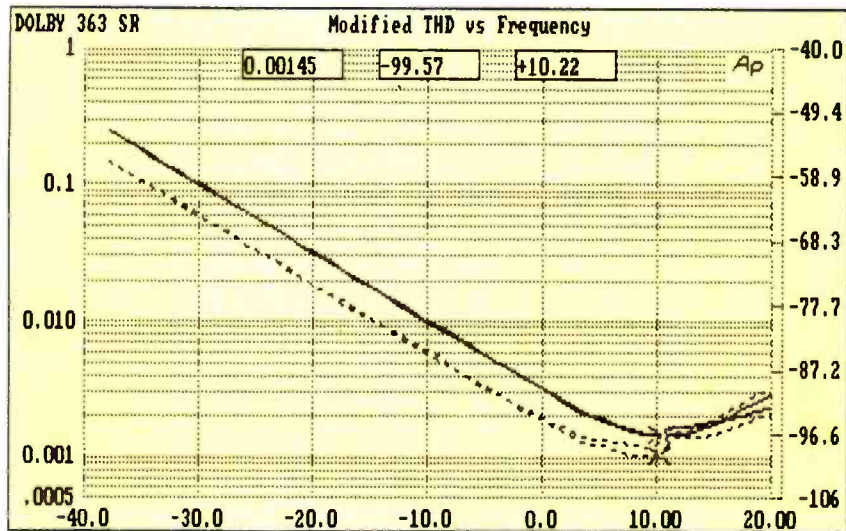


Figure 3. THD plus noise vs. amplitude of a modified Dolby 363, console out to recorder in, measured at 1kHz and 20kHz. The dotted line is the right channel.

ed to filter the power lines to the op-amps, and is necessary to keep the 5532s stable.

After the last steps are completed for both channels, it is time to recheck all solder connections and part locations. As tempting as it is to fire it up, double-check all of your work first; this is an expensive piece of gear, and it's worth taking your time to look it over once more. If everything checks out, re-install the motherboard into the chassis and re-connect the

fan and power connectors.

Don't tighten the XLR screws or install the cover plate until the board is checked out. Apply power and test the voltage from pins 4 to ground. You should get -15Vdc. Test the voltage from pins 8 and ground. You should read +15Vdc. Now take the scope probes and put the ground probe on a convenient ground trace. Place the "hot" probe on the op-amps's output pins and look for low level, high-frequency

oscillations. The scope sensitivity can be around 50mV or so, and the op-amp's outputs are pins 1 and 7. You should see virtually no output (high-frequency component), with the exception of a little fuzzy noise at higher sensitivities. If all the op-amps check out, re-assemble the rack.

If oscillations do show up, try substituting another op-amp. If that doesn't work, solder a 0.1µF mono cap between pin 4 and a close ground, and solder another 0.1µF mono cap from pin 8 to ground. I've never had to resort to these measures on a 363, but I've included them in case Mr. Murphy makes a visit.

#### TIME TO LISTEN

After assembly, re-install the rack and re-check the alignment to your tape machine. You may notice some improvement playing back pre-recorded tapes; however, to fully hear the improvements, encode a new mix and then play it back through the modified 363. Figures 2 and 3 illustrate the performance (before and after) of a typical 363.

Although the modified unit's noise is lower, it really doesn't matter much because the encode-decode process makes the unit so quiet anyway. The real improvement is in distortion and speed. The stock 363 has a slew rate of 1V per microsecond, but once modified, the slew rate increases to about 8V per microsecond. The result is a clearer transient response and a more open "airy" quality.

**A very large improvement can be seen in the distortion vs. amplitude chart.**

A very large improvement can be seen in the distortion vs. amplitude chart. Although there is a significant reduction in THD at 1kHz, there is almost a 20dB reduction in THD at 20kHz compared with a stock 363. This can be attributed to that increase in slew rate over the original op-amps.

Remember, work carefully and re-check the parts placement thoroughly. Once the unit is modified, Dolby will be less than enthusiastic about repairs, especially if it is under warranty. Here's hoping your next mix has all the sparkle you've always wanted. ■

By Laurel Cash-Jones and Fred Jones

## ARE YOU A "MOD" OR A "ROCKER"?

Now you can be both! How? By installing a pre-built modular studio in your home or facility. RMS (Results in the Management of Sound), a North Hollywood-based acoustical consulting company, has introduced its line of modular pre-fabricated studios. This new design allows you to build a complete studio in the space of a 2-car garage that can be assembled from pre-fabricated sections. This can then be disassembled at any time and moved to a new location.

You might think that this type of construction would have to skip somewhere. Oh contraire! Although each unit can be modified (at additional cost), the basic design has soffits for speakers and video monitors, front and rear bass soak dampeners, floating floor, carpet and wood flooring, and all the cable runs and air plenum hookups that you could need. Plus, if you need something special, the basic design can be modified at a moderate additional cost.

This design would be ideal for media recording studios and in-house advertising or corporate facilities that are located in high-rise office buildings. Due to the fact that it is not a permanent fixture, it may be considered for tax purposes as an equipment purchase instead of a leasehold improvement. See your accountant for further details.

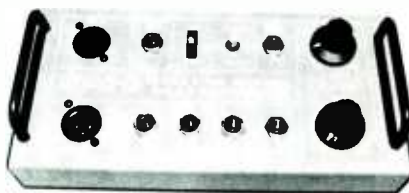
What makes this all the more interesting is that RMS claims that the pricing is very competitive with fixed installations.

Circle (101) on Rapid Facts Card

## A "CUTE" SOLUTION

Hey, give us a break; not all the headlines can be as good as the products they introduce. For example, take the new SB-2300 Studio Headphone System Controller from Artefx. Until now, if you wanted a headphone distribution system of very high quality, you probably had to build it yourself.

Designed as a DIY alternative, the SB-2300 can be mounted to various types of surfaces, or placed on the floor, and can be connected to any power amplifier. Input to this box is via two 1/4-inch mono speaker cables; you can daisy-chain several of these headphone boxes using a standard mic cable.



Each SB-2300 has connectors for four headphones, a mode selector switch (stereo, mono left, mono right and mix mono), and left and right high wattage wire wound level controls.

Heavy-duty-type isolation resistors and user replaceable internal fuses help protect the headphones in use, regardless of how many boxes or headphones are connected.

Each SB-2300 is built on a solid-steel chassis with integrated handles to protect the jacks and controls from breakage, and a mounting bracket is supplied to attach it to a mic stand without disassembling the box.

Circle (102) on Rapid Facts Card

## RACK 'EM UP

Of all of the rack-mountable mixers that we've come across, the Mackie Designs CR-1604 is one of the slickest. First, the mixer can be rack-mounted, or used as a table-top mixer, depending on how you adjust the rear panel. This panel can be turned at a 90° angle, which allows the versatility of mounting options. The rear panel contains all of the connectors for the mixer.

The unit is a 16-line input, stereo bus output mixer with six built-in mic pre-amps. An additional option. It has a stereo output and a second set of alternate or "preview" outputs that you can switch between by utilizing the dual function mute switch.

In one mode, this mute switch is used to route the signal to the preview stereo bus, while in the other, it is a standard mute switch. It also sports seven auxiliary sends per channel, and 4 stereo auxiliary returns. It also has an in-place solo system

and what Mackie calls a "constant power pan pot." This is said to produce the same signal level in the center position as when it is panned to any position. Plus, it has a very unique gain structure: Each line input is adjustable from -20dB to +4dB and the mic inputs are adjustable from -60dB to +4dB.

Here is where things get interesting. Each fader has a center detent position, which (if you have set the correct input level) is unity gain. You might think that a detent in the fader path would be a little annoying while you are mixing, but remember, you only go past the detent if you need to really push the signal past a unity setting. (You can go another 20dB above the detent.)

As you can see, if you are a little clever in the use of the signal flow of this seemingly 16x2 mixer, you could do some pretty interesting things. From a sonic point of view, this thing shines. The dynamic range is a reported 112dB, with 90dB S/N ratio. The maximum output of this unit is +28dBu. The mic pre-amps are studio-grade, 48V phantom powered, 4-transistor op-amp combination and are extremely clean. The 3-band EQ is set up as follows: high end, ±15dB shelving at 12kHz; mid, ±12dB peaking at 2.5kHz; low, ±15dB shelving at 80Hz. All have a very wide and musical Q.

It is also nice to see that someone has finally put high quality components in this type of product. All of the potentiometers are of a third generation, precision, high-technology sealed design. You will appreciate this after you have used it for a few years in an environment where there is a lot of smoke or dust. You'll also appreciate the fact that every CR-1604 is hand-made in the USA.

Never have we seen so many features with so much quality in one compact little mixer for less than \$1,100. Check this one out. ■

Circle (103) on Rapid Facts Card

# Cutting Edge

## ESE interface

The ES-244 is a bidirectional IHF-to-PRO level/impedance interface. The unit features four independent amplifiers, which provide full stereo input and output interfacing, RF shielding and output level adjustments. List price is \$179. A single or dual rack-mount panel option is \$35.

Circle (109) on Rapid Facts Card

## Soundcraft Spirit consoles

The Spirit Studio console is designed for multitrack recording from 8- to 24-track, and is available in 16x8x2 or 24x8x2 configurations. The Spirit Live console, for sound reinforcement applications, is available in 8x3, 16x3 and 24x3 frame sizes; an 8-channel expander is optional. Other features include an integrated armrest/carrying handle, clear panel graphics and LED bar-graph metering.

Circle (110) on Rapid Facts Card

## Amek/TAC console

The TAC SR6000 sound reinforcement console is electronically balanced and incorporates parametric EQ, input metering, stereo effects returns and a 10x8 output matrix. It features 4-band EQ with variable high-pass filter, eight VCA/mute groups, an auxiliary send system from eight to 16 sends and input metering on every channel. Other features include

eight audio groups, pan pot switches out of circuit, a high-power headphone amp and 12 VU meters. List price for the 40-input model is \$59,500.

Circle (111) on Rapid Facts Card

## JBL SR4700 loudspeakers

The six models of the SR4700 series of loudspeakers feature titanium diaphragm compression drivers with diamond surround, Bi-Radial horns and Vented Gap



Cooling LF transducers. A 2-position toggle switch on the back of the cabinet permits 2dB of HF attenuation. Its passive crossover networks contain switching jacks, which permit bi-amplification. The trapezoidal shape of the cabinets allows

tight grouping to form arced arrays when used in multiples. Optional speaker covers are available.

Circle (106) on Rapid Facts Card

## Hill Audio mixing consoles

The Datum series consists of a range of 4- and 8-bus consoles available in three configurations: studio recording, sound reinforcement and stage monitoring; four frame sizes are available in each. Other features include up to 48 inputs on most configurations, inputs with sweep EQ and up to eight aux sends, separate tape input sockets on all inputs, and EQ and aux sends on all tape monitors. The recording console features a meter bridge; the sound reinforcement and monitor consoles have metering on modules with meter bridge optional. An FX return module provides two mono returns and one stereo.

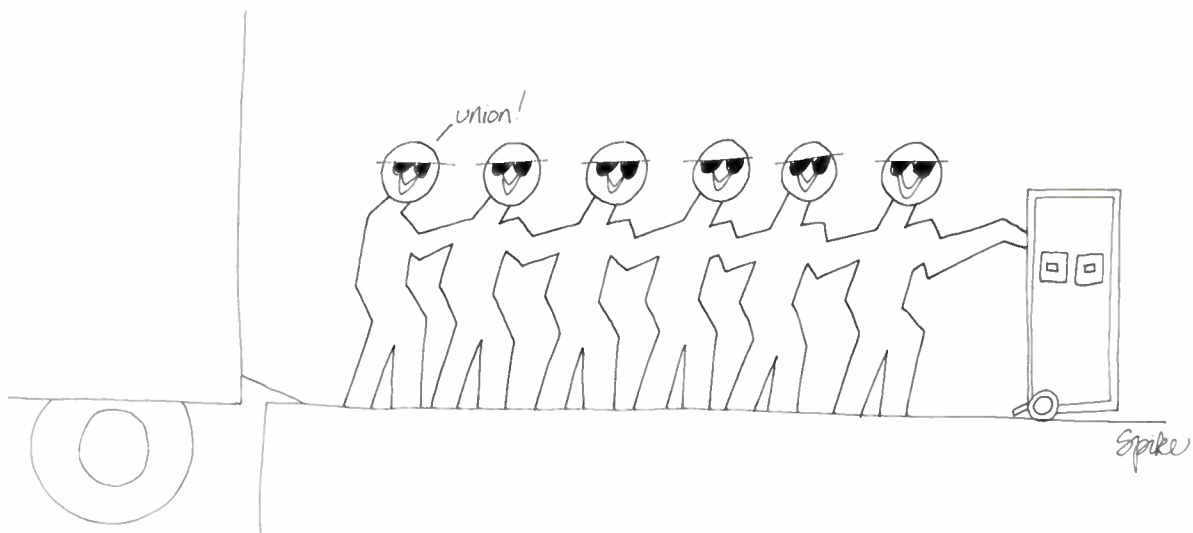
Circle (112) on Rapid Facts Card

## Renkus-Heinz C-1A loudspeaker

The C-1A coaxial point source speaker system is designed for easy rigging in large concert sound applications. It can be flown in large, multiple column arrays. The C-1A provides controlled dispersion and a high output level, often reducing the number of cabinets required for smooth coverage throughout entire seating areas.

Circle (113) on Rapid Facts Card

Spike and Mic



"Let's see..... two minutes labor..... \$1,400<sup>00</sup>....."



**Shure WA400  
distribution system**

The WA400 amplified antenna distribution system is a 2-input/8-output system that uses two antennas with as many as four diversity wireless mic systems or eight non-diversity systems. It removes the interference associated with multiple antennas in applications where several wireless mics are required. Its critical components are tightly specified so distortion and noise are kept to a minimum, and intermodulation effects are eliminated. It operates with all Shure wireless systems and most other wireless systems. It is rack-mountable, and is supplied with connecting cables. Net price is \$583.50.

Circle (114) on Rapid Facts Card

**Studer CD recorder**

The D740 CD-R is a self-contained, single-package rack-mount digital recorder using Write Once optical media. Compati-



ble with the CD format, the D740 has a built-in PQ Editor that automatically generates a table of contents, including track numbers and exact running times. It can be calibrated for all commonly operated audio levels, and features a dynamic range of about 98dB and a frequency response of 20Hz to 20kHz.

Circle (107) on Rapid Facts Card

**Crown mini condenser mic**

The CM-30 miniature, supercardioid electret unit operates with 12V-48V phantom

power. The mic features a sensitivity of 13.5mV/Pa and an impedance of 150Ω (balanced). A strain relief can be used to securely clamp the unit's cable at the desired length. Electronics attach to a rectangular or circular electrical plate for installation into any ceiling electrical box; the electronics/plate assembly can be mounted to an electrical handy box for non-hanging applications. Suggested retail price is \$215.

Circle (115) on Rapid Facts Card

**Audio-Technica mic**

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# Cutting Edge

tion between artists during performances and while recording. It offers a 50Hz-to-15,000Hz frequency response and a sensitivity of  $-56.4\text{dBm}$ .

Circle (116) on Rapid Facts Card

## Electro-Voice cardioid mic

The RE27N/D dynamic mic is intended for broadcast applications with digital source material and for studio miking applications. Using E-V's N/DYM and Variable-D technologies, the RE27N/D features internal shock-mounting and multifrequency equalization. The mic is an update of the RE20, and provides a crisper high-end sound while retaining the advantages of the RE20.

Circle (117) on Rapid Facts Card

## Roland MIDI cuing box

The SBX-1000 provides SMPTE-based synchronization of MIDI events for film and video editing; a built-in sequencer controls external MIDI devices. A Cue Sheet function stores data at a resolution of  $1/4$ -frame for up to 30,000 events, with a name



for each event. Data can be entered by step input or in real time. The sequencer offers 16 tracks and a capacity of 100,000 notes. Tempo Control provides several methods of tempo data programming; tempo data for up to 32 songs can be stored internally.

Circle (108) on Rapid Facts Card

## Yamaha P120 amp

The P120 is a single-channel, 200W (4 $\Omega$  rating) amp featuring a 7-band graphic equalizer for feedback control and tonal shaping. A limiter is included to prevent clipping. Forced air cooling is used to reduce component deterioration. It provides  $-20\text{dBm}$  and  $+4\text{dBm}$  inputs with loop-

through connectors; all inputs and outputs use  $1/4$ -inch phone jacks. The P120 is UL-listed, and is housed in an all-metal, rack-mount chassis occupying two standard spaces.

Circle (119) on Rapid Facts Card

## Sony compressor/limiter and parametric EQ

The MU-L021 compressor/limiter restricts dynamic range to facilitate the processing signals with wide level variations. Its 2-



channel design makes it possible to have independent or linked processing of both channels. A noise-gate section can be triggered by feeding an external control signal to the Gate In jack. Frequency response is 20Hz to 20kHz,  $\pm 1\text{dB}$ , and the S/N ratio is 95dB. The MU-E041 parametric equalizer is a 4-band with variable center frequencies. The boost/cut range can be switched between  $\pm 6\text{dB}$  and  $\pm 12\text{dB}$ . The reference output level is fixed at  $+4\text{dB}$ ; the maximum output level is  $+20\text{dB}$ . Suggested retail price of the MU-L021 is \$799; the MU-E041 is \$699.

Circle (129) on Rapid Facts Card

## ESE distribution amp

The ES-246 quad  $1 \times 6$  features balanced I/Os via terminal block connectors; an XLR connector rear panel is optional. Specs include  $+20\text{dB}$  maximum gain;  $600\Omega$  or  $100\text{k}\Omega$ ,  $+21\text{dBm}$  maximum input level;  $600\Omega$  balanced or unbalanced,  $+23\text{dBm}$  maximum output level; and a frequency response of 20Hz-20,000Hz,  $\pm 0.25\text{dB}$ . Suggested list price is \$395; the XLR option is \$200.

Circle (130) on Rapid Facts Card

## Alesis compressor, reference amp

The 3630 is a dual-channel compressor/limiter equipped with switchable RMS/peak and hard knee/soft knee styles. Dual 12-segment LED meters display gain reduction and I/O levels. The RA-100 reference 100W/channel power amplifier features an electronically delayed turn-on and rapid turn-off circuitry to prevent transient signals from damaging monitors or other

speaker cabinets. Built-in heat sinks provide high heat dissipation without a fan-based cooling system.

Circle (134) on Rapid Facts Card

## Tripp Lite line conditioner

The LC-1200 regulates voltage and conditions power lines for operating sensitive electronic equipment. It provides up to 1,200W of power from four Isobar spike-protected ac output receptacles. Two isolated filter banks provide protection and guard against interference. It features a 12A circuit breaker and a heavy-duty ac power cord. Complete spike, line noise and RFI/EMI filtering are built-in; external surge suppression is unnecessary. Suggested retail price is \$249.

Circle (132) on Rapid Facts Card

## Milab condenser mic

Designed for live sound applications, the LSR-2000 mic provides a maximum SPL of 133dB before saturation, and operates at 12V-52V phantom power. A silicone



rubber capsule cradle cuts out hand noise; its transformerless circuitry provides consistently detailed sound. Primarily designed as a hand-held vocal microphone, it may also be used in instrumental applications.

Circle (123) on Rapid Facts Card

## Yorkville Sound enclosures

The Pulse 153 3-way speaker system is an updated version of the 250W,  $8\Omega$  HP-150.

# HEAVY DEALS

It features a 1x15-inch Eminence woofer, a 7-inch zoned conical horn with 1-inch titanium driver, and a Leson tweeter. The Pulse 253 is a larger 500W enclosure with two 15-inch speakers, one horn and two tweeters. The Pulse 283 300W enclosure features two 8-inch Eminence speakers, an RCF horn and a Leson tweeter. All enclosures offer advanced crossover designs and 3/4-inch plywood construction.

Circle (120) on Rapid Facts Card

### Community CSX57 loudspeaker

The 3-way CSX57 has a power capacity of 300W<sub>rms</sub> and 750W program, and a frequency response of 40Hz to 18kHz. At the midrange level, it is horn-loaded to enhance directivity, and uses a 1-inch ferrofluid compression driver with a titanium



diaphragm to withstand constant high SPLs. High frequencies are directed to a horn-loaded PZT driver that receives signals from the passive crossover beginning at 10kHz. Maximum SPL is 128dB; sensitivity measures 102dB SPL/1W/1m. PowerSense fuseless circuitry protects against system overload. Suggested retail price is \$695.

Circle (118) on Rapid Facts Card

### Dynacord MCX series consoles

The 4800 live and recording mix consoles are available in 16, 24 and 32 channels with eight submixes down to two channels. The 32x8x2 is especially suited for recording applications. The 4800 has a steel design and retrofit multicore system; all consoles feature a modular design.

Several I/Os for connecting tape machines, and auxiliary send and monitoring capabilities make the consoles suitable for studio applications. A separate 19-inch power supply unit is included.

Circle (121) on Rapid Facts Card

### Comprehensive mic mixer

The MM-3100 electronic field production mixer combines three balanced input signals and permits these combinations to be changed regardless of the differences in the signal generator. Each signal has individual volume control with calibrated scales. The one balanced mic output is switchable +4/-20dBu output level. Other features include Master gain control, a battery check switch, a headphone amp with separate volume control and an external ac/dc power socket. A padded carrying case with Velcro closures is made of waterproof Cordura. List price of the MM-3100 is less than \$400; the case is \$59.

Circle (122) on Rapid Facts Card

### Crown Macro-Reference amp

The Macro-Reference amp is a 20-bit digital unit that features a standard analog input augmented by a plug-in input that will accept modules capable of working with many digital formats. It is operable in bridged/mono or parallel/mono modes, and can drive loads rated as low as a single ohm. An internal bandwidth of 3Hz-100,000Hz,  $\pm 1.5$ dB, eliminates the possibility of transient intermodulation or slewing-induced distortion. Other specs include a power rating of 760W/channel at 8 $\Omega$ , 0.02% THD and a S/N ratio of 120dB. Suggested retail price is \$3,500.

Circle (125) on Rapid Facts Card

### JLCooper synchronizer

The PPS-2 is an updated version of the PPS-1 synchronizer. It reads and generates SMPTE time code and converts SMPTE into MTC or Direct Time Lock. It also reads and generates JLCooper's Smart FSK sync, and converts it into MIDI clock with song position pointer. New features include jam sync, which provides SMPTE regeneration capability for tape duplication and time code repair; flywheeling, which protects against tape dropouts; and Auto-Merge. Optional PPS-2 Remote Software lets the user enter a start time for striping SMPTE. Suggested list price of the PPS-2 is \$169.95; the software is \$14.95.

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# Cutting Edge

## MEDIA

### APRS reference book

The Association of Professional Recording Services has published the 1991 edition of the "Guide to Recording in the U.K." The book provides details of more than 100 sound recording and post-production facilities and mobiles, and pressing and duplicating facilities. A biography section of leading music producers is included. Entries feature a photo and list of services, equipment and charges. Edge-of-page symbols highlight key features.

Circle (135) on Rapid Facts Card

### Computer Concepts demo disk

The DCS demo disk for the Digital Commercial System is available in IBM-compatible format on 5.25- or 3.5-inch diskettes. It simulates a walk through the DCS production studio and control room. It also includes an overview of the product, pro-

duction and control room interfaces and a brief review of log editing and system configuration.

Circle (137) on Rapid Facts Card

### Shure products catalog

Shure has published a 25-page catalog of sound reinforcement, recording and broadcast products, featuring information and specifications on Shure's product lines including the VP88 stereo mic, Beta series mics and L series wireless systems. It is free of charge.

Circle (136) on Rapid Facts Card

### Magna-Tech data sheet

A 2-page data sheet on the Series 10,000 Electronic Interlock Magnetic film recorders and reproducers for motion picture post-production lists basic features and information on the film drive system, the reel spindle drive, magnetic heads and other parameters.

Circle (139) on Rapid Facts Card

### Magic Boxes catalog

The 1991 catalog contains products such as Digital Flicker generators; miniature 2,000W, 5,000W and 10,000W Dimmers; Shadowmaster Plus, a flicker/dimmer unit with chaser/tracer functions; Lampdog, an hour timer and key-switch unit; and the Batt-laster, a unit that discharges, tests and maintains nicad, lead-acid and other battery packs.

Circle (138) on Rapid Facts Card

### Pearson Technologies seminar catalog

A catalog describes the 15 fiber-optic workshops and seminars available from Pearson. The workshops cover the aspects of using fiber optics for data transmission. Theoretical knowledge and hands-on training are stressed. All courses include extensive note packages of reference materials.

Circle (140) on Rapid Facts Card

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Circle (51) on Rapid Facts Card

## Stewart amplifiers



The PA-1200 and PA-1500 are dual monaural amps featuring Switch Mode Power Supply, which recharges at 120,000 times per second; capacitors must supply only 3%-5% of the total output power. Each chassis contains two independent amps, each with its own power supply, sharing the ac power cord and cooling fan. If a fault condition shuts down one channel, the remaining channel continues to operate unaffected. A circuit monitors the current drawn from the power supply, but does not affect the amp's output until the load impedance falls below  $\frac{1}{2}\Omega$ .

Circle (126) on Rapid Facts Card

## Soundtracs console lines

The Megas Mix is a general-purpose console for applications where a maximum of four group buses is sufficient. The Megas Stage is a dedicated sound reinforcement console with moving coil VU meters and group mutes. The Megas Studio is a dedicated recording console with 16 or 24 group buses, with or without patchbays; it is fitted with MIDI mute automation. The Quartz production console offers 104 real inputs, integral MIDI muting and 24 buses. The Sequel sound reinforcement console features a 4-band parametric EQ with high-pass filter.

Circle (127) on Rapid Facts Card

## SpeakEasy loudspeaker design tool

The Low Frequency Designer 1.0 is a computer-aided design program, written for IBM PCs and compatibles, that models the LF performance of loudspeaker systems. It models five types of systems: sealed HP, vented HP, sealed-vented BP, double-vented BP and series-vented BP. It calculates and plots the magnitude response and displacement for each type of system. It also calculates a set of driver and box parameters, alters the value of selected driver and box parameters, varies

a parameter in steps over a given range and generates a family of curves. List price is \$195.

Circle (131) on Rapid Facts Card

## Electro-Voice floor monitor

The FM-12C is a 2-way coaxial system designed to provide live stage monitoring in areas with limited space. It delivers 200W long-term power with 800W peaks. It features a 12-inch cast-frame woofer, coupled to a SuperDome HF driver, which provides controlled response to 18kHz. The sealed enclosure is made of roto-molded polyethylene; its shape allows for 35°, 45° and 50° orientations to the floor. Full-range monitoring is provided in a package that weighs less than 30 pounds.



Circle (124) on Rapid Facts Card

## A-T field production package

Audio-Technica has introduced a stereo field production package, containing the AT4462 mixer, the AT825 X/Y stereo field recording microphone and the AT804 omnidirectional dynamic. The package is designed to give users an equipment combination for almost any application in the field.

Circle (144) on Rapid Facts Card

## Sanken COS-11BP mic

A battery-pack version of the company's COS-11 lavalier, the COS-11BP is designed for field or remote applications. The mic operates with AA batteries or 12V-52V phantom power, contains a vertical diaphragm for greater effective area and highest performance and protection

against sweat and spray, and a 3-layer windscreen. It measures 4mmx16.1mm and contains a specially designed clip to avoid mechanical/surface noise. A line of accessories is also available.

Circle (142) on Rapid Facts Card

## Tascam CD player



The CD-301 features balanced and unbalanced outputs, hard-wired 10-key remote control and a 20-program memory. Two CD-301s can be joined together and pre-programmed by a Link function, which allows each unit to be started and stopped by the other for continuous playback. It features a center-drawer design and built-in rack-mounts. Retail price is \$549.

Circle (133) on Rapid Facts Card

Spike  
and  
Mic



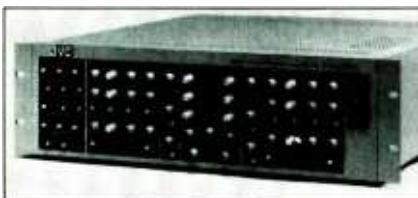
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## CUTTING EDGE

Continued from page 71

### JVC parametric EQ

JVC's DS-LC900U digital parametric controller and equalizer is designed to emulate the feel of an analog EQ. Using a FIR-type digital filter, the unit provides 28 fixed



frequencies available over four overlapping bands, which provides a total of 54 EQ points. In addition to shifting center frequency, response sharpness and level boost/cut can be varied. I/Os include JVC-DAS, AES/EBU and SDIF-2. An RS-232-C port allow the DS-LC900U to be controlled via a personal computer.

Circle (141) on Rapid Facts Card

### Nady 1200 wireless

The Nady 1200 VHF wireless microphone system features a mic ball sleeve with a modular plug that snaps into the unit's microphone casing, allowing users to switch capsules without soldering. Three standard mic elements are available — Shure SM 58, Electro-Voice N/D 757 and E-V N/D 357 — or the company will custom-install a user's preferred mic element into the system. Up to 20 systems can be used



on a single stage, according to the company, and lavaliers can be added to the system. Users can custom-select a frequency when ordering.

Circle (143) on Rapid Facts Card ■

## DIGITAL DOMAIN

Continued from page 22

need to share the same hardware.

One of the advantages of sharing hardware is that all users could access the same central sound library. SSL, NED and others are already working in this area. Unfortunately, multi-user systems are difficult to design, because of the difficulty to find a true multi-user operating system capable of performing the amount of simultaneous real-time operations that audio requires.

### A NEW WARMING TREND

Some purists harp on the need for greater sampling rates. Sure, higher sampling rates would be nice, but let's not forget the fact that our release format has a fixed sampling rate of 44.1kHz. And, if you didn't already know, sample rate conversion is a destructive process.

So, what will it take to get die-hard analog enthusiasts interested? How about an all-tube analog front-end for a digital recorder? Before you laugh, think again. Everyone knows that the A/D circuit is one of the most critical parts of the conversion process. Tube processors are cherished because of the warmth they bring to sound.

When was the last time you heard someone refer to digital as warm? But what about the noise floor? Aren't tubes noisy? Not necessarily; a well-filtered power supply fronting a good tube design is capable of more than 110dB dynamic range. Finding a digital recorder with a lower noise floor could be difficult considering 16-bit products are capable of a S/N ratio with a theoretical limit of 96dB. David Manley already markets such a product with 20-bit equivalent resolution.

Although manufacturers are presently hard at work on second- and third-generation products, it's good to note that many of the current products have been on the market for more than three years. Because workstations are software-based, manufacturers are able to continue making improvements without requiring the users to buy all new hardware. This is one of the biggest advantages of tapeless production.

The winners will be the companies that provide the flexibility and ease of use of analog, combined with the incredible new functionality that digital technology can offer. The race is on . . . . ■

## ROADWORK

Continued from page 45

well; in fact some of the cabinets once fell five feet off a truck and nothing happened to them. The flying hardware is extremely easy to use and they sound great." Both the main and stage systems are powered by Carver 1250 and 2.0 amplifiers. Wedges are Klipsch's 2-way (passive crossover) KSM1 that sport a 15-inch ported woofer and a 1.5-inch compression driver. Walker consoles are utilized in both FOH and on stage. Recent equipment purchases include a Whirlwind 42-pair blue Belden snake and Klark-Teknik Quad limiters and noise gates.

**Odds and Ends:** Sound reinforcement company **Frank Mayes & Associates** just purchased another high-end 40-channel AT1 Paragon universal mixing console. This is FM's second Paragon purchase this year ... London's **Nomis Studios** has become the first rehearsal hall in the U.K. to install Ramsa's WR-S840 monitor console. Two of the 840s were supplied by distributor Britannia Row for the six-studio complex. Nomis also employs the T.C. Electronic 1128 programmable EQ system ... **Clair Bros.** (Lititz, PA) had a very slow late winter season. For awhile only two of its many systems were out working. The two tours — Sting and Paul Simon — feature the new Coherent Transfer drive system and have been drawing rave reviews for audio quality (see the article on Clair's Coherent Transfer System in this issue) ... **Proshow USA** (Bellevue, WA) just purchased 24 Electro-Voice MT-4 main cabinets, bringing its MT-4 inventory up to 96 boxes. 56 MTs are for touring; the rest are installed at the Kingdome in Seattle. Proshow also recently purchased a Soundcraft Delta monitor console ... A **MacPherson** LPM-2 monitor rig was recently delivered to ABC (Burbank, CA) for use on Rick Dees's "Into The Night." Chicago's Media Control purchased a complete 16-box MacPherson main system and a 12-mix MacPherson monitor rig ... Loudspeaker manufacturer **Community Light & Sound** just released the new RM220 electronically controlled stage monitor. It is horn-loaded with two 8-inch speakers, a 2-inch compression driver and a 1-inch feedback-sensing, wavefront-coherent driver. ■

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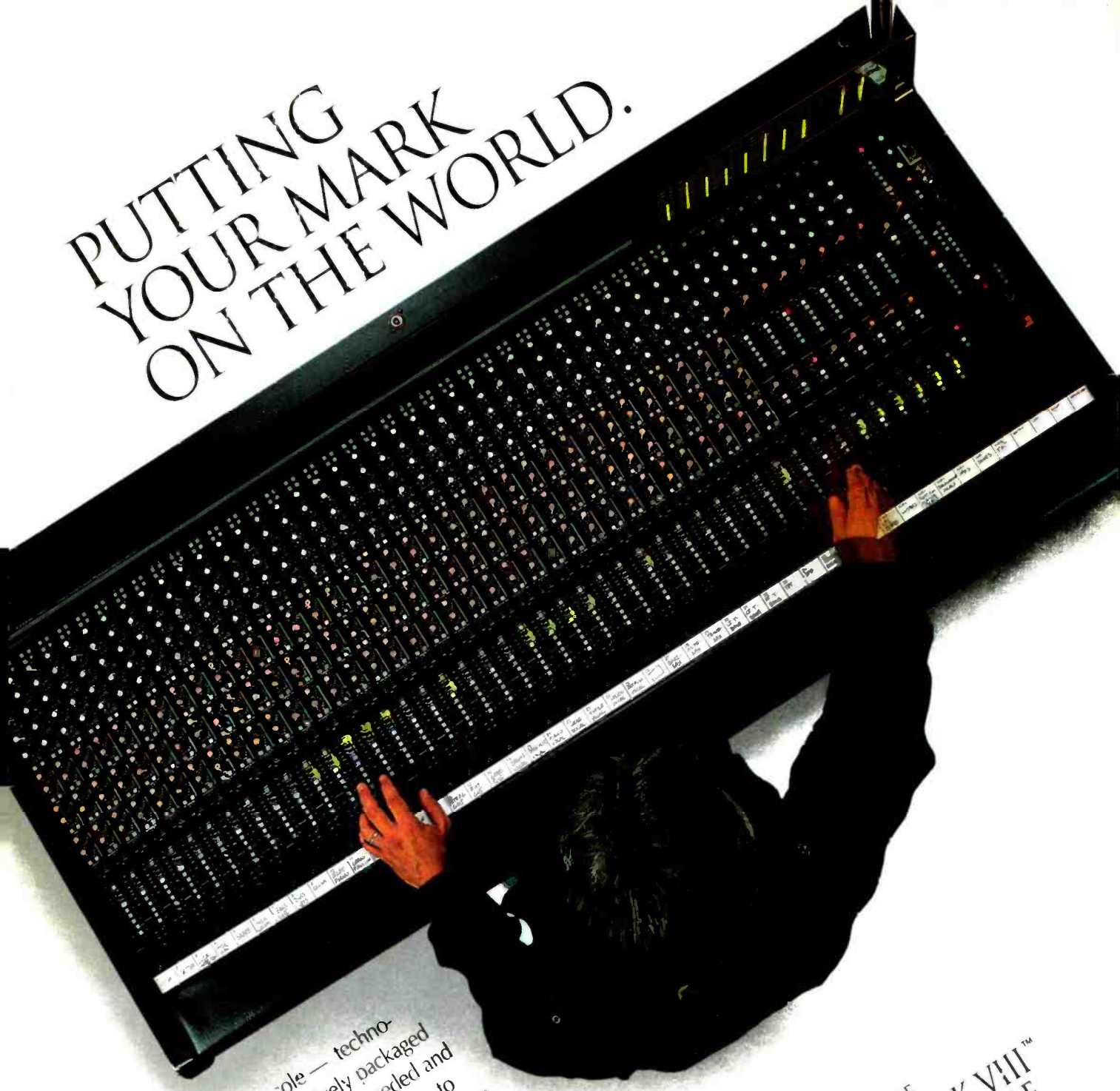
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