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PROFESSIONAL RECORDING • SOUND AND MUSIC PRODUCTION

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**Cover:** What does the future hold for consumers in the ongoing war over re-cording and playback formats? Will the CD continue its startling climb, or will its dominance be blunted by the new formats such as DCC or Mini Disc? Stay tuned. **Photo:** Joe Drivas. **Inset photo:** David Lee, courtesy of Warner Bros.



# 8 Tracks

RECORD  
INPUT

1 2 3 4 5 6 7 8

POWER

1 2 3 4 5 6 7 8

**D**emos to masters. Creativity to tape. Dreams to reality. Magic phrases for those who want to make music that sounds as good as it feels.

The inspiration for these thoughts is the **Alesis ADAT Professional Digital Audio Recorder**, a technological revolution that tears down the walls to your creativity while delivering world class master recordings. Too good to be true?

Here's the concept. ADAT fuses a supersonic Alesis-designed very large scale integrated chip set with the proven reliability of an industrial grade S-VHS\* tape transport and a logical, sensible user interface. The result is a digital tape recording system that exceeds the most demanding requirements of professional audio and that can be used by literally anybody. Hard to believe?

Here's some specs. Bandwidth 20Hz to 20kHz  $\pm 0.5$ dB. Total Harmonic Distortion plus Noise 0.009%. Wow and flutter unmeasurable. ADAT uses the professional standard 48kHz sample rate and delivers better than 92dB dynamic range.

Here's some features. ADAT uses the familiar tape recorder controls that you already know how to use so

recording is fast, intuitive, effortless. Connections are provided for balanced +4dBu levels on a single 56 pin ELCO\*\* connector and unbalanced -10dBV signals on 1/4" jacks. And ADAT uses S-VHS tape because it's a proven, robust recording medium with wide 1/2" tape to solidly support ADAT's 8 recording tracks while delivering 40 minutes of recording time.

The best part. ADAT's Proprietary Synchronization Interface (Patent Pending) locks multiple ADATs, independent of the audio tracks, to single sample accuracy  $\pm 5\%$  of 1/48,000th of a second! In other sciences this is referred to as 'air tight'. So multiple ADATs function in perfect mechanical and electronic unison: up to 16 ADATs without an external controller. That's 128 tracks!

More best part. ADAT's Proprietary MultiChannel Optical Digital Interface (Patent Pending) simultaneously sends all 8 tracks of recorded information out the Digital I/O for perfect safety tapes and perfect track bounces.

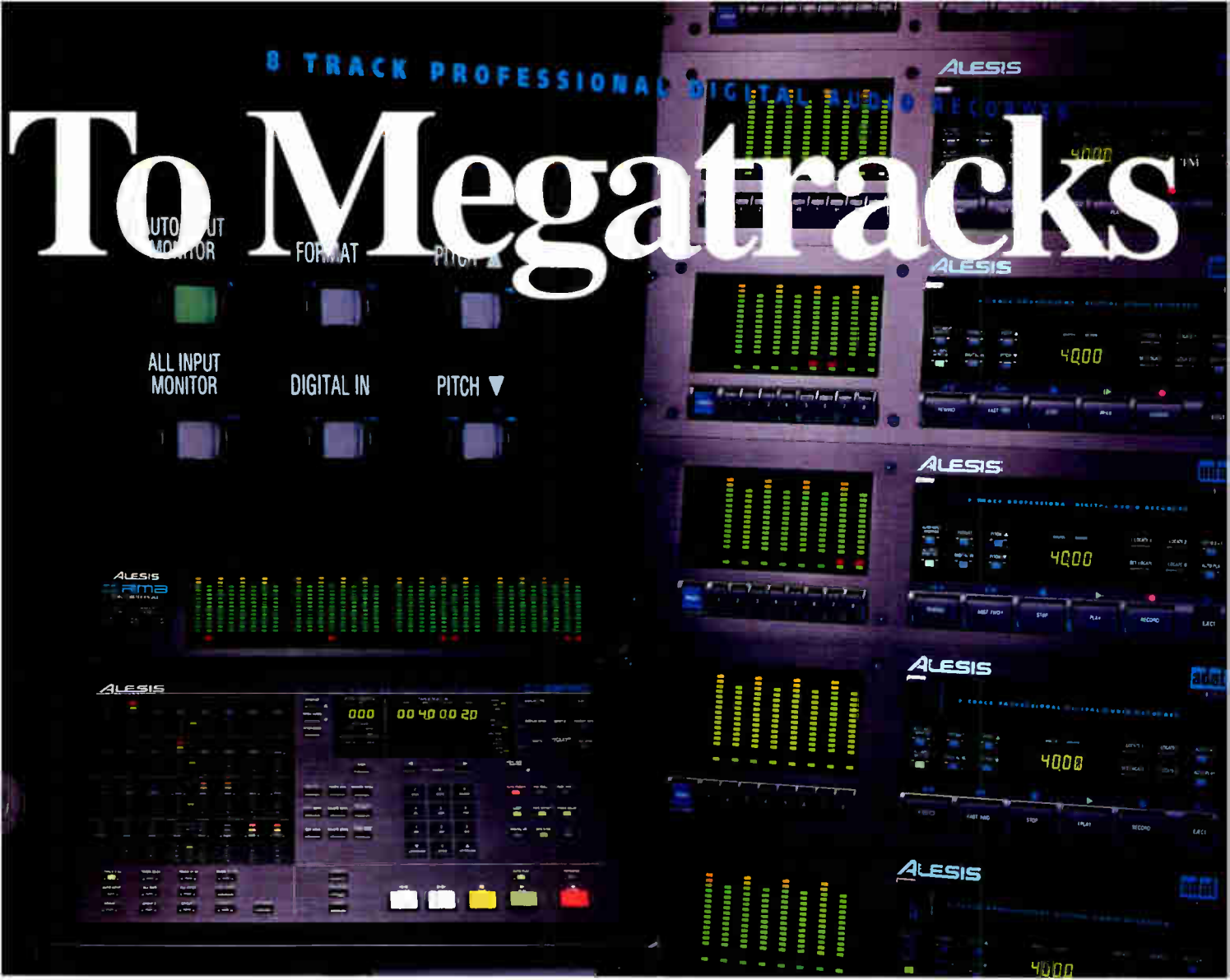
Even more best part. The optional BRC Master Remote Control opens a whole other door to the ADAT miracle. With it you can control up to 16 ADATs (128 simultaneous tracks) with full transport functions, track offsets, machine offsets,

8 Tracks to Megatracks. Megatrack and ADAT Worldwide Network are trademarks of Alesis Corporation  
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Also available: The AI-1 ADAT to AES EBU and S PDIF Digital Interface with sample rate converter.  
RMB 32 Channel Remote Meter Bridge.

Call 1-800-5-ALESIS for information about the ADAT Worldwide Network.







# To Megatracks

digital assembly editing via the Digital I/O, SMPTE and MIDI Time Code, Video Sync and more.

What does all this mean? Here's just a few benefits.

It's commonly known that many hours are wasted during expensive album projects while the artist, producer and engineer work in vain to reproduce the rhythmic feel and tonal nuance of demos. Demos that couldn't be used because they suffered from noise, limited bandwidth and overall sonic feebleness. Those days are over forever. ADAT's Sync and Digital I/O perpetually link your demos to your masters making them all part of the same creative process. Every track you record on ADAT is a master track that can be flown into any other ADAT recording, at any time. The best part is that ADAT can be there at any time to catch you at your best, flawlessly stored in the digital domain...forever.

Need more tracks? ADAT studios can be expanded at any time. The cost of a single ADAT is remarkably inexpensive and new ADATs can be added as budgets permit. Add the BRC at any time for more control and advanced editing. Producers please note: with ADAT, Megatrack™ recording is a reality.

Your favorite sax player lives in Idaho? No problem. Send 'Supersax' a formatted tape with a guide track of your song. You'll get back 7 tracks of burning solos you can fly back into your production. All in perfect sync, all in the digital domain. All dripping with soul. Want more tracks? Just send more tapes.

ADAT is not only a new recording medium, it is the new recording standard. Imagine a network of ADAT users from bands, composers and project studios to professional studios, video editing suites and broadcast production studios. All recording master quality tracks with full compatibility and no barriers between their creative disciplines. In fact, we're launching the ADAT Worldwide Network™ multitrack recording group to facilitate communication between ADAT studios.

In time we'll all start taking these little miracles for granted. Before that inevitable event, unpack your first ADAT and track a minute of single notes and chords on your favorite instrument. Play loud, play soft. Play it back and listen really close. It's always a good feeling to have your mind completely blown.

See your Alesis ADAT Dealer today and start Megatracking on ADAT.

Alesis Corporation 3630 Holdrege Avenue Los Angeles CA 90016



# FROM THE EDITOR

The consumer playback world gets blitzed this month with the biggest format introduction, times two, since the birth of the CD ten years ago. Duplication, replication and mastering facility owners are watching initial public reactions carefully in order to make decisions on capital investments.

As this issue goes to press, Sony's top brass are cutting the ribbon on the first production run of Mini Discs at Digital Audio Disc Corporation in Terre Haute, Ind. Meanwhile, in Amersfoort, The Netherlands, the much-delayed Digital Compact Cassette recently began to roll off the assembly lines for shipment to European, American and Japanese distribution centers. Around the world, heads are being scratched in remembrance of fossils like Beta home video, the Elcassette and Quad speakers. Consumers and professionals alike are wondering if there is really room for either of these new consumer formats.

And what about this high-end tweak on the CD that's all the rage? We are never totally happy with our current level of technology. With each improvement, our ears and measurement systems become intensely critical of things we once thought brilliant. We chase the high-fidelity horizon to no real end, just job security for the technically employed.

Many of these topics are fodder for this month's Tape and Disc theme issue. We owe thanks to Phil De Lancie, our own Mister Master, for his guiding hand in preparing this edition.

A final thought for the month. It's going to be an austere holiday season—why not make a list of "Great Recordings I Have But Never Listen to Anymore," dig them up and take a little time to remember? Get out that turntable. Stroll down Memory Lane, and then share some great, slightly used music with your friends.



Keep reading,

David Schwartz  
Editor-in-Chief

## STAFF

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PUBLISHER Hillel Resner

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GRAPHIC DESIGNER Linda Gough

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Sue Horwitz

EASTERN ADVERTISING MANAGER  
Michele Kanataus

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MARKETING MANAGER Elise Malmberg  
ART DIRECTOR, SPECIAL PROJECTS

Michael Zipkin

ASSISTANT TO THE PUBLISHER/  
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David Schwartz and Penny Riker Jacob

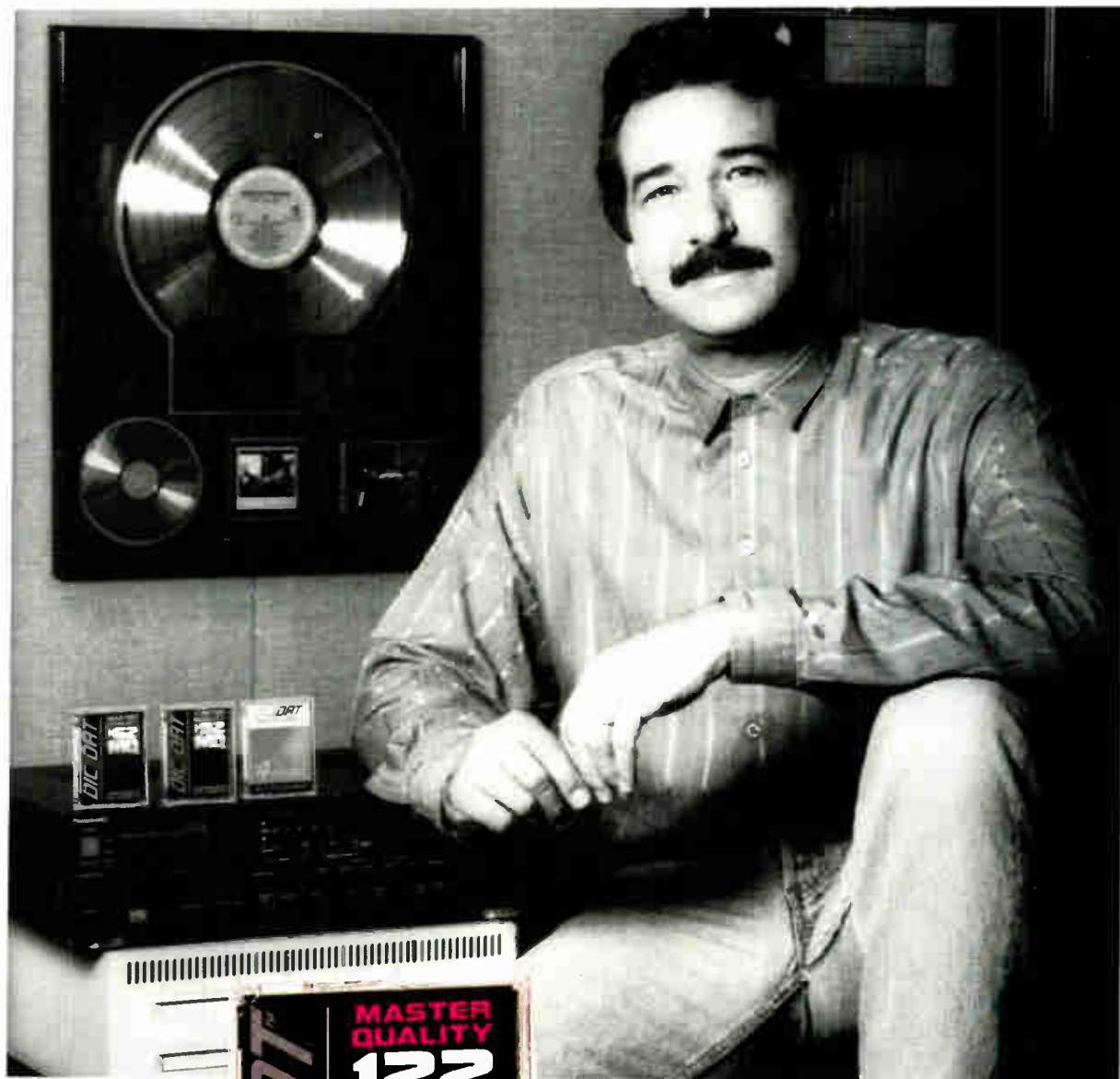


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Technology in its highest form. That's the John Arrias trademark witnessed on albums he engineered for Barbra Streisand, Bob Seger and countless other artists who demand his distinctive sound of perfection.

John developed his own audio preservation system which transforms older analog recordings into crisp, clear digital sounds. And to back up these and new recordings, he uses four digital audio tape computer drive units. Whether mixing down or backing up, John relies on DIC Digital's MQ series DAT and 4 mm data grade metal particle tape products.

The only cassette made in the U.S.A., the MQ shell has increased stability and structural integrity so it can stand up to rigorous studio use inflicted by the most astute engineers.

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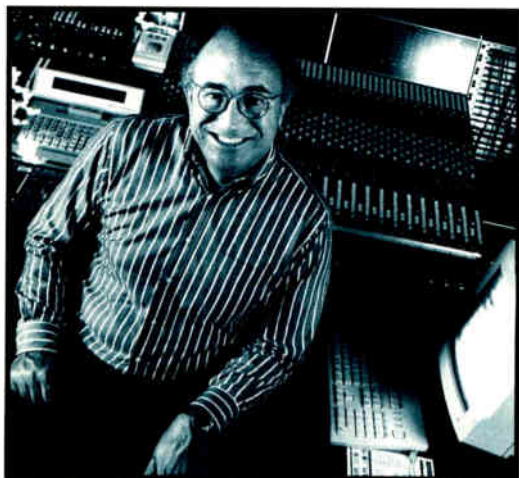
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# DIGIDESIGN HOW THE PROS HA



## Randy Thom

Film Sound Designer —

*Backdraft, Wild at Heart, Star Trek III, Raiders of the Lost Ark*

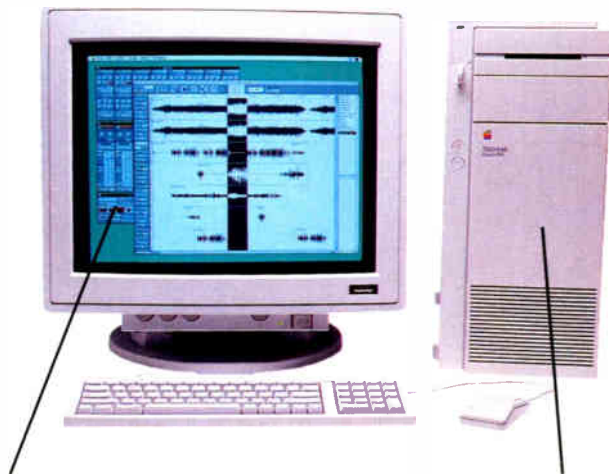
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So why are more pros putting their money on Pro Tools™ than all other multichannel digital

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*Pro Tools software provides a simple yet powerful interface for multitrack digital audio recording, one-step spotting, trimming, crossfades, and more.*

*Pro Tools is based on the Apple Macintosh® which means it's easy to set up, and extraordinarily easy to learn and use.*



*Post magazine's readers voted Pro Tools the best digital audio workstation of the year over some of the biggest names (and the biggest price tags) in the business.*



*We're one of the fastest growing companies in America and the leader in digital audio recording and editing systems for one reason—you. We listen to your needs and those of the rest of the industry. Our business is making products that help build your business.*

# PRO TOOLS. HANDLE THE TOUGH SPOTS.



## Geoffrey Rubay

Sound Editor — *Basic Instinct, Reservoir Dogs*

*"Of all the systems I've encountered, I must say I prefer Pro Tools. I try to avoid buying equipment, but I feel that Pro Tools is just too cool not to have whenever I want it, no matter where I'm working. Some people bring their own pen to work; I'll bring my own digital editing system."*

mode devoted to post: *Spot* mode. With it, spotting and trimming is as easy as *one keystroke*. Best of all, Pro Tools is a joy to use—a fact you'll appreciate even more during lengthy spotting sessions (just ask Randy Thom or Geoffrey Rubay).



*For fast spotting adjustments, Pro Tools' programmable "nudge" feature lets you quickly and precisely adjust audio spots—with sub-frame accuracy.*

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# CURRENT

## **CONGRESS PASSES HOME RECORDING ACT**

The United States Congress passed the Audio Home Recording Act of 1992 on October 7, sending the bill to President Bush for his expected signature. The legislation, which is designed to remove barriers to advanced audio technology and sound recordings reaching the market, clears the way for the introduction of DCC, Mini Disc and future consumer digital recorders.

The legislation was created last year when consumer hardware manufacturers joined with record companies and music publishers to end more than a decade of acrimonious dispute over home taping. The software side agreed to drop opposition to consumer digital recording formats in return for royalties levied on recorders and blank media to compensate for revenue losses attributed to home taping.

Hardware interests agreed on the mandated inclusion of SCMS digital copying limitations in return for the exemption of home taping, analog or digital, from the infringement provisions of copyright law. For more information, call (202) 224-7454.

## **NEVE/AMS MERGER NEWS IN THE STATES AND ABROAD**

As you probably know, the United States' branches of Neve and AMS merged this fall. As of October 1, Neve Electronics International Ltd. and AMS Industries plc merged their business interests and now occupy joint headquarters in Burnley, Lancashire, England. The Neve headquarters in Littleington were forced to fire approximately 80 Neve UK employees; offers of continued employment and relocation to other group sites will occur when pos-

sible.

Mark Crabtree, formerly of AMS, takes over as managing director of the merged companies. Hans Heider is the chairman, and Laci Nester-Smith is deputy chairperson and group president of Siemens Audio and Video Systems.

Former Siemens U.S. president Gerhardt Gruber will be returning to the AMS Austrian headquarters to head the regional Siemens office there. Former AMS executive John Gluck took control of the presidential reins at Siemens U.S. Gluck's promotion is intended to help unify the American operation, which has experienced 12 rocky months following the acquisition of AMS.

## **NARAS OFFERS HEALTH INSURANCE**

MusiCares, the charitable foundation of the National Academy of Recording Arts and Sciences, implemented a national, self-paid insurance program for music industry professionals. As of October, the program was accepting applicants in Arizona, California, Florida, Illinois, Indiana, Louisiana, New Mexico, Nevada, North Carolina, South Carolina, Texas, Georgia, Michigan, Tennessee and Wisconsin.

The four options available to applicants include a preferred provider plan, an HMO plan, a dental option and a visual plan. Coverage is available to individuals, small and large employer groups, organized labor and seniors. Interested companies or individuals should contact PacFed Benefit Administrators for an enrollment kit and additional information. The PacFed address is 801 North Brand Blvd., Suite 1160, Glendale, Calif. 91203. The phone number is (818) 243-0222.

**WAVEFRAME ACQUIRED**  
The Mountain View, Calif.-based

video post-production systems company Digital F/X announced the acquisition of the high-end audio workstation manufacturer WaveFrame. WaveFrame will merge with the Digital F/X Audio Division, which was formed with the acquisition of the assets of Hybrid Arts in July of this year. The Digital F/X Audio Division is in the L.A. area.

## **PHILIPS' CD-E**

Philips plans to market a rewritable CD-compatible consumer recording system in 1996. The system, called CD-E for "erasable," will probably be based on the phase-change approach to optical recording that Tandy announced several years ago and later quietly abandoned. Phase-change recordings may be read by the optical pickups in existing CD players. The CD-E system would reportedly be capable of recording full 16-bit audio without the data compression schemes used to fit album-length program on Mini Disc and DCC.

Another Philips development that's a little more solid is their full-motion video adapter for Compact Disc-Interactive. According to Philips Interactive Media spokesperson Anne Lieberman, Philips will produce a chip that can plug into a CD-I unit and enable it to play continuous full-motion video from a 5-inch CD using the CD-I format. The CD-I player will also be compatible with Kodak's new Photo-CD technology. No definite release dates have been released.

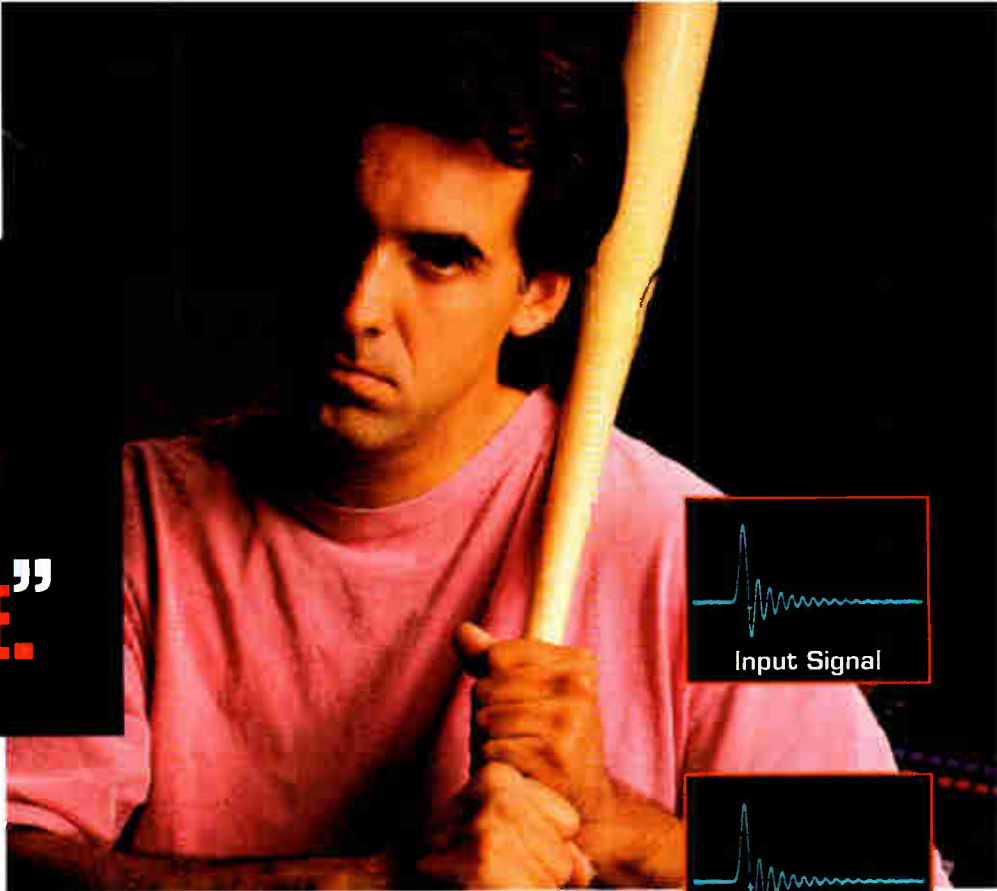
## **ITA JOINS REPLITECH**

The ITA reached an agreement with Knowledge Industry Publications to coordinate the seminar side of the Replitech Conference

—CONTINUED ON PAGE 16

Until every facility and touring system gets one, you'll want to keep your SuperGate™ nearby. That's

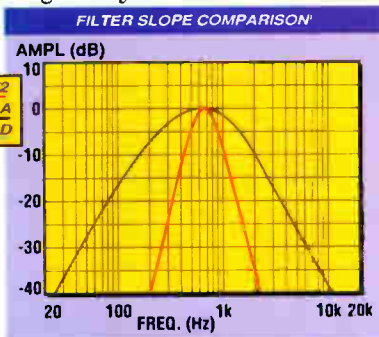
# “NOBODY TAKES MY SUPERGATE.”



because dbx's real engineering advances mean your 172 will pull sparkling, clean output from material other gates can't touch. You won't want to let go of your SuperGate because it sounds better, sets up faster and does more for you than those other gates can.

## You'll be more selective with Voltage Controlled Filters.

The SuperGate uses sophisticated VCFs to produce steep slopes that are TWICE as selective—dramatically reducing false triggering. They're also faster to set up because the PARAMETRIC design lets you zoom in on exactly the instrument or part of the attack you want to catch.



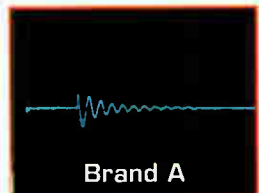
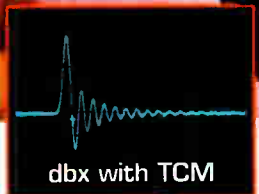
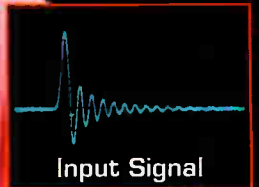
## You'll stop time with Transient Capture Mode™

You can see and hear the difference TCM™ makes compared to other gates. With real-world filter and threshold settings, it attacks so quickly you'll actually catch those critical transient wavefronts that give percussive signals their life and definition.

## You'll control time with One-Shot™ mode.

In One-Shot mode, the 172 gives muscle tone to that drummer

with the not-so-steady hand or foot, so you get solid, even output from erratic input. There's more—we'll fax you the whole story. But with all of the people who want to get their hands on a SuperGate, it may be awhile before you can test one for yourself. When you do get yours, you may find yourself going to extremes to hang onto it.



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World radio history

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C-800





SONY

SONY

C-800G

## AND VERY COOL.

The C-800G is engineered to excel in vocal recording applications and employs an innovative thermo-electric cooling system, which significantly reduces inherent noise and distortion. A newly developed dual diaphragm capsule provides superior off-axis frequency response.

All of which means this: for sound that's very warm and very cool, one name is very clear. Sony.

For more information, call 1-800-635-SONY, ext. TUBE.

# INDUSTRY NOTES

Hiroyuki Nishiyama is the new president of South San Francisco-based **TOA Electronics Inc.** He brings almost 30 years of sales and marketing experience to his new position, all of which he has accumulated at TOA since joining in 1963...**Alan Burrows** was appointed general manager of Sydney, Australia-based **Fairlight ESP Pty Ltd.**...**Sony Corporation of America** in Montvale, NJ, appointed **Kevin Dauphinee** to VP/general manager of the Business and Professional Group's Northwest region...**Rane Corporation** (Mukilteo, WA) hired **Omnimedia Corporation** to handle their Canadian distribution...The **Orban** division of **AKG Acoustics Inc.** (San Leandro, CA) welcomed **Phil Moore** to a newly created position: As Orban Product Manager, Moore is responsible for the maintenance and development of Orban's Optimod and Studio product lines for all markets worldwide. In other AKG news, **Daniel Abelson** was named the exclusive U.S. sales representative for the Turbosound line of speaker products, and **Joey Wolpert** is a new product specialist...**Numark** products are once again available. Manufacturing is underway in a California production facility owned solely by **Numark Industries** (headquartered in East Providence, RI), the company that grew out of Jack O'Donnell's purchase of Numark Electronics...**Jimmy Kawalek** was appointed to the newly created position of sales manager, entertainment products at **Renkus-Heinz Inc.**, Irvine, CA...**Denon** (Parsippany, NJ) welcomed two new managers to its Professional Audio Division: **Barry Seiden** is national sales manager, and **Michael Stelts** is product manager...**Bose Corporation** of Framingham, MA, appointed **Allan J. Evelyn** to the newly created sales position of manager, residential

market development...**TRF Production Music Libraries** and its associate music publishing Co., **Alpha Music Inc.**, have moved. The new address is 747 Chestnut Ridge Rd., Chestnut Ridge, NY 10977. Phone (800) 899-MUSIC and (914) 356-0800; fax is (914) 356-0895...**Grey Matter Response** of Palo Alto, CA, appointed **Suz Howells** director of sales and marketing...**Ensoniq Corp.** of Malvern, PA, made two hires in customer service: **Dennie Edwards** will service accounts in the Midwest, and **Anthony Ferrara** will service mid-Atlantic accounts...**Circuits Maximus Company Inc.** (CMCI) of Arlington, VA, chose **Audio Independence Ltd.** as the exclusive North American agent to represent the company's CMAX™ Wearable Monitor Systems...**First Choice Marketing** now represents **Crown** (Elkhart, IN) in the northwest U.S... Some changes in **Vega's** (El Monte, CA) sales and marketing staff: **Ken Bourne** was promoted to VP of marketing; **Robert Bell** was promoted to wireless marketing manager, and **Paul Baughman** has been named national sales manager...**Ralph Jones** was promoted to the newly created position of VP of development at **Meyer Sound** in Berkeley, CA...**Michael Schwartz** joined **Fender Musical Instruments** (Corona, CA) as manager of professional sound products...**Shure Brothers Inc.** (Evanston, IL) promotions: **Harvey Amend** to executive VP, operations; **Bill Bevan** to VP, research and development; **Nancy A. Calvert** to director, marketing communications; **James M. Furst** to VP, total quality; **Robert Gilbert** to executive VP, sales and marketing; **Bernie Jakobs** to senior VP, engineering; **Alan B. Shirley** to director, technical markets and strategic planning; and **Aspy Tantra** to associate VP, research and development. ■

—FROM PAGE 12, CURRENT

and Exhibition scheduled for June 15-17 in Santa Clara, Calif. Seminar planning for the event, which focuses on the optical and magnetic duplication industries, will be handled for the ITA by former Electro Sound executive **Bob Barone**.

## FIRST CITIES

Twelve companies formed a project called "First Cities," which hopes to eliminate technical barriers to the delivery of integrated, interactive multimedia services. The original organizer, **MicroElectronics and Computer Technology Corp.**, was joined by eleven others, including **Apple Computer**, **Bell Communications Research**, **Eastman Kodak Company** and **North American Philips**. Additional companies from related industries may join in the future.

First Cities wants to aid in the development of a national multimedia infrastructure for entertainment, long-distance learning, healthcare and electronic commerce in and outside of the home. "The ultimate goal is interactive multimedia information—where, when and how you want it," says **Bruce Sidran**, **MicroElectronics and Computer Technology Corp.** VP and executive director of First Cities.

## CONVENTION NEWS

The **Audio Engineering Society** changed the date for their fall 1993 conference. It will now be held October 12-15 in New York City. We'll keep you informed as more news becomes available.

The second annual **ShowBiz Expo East '93** will be held January 7-9 at the New York Hilton. Organizers expect it to host 175 exhibitors and over two dozen industry-led conferences. The theme will be "One World of Production," referring to the Expo's desire to meet the needs of all people involved in production.

## CORRECTION

In our July 1992 article "Tools for the Digital Studio," the area code for **Graham-Patten Systems** was incorrect. The correct phone number is (916) 273-8412. ■

# The 4200 Series. Designed For The Control Room, Not The Living Room.

Today's recording studio has evolved into a multi-function facility which simultaneously addresses the specialized needs of music recording, film and video post, and radio production. In this environment, where the most critical listening often occurs in the final mix, close proximity monitors are often more important than the mains. The problem: most console top monitors, unfortunately, were designed for the living room not the control room. Until now.

With the 4200 Series we're taking our stand from where you sit: right where you work at the console. Designed, engineered and tested from this position, the 4200 Series is the first console mount monitor created specifically for the professional recording environment.

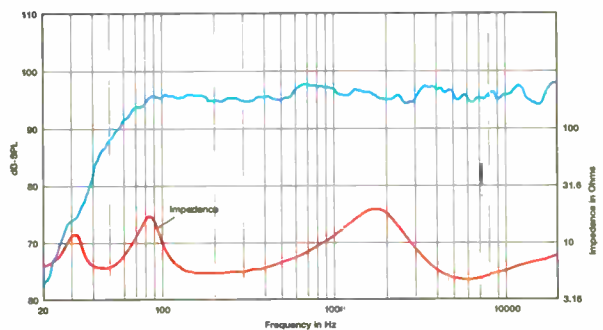
Both models give you pin-point imaging by delivering high and low frequency information to your ears at precisely the same instant. By virtue of their symmetrical design the 4200 Series monitors are mirror imaged.

And so nothing gets in the way of your music, the 4200 Series introduces our uniquely sculpted Multi-Radial™ baffles incorporating newly designed pure titanium tweeters and low frequency transducers. The combination of these technologies successfully corrects time arrival anomalies and eliminates baffle diffraction distortion.

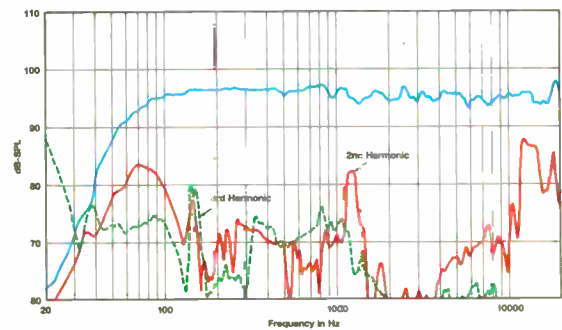
4200 Series: console top monitors designed in the studio, for the studio, with sonic performance rivaling much more expensive monitors. 4200 Series: the shape, and sound, of things to come. Available at your local authorized JBL Professional dealer.



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Frequency Response (Model 4206): 96 dB at 1 m, typical console listening levels



Distortion vs. Frequency (Model 4208) 96 dB at 1 m, typical console listening levels (distortion raised 20 dB)

by Ken C. Pohlmann

# MINI DISC TECHNOLOGY

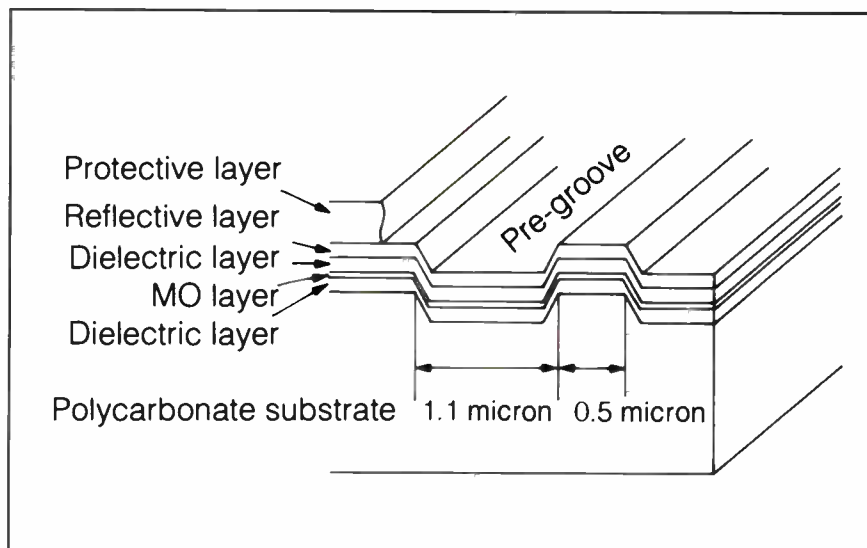
## PART II, DISC DESIGN

B

oth prerecorded and recordable Mini Disc formats have been developed to meet specific needs. The prerecorded disc format is designed to disseminate music from record companies, where high-volume production at low manufacturing cost is essential. To provide this, the prerecorded format borrows many techniques from the compact disc format in terms of concept and manufacturing methods. In fact, the prerecorded disc itself is very similar to a CD. Data is recorded on a spiral from inner diameter to outer, with a lead-in area prefacing the program area and a lead-out area following it. As in CD, MD data is represented as pits impressed in a polycarbonate substrate, and thus can be manufactured by injection molding techniques at CD pressing plants. Also, as with CDs, the pit surface is covered by an aluminum reflective layer as well as a protective layer. For commercial appeal, the disc car-

tridge has only one back shutter; the front of the cartridge can contain full graphics.

The recordable disc format differs considerably from CD and the prerecorded MD formats, and is similar to magneto-optical discs already in use in computer applications. Disc layout is similar, in that lead-in, program and lead-out areas are present. However, pits and optical storage are not used. Instead, data is stored through MO recording techniques. In addition, a User Table of Contents (UTOC) area is inserted between the lead-in and program areas; it is used to store information on data written to a disc. Furthermore, the lead-in area of a recordable disc contains information on recording power, recording time and time of the UTOC. Because MO recording requires both a magnetic head and laser pickup for operation—one on each side of the disc—shutters are placed on the front and back of the disc cartridge.



**Figure 1: MO layered construction of a recordable Mini Disc.**

To help ensure compatibility between discs and players, recordable discs are manufactured with a pre-groove configuration, as shown in Fig. 1. Using the tracking and spindle servo control circuits, this groove guides the writing and reading laser within a spiral track that is 1.1 microns wide, separated from adjacent tracks by 0.5-micron buffers. The groove is 70 nanometers deep. Data is stored in a magneto-optical layer, sandwiched by two dielectric layers. In addition, an aluminum reflective coating placed over these layers reflects the reading and writing laser beams. This entire structure is built on a polycarbonate substrate and covered by a protective layer.

Both the prerecorded and recordable discs are essentially donut-shaped, with an outer diameter of 64 mm, inner diameter of 11 mm, and substrate thickness of 1.2 mm. A magnetic center clamping plate covers the interior area and is used to stabilize the disc in the drive; clamping is performed on only one side of the disc. As with CDs, the inner circumference edge of the disc substrate is used to center the disc on the drive's spindle.

Quick random access to stored data is an important feature of the Mini Disc system. As in the CD, prerecorded MDs have addresses for each program selection, stored in the subdata area. The pregrooves on recordable MDs cover the entire recordable surface and are specially formed to create addressing data, promoting quick access. Specifically, the grooves contain a wobble to create addresses in 13.3 millisecond intervals, effectively controlling both absolute address time and the CLV

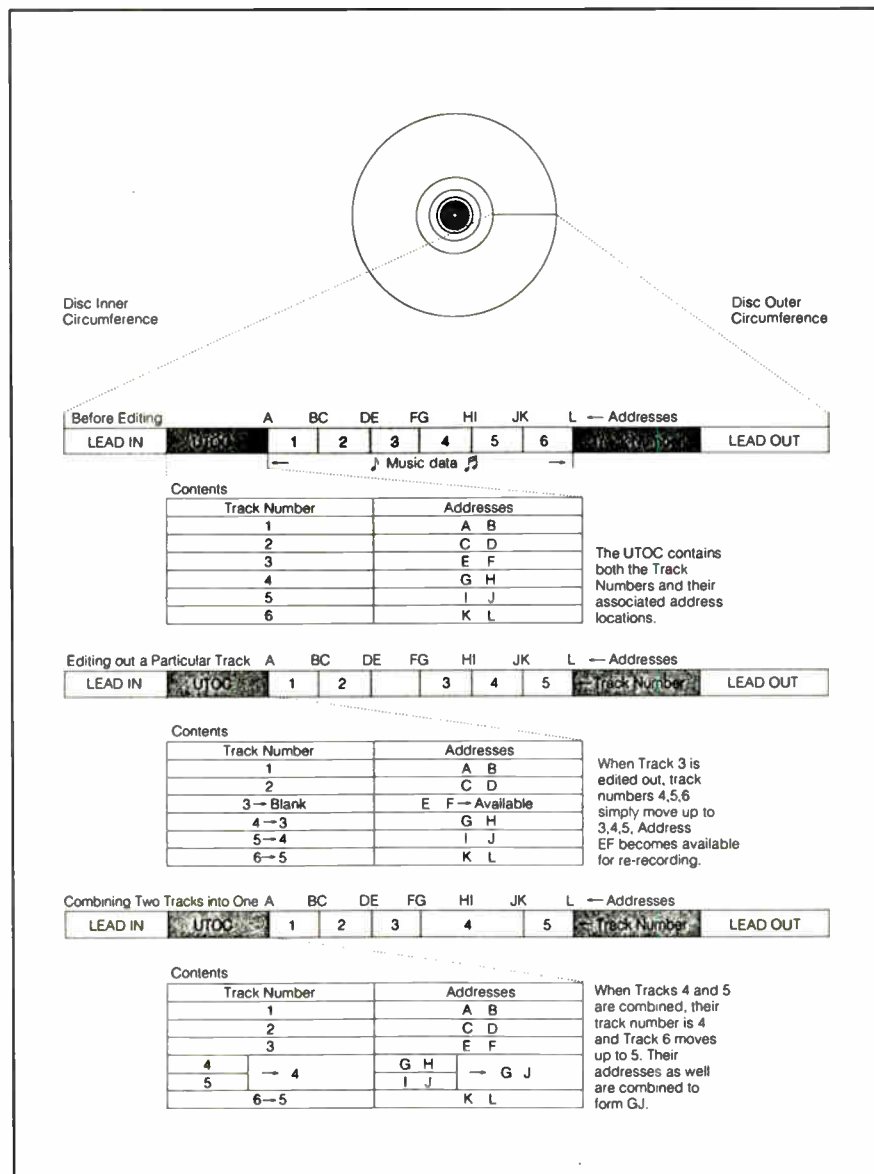


Figure 2: Track re-numbering using the Mini Disc User Table of Contents.

speed. The program area and UTOC grooves contain a wobble. The User Table Of Contents contains track number addresses (start and finish); because the UTOC uses the same MO technology as the recordable program area, track addresses can be edited to reflect changes in the recorded contents of a disc.

For example, Fig. 2 shows a UTOC. In the first case, six tracks are marked with sequentially incremented start and stop addresses A

through L. In the second, an unwanted track has been erased; track 3 is removed from the UTOC, track numbers 4 through 6 are incremented upward, and addresses E and F become available. In the third, two tracks have been combined into one; tracks 4 and 5 become track 4, track 6 becomes track 5, and start/stop address pairs G/H and I/J are rewritten to show G/J.

Although the prerecorded and recordable MD formats were devel-

oped as separate yet compatible media, Sony has recently announced a hybrid MD format that combines prerecorded and recordable areas on one disc. Such a format could see applications in language and music study. For example, a student might listen to a pronounced phrase, repeat the phrase while recording, then listen to the result, comparing it to the original phrase. Of course, this hybrid format will remain compatible with other MD hardware players and recorders. Presumably,

hybrid discs will contain prerecorded program areas coded with optical pits, along with recordable MO program areas. In addition, a UTOC would probably be necessary to log recorded tracks.

All types of Mini Discs benefit from portability and a carefully designed ability to resist the effects of shock and vibration. Larger-diameter discs, such as CDs, are inherently more sensitive to physical motion than the smaller-diameter MD. Moreover, all MD players come equipped with a memory that provides continuous data flow, even when data

reading from the disc is interrupted. This technique can be applied to CD players, but the large volume of output data necessitates a very large memory. In the MD, thanks to data reduction, the required data rate is about 20% what it is for CD; thus, a correspondingly smaller memory can be used.

Specifically, an MD player contains a 1Mb FIFO memory that acts as a buffer, holding about three seconds of stereo playing time; it is positioned prior to data decompression and conversion stages. If the laser pickup mistracks, data will continue to output from the buffer, giving the pickup time (three seconds) to resume proper tracking with the aid of address locations along the data track. The pickup reads data from the disc at a rate of 1.4 Mb/second. However, through data reduction, the required output rate from the buffer is only 0.3 Mb/second (the ATRAC decoder accepts this 0.3 Mb/second rate and outputs data at a 1.4 Mb/second rate). After tracking resumes, the buffer is quickly refilled (in less than a second) at a rate of 1.4 Mb/second.

Clearly, during normal operation, the data rate from the pickup is about five times faster than required for playback; thus, data is read from the disc in intervals, as opposed to the continuous 1.4 Mb/second rate from (uncompressed) CDs. The duration of these intervals can be adjusted to replenish the buffer memory as necessary, avoiding both memory underflow and overflow. Of course, continuous pickup mistracking from sustained interruption, or intermittent interruptions that do not permit buffer refilling, will result in muted audio output.

The buffer offers another unique advantage. When adding material to a previously recorded disc, the system is able to move from one place on the disc to another, fitting the data non-continuously into available disc space. The buffer permits continuous data input while discontinuously recording, and it provides continuous output during playback. ■

*Ken Pohlmann is author of Principles of Digital Audio and The Compact Disc Handbook and co-author of Advanced Digital Audio, all available from the Mix Bookshelf.*



## CD-quality stereo with Dolby AC-2

Introducing this year's hottest audio product, the new SX-20 digital audio adapter with Dolby AC-2 from Antex. It's the first PC compatible board to use Dolby AC-2 digital audio coding technology for real time, direct-to-disk record and playback of CD-quality stereo audio with 6:1 compression.

With a frequency response of 20 Hz - 20 kHz and 16 bit, 64 times oversampling, the Antex

SX-20 offers high quality, digital audio for 386/486 PCs. CD-quality audio can now be economically transmitted at 128 kbps over T1, ISDN and S56 digital networks.

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## SONIC SOLUTIONS

by Stephen St. Croix

# FOLLOW THE YELLOW BIT ROAD?

**T**

## THE FIRST MISTAKE

*Mix* called a while ago and suggested that I write on analog signal processing and what I might like about it. Ha! Remember when Tweety Bird's nice, gray-haired, grandmotherly owner had to go grocery shopping and asked Sylvester to watch the bird? It's *exactly* like that. Okay, I'll eat... sorry, I'll watch the bird.

## DO YOU KNOW ME?

Of course, there is no way I can ascertain how many of you know me, and I'm not about to print a picture of my American Express card. So I'll tell you that in the early days of Homo sapiens I designed the Marshall Time Modulator, the Tape Eliminator and several other somewhat extreme, pro, *analog* delay-manipulation products. The custom silicon I developed for this equipment produced dynamic ranges well over 100 dB (really) 18 years ago. I still make money from those designs, so I *like* analog processors, see? Now you decide if I am biased.

BUT...there are certain effects that never were (and never will be) realized properly in the analog domain, like reverb, EQ and...well, reverb and EQ.

Artificial reverberation was originally done mechanically (plates and springs) and later electronically (digital). That's it. Nothing in between. Marshall spent some time on an analog electronic reverb that we thought sounded excellent. But it proved far too thermally unstable to go into production. Oh well.

And although the first-through-fourth-generation digital reverbs were embarrassingly horrible (you don't get room simulation simply by making your display show the words "room simulation"), one or two nice



ILLUSTRATION: JIM PEARSON



# NO AUDIO TAPE HAS EVER RATED SUCH INCREDIBLE RESPONSE.

*"I love the extra headroom it gives you. Different types of music call for you to hit the tape differently. I've hit it light and I've hit it hard, and the 3M 996 will definitely take the level."* —Ed Cherney,  
independent producer

*"You can hit it 3 dB hotter without any distortion or bottom-end modulation. It's a mirror image of the source material."* —Tom Tucker, Paisley Park Studios

*"A lot of engineers and producers want to really be able to slam levels to achieve a certain sound. 3M 996 gives them more options and opens more doors, sonically speaking."* —Barry Bongiovi, Power Station

Clear. Dynamic. Musical. Exciting. That's the response recording engineers are giving 3M 996 Audio Mastering Tape. Because 3M 996 audio tape is giving them the performance they've always wanted: The ability to record as hot as you want (level +9) with virtually no distortion. A signal-to-noise ratio of 79.5 dB. Print-through level of -56.5 dB. And maximum output level of +14 dB (at 1 kHz.). So 3M 996 audio tape returns every note, every nuance, every thrill exactly as you put it down. Call 1-800-245-8332 for full information. **We won't be satisfied until you are.**



this way.

Then again, I like digital processors because they are usually much more powerful and versatile, and they are always programmable, which means guaranteed repeatability. More power, more speed, more more!

#### DID YOU? NO

You may not know one of the reasons why digital gear is also popular with manufacturers. Once they all got over the shock of being forced to design and manufacture a totally new type of technology, obvious advantages emerged. Manufacturing times were actually shorter because setup and trimming essentially disappeared. No more hours tweezing trimmers while listening to sine waves or looking at scopes. No more matching resistors to 1%. No more chasing leaky caps.

But that's not all. With digital devices, an engine runs code that lives in a ROM, which lives somewhere inside. While the old analog units required removal and replacement of

actual components (often soldered in) to fix a problem that showed up later in the field, the new DSP stuff usually requires only a new plug-in ROM. Hmmm, definite advantage here.

Well, well. Look at this. I started off convinced that I would be writing all about how analog processors are the basics that feed the real men, while the digital ones are the quiche that real men don't eat. But it didn't turn out that way.

DSP is just too powerful and convenient to dismiss, though it is currently very dangerous. Poor-quality conversion, poorly thought-out concepts and algorithms still plague most units, inflicting considerable damage to all audio that has the misfortune to pass through. Be careful. Listen. A/B with alternatives. How much are features really worth to you if they *sound* bad?

So, back to analog? Of course not. Dinosaurs are dinosaurs because they have been passed by. But as you gleefully hop and skip down the yellow bit road into the digital future, don't settle for *less* than you had in the past. Embrace the power and ver-

satility that the wizards of the Emerald City offer, but kick 'em in the ass if they try to sell you something that doesn't sound as good as what you are throwing out!

Remember that if you refuse to put up with 16-bit conversion, manufacturers will be forced to build 18- or even 20-bit. If you reject snaps, pops and zippers, they will have to build gear that doesn't do that. You get the idea.

#### AND NOW...

Next month I'll tell you what Bruce Swedien has to say on the subject of analog and digital. I think you'll find it quite interesting. Here's a sample:

**St. Croix:** Bruce, what was that shocking thing you were just telling me about earlier?

**Swedien:** Well, Steve...[to be continued] ■

*Stephen St. Croix prefers food cooked in conventional microwave ovens. He feels that certain fish and several vegetables take on a harsh, edgy taste when cooked with some of the new digital microwaves.*

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The PDR-10 CD-R provides total I/O format flexibility, with **AES/EBU** and SPDIF (electrical and optical) digital inputs and outputs, along with balanced XLR and unbalanced RCA analog connections. The PDR-10 generates a temporary Table of Contents (TOC), so you can start and stop while recording, as well as delete any false starts or unwanted tracks. After finalizing the TOC, your CD-R is playable on any CD player.

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"Simply lovely. Smiles all around. Room agreement was unanimous: We want this thing on all our tracks." **Mike Joseph—Editor REP, March 1992**

"I have used similar 'single-ended' devices on the mixes of 'Ghost' and 'Godfather III' and found the Behringer Mark III to be superior in every category—from ease of operation to final result.

"Consequently, I am—without hesitation—recommending to LucasArts/Skywalker Sound that they buy at least four channels of Behringer Mark III DeNoising for each mixing console here and in Los Angeles; a total of twelve mixing rooms."

**Walter Murch—Film Editor and Music Mixer, LucasArts/Skywalker Sound**

"If the phrase *noise floor* is in your vocabulary and you would prefer that it was not, get a Behringer single ended noise reduction unit to the top of your *got to have one* list." **Robert Scovill—Sound Engineer/Mixer, Rush/Def Leppard**

The experts know why Behringer DeNoisers let them take the noise out and leave the audio quality in. Isn't it time you discovered all the good things Behringer can do for your audio?

**THE PERFECT EAR.**



# THE 1992 TEC AWARDS BY THE BAY

**F**or the first time in their eight-year history, the Technical Excellence & Creativity Awards came to San Francisco, home of *Mix* magazine. Held at the Westin St. Francis on October 2, the ceremony began with the presentation of the Hall of Fame Awards to three industry greats: synthesizer pioneer Bob Moog, engineering legend Bill Porter and producer Phil Ramone. Following the Hall of Fame Awards was five-time TEC Award winner Bob Clearmountain, who accepted the 1992 Les Paul Award from his good friend, renowned mastering engineer Bob Ludwig.

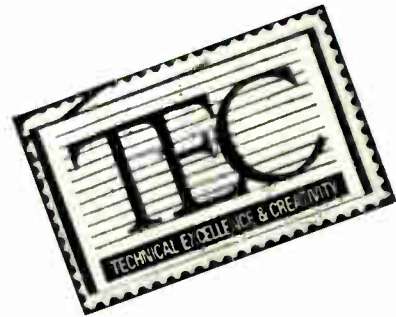
The big winner of the evening in the Technical Achievement category was Alesis, which captured three awards, including Recording Product of the Year for the ADAT Digital Multitrack. Other winners included Ocean Way Recording, taking home its second consecutive TEC Award for Outstanding Institutional Achievement, Recording Studio, and four-time TEC Award winner George Massenburg, who won Outstanding Creative Achievement, Recording Engineer.

Once again the TEC Awards raised funds for the House Ear Institute's "Hearing Is Priceless" (HIP) campaign and audio education scholarships. Co-sponsored by *Mix* magazine, the HIP campaign is dedicated to informing professionals and the public alike about the dangers of listening to music at excessive volumes.

Hearing was a major topic of the evening as the importance of safe listening levels and regular hearing tests was stressed by many celebrity presenters, including Pink Floyd's Scott Page and the Doobie Brothers Jeff "Skunk" Baxter.

Besides the HIP Campaign, proceeds from the TEC Awards are also distributed to the AES Educational Foundation, the Society of Professional Audio Recording Services (SPARS); and Berklee College of Music (winner in the Recording School/Program category) as well as the other recording school nominees. Also receiving funds this year is H.E.A.R. (Hearing Education Awareness for Rockers), an internationally recognized, San Francisco-based organization that works to educate the public—especially musicians—about the dangers of noise-induced hearing loss.

The 1992 TEC Awards were partially funded through the generous donations of Platinum Sponsors Act III Publishing, Ampex Recording Media Corporation, JBL Professional and Siemens Audio; Gold Sponsor Yamaha Corporation of America; and Silver Sponsors AKG Acoustics, Alesis Corporation, Aphex Systems, Digidesign, DOD Electronics Corporation, Dolby Laboratories, Inc., Lexicon, Inc., Meyer Sound Laboratories, Inc., Panasonic/Ramsa, Sony Professional Audio, Studer Revox America, Inc., TEAC America Inc. TASCAM Division, Technical Audio Devices/Pioneer, TDK Electronics Corporation and 3M Corporation.



(L-R) Mark Mothersbaugh, Marty Frasu and *Mix* magazine's Mr. Bonzai ham it up before the awards ceremony.



(L-R) Les Paul recipient Bob Clearmountain, Hall of Fame inductee Bill Porter, mastering engineer Bob Ludwig and House Ear Institute HIP campaign spokesman Scott Page.



◀ Phil Ramone talks with fellow producer Bruce Swedien before the ceremony.



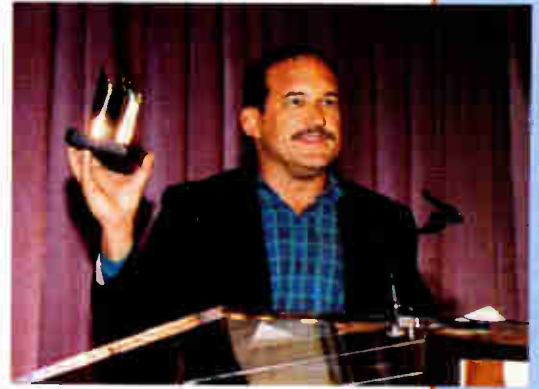
▲ Three generations of drummers were on hand at the 1992 TEC Awards: (l-r) Hal Blaine, Chad Smith and Jim Keltner.



▲ Presenter Mark Mothersbaugh bows before Bob Moog, as Moog accepts his Hall of Fame plaque.



◀ Co-presenters saxophonist Steve Douglas and drummer Hal Blaine.



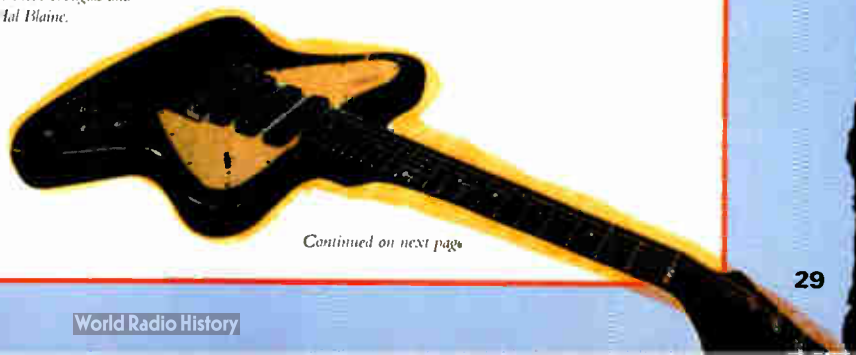
Russell Palmer accepts one of three awards for Alesis. The company took home honors in the categories of Recording Devices and Recording Product of the Year for the ADAT, and Musical Instrument Technology for the D-4 Drum Module.



(L-R) Mix magazine's editor-in-chief David Schwartz, Audio-Technica's Buzz Goodwin, Hall of Fame inductee Phil Ramone, A-T's Kon Reichel, and Mix magazine's publisher and TEC Awards executive producer Hillel Resner.



(L-R) HEI's Charlie Lahaie presents a proclamation to David Schwartz, TEC Awards executive director Karen Dum, Hillel Resner and former TEC Awards producer Penny Jacob.



Continued on next page

# 1992 WINNERS



## O U T S T A N D I N G

### TECHNICAL ACHIEVEMENT

**Recording Devices**

Alesis ADAT Digital Multitrack

**Transducer Technology/Microphones**

Electro-Voice N/DYM Series III

**Transducer Technology/Loudspeakers**

JBL 4200 Series Studio Monitors

**Computer Software/Peripherals**

Mark of the Unicorn Digital Performer Sequencer

**Signal Processing Technology**

Digitech VHM5 Vocalist

**Ancillary Equipment Technology**

Apogee AD-500 Analog-to-Digital Converter

**Console Technology**

Solid State Logic SL 8000

**Musical Instrument Technology**

Alesis D-4 Drum Module

**Sound Reinforcement**

**Product of the Year**

Future Sonics Ear Monitors

**Recording Product of the Year**

Alesis ADAT Digital Multitrack



Apogee president Bruce Jackson accepts his award for Ancillary Equipment Technology for the Apogee AD-500 Analog-to-Digital Converter.



Skywalker Sound's Tom Kobayashi accepts the award for Audio Post-Production Facility.



Hall of Fame inductee Bill Porter, whose work with Roy Orbison, Elvis and many others helped define the rock 'n' roll sound, accepts his award.



David Schwartz and Hillel Resner with Yamaha's John Gatts (seated, l) and Don Bowles.

Anne Robinson (r) looks on as Don Pultze accepts the TEC Award for Recording School/Program for Berklee College of Music.



Jeff Baxter and Tom Lord-Alge (r) congratulate DOD's Ferd Boyce (l) on winning the TEC Award for Signal Processing Technology for the Digitech VHM5 Vocalist.

### CREATIVE ACHIEVEMENT

**Audio Post-Production Engineer**

Gary Rydstrom

**Remote/Broadcast Recording Engineer**

David Hewitt

**Sound Reinforcement Engineer**

Robert Scovill

**Mastering Engineer**

Bernie Grundman

**Record Producer**

Don Was

**Recording Engineer**

George Massenburg

### INSTITUTIONAL ACHIEVEMENT

**Acoustics/Facility Design Company**

Russ Berger Design Group, Inc., Dallas, TX

**Sound Reinforcement Company**

Showco Inc., Dallas, TX

**Recording School/Program**

Berklee College of Music, Boston, MA

**Mastering Facility**

Bernie Grundman Mastering, Hollywood, CA

**Audio Post-Production Facility**

Skywalker Sound North, San Rafael, CA

**Remote Recording Facility**

Westwood One Mobile Recording Division, Culver City, CA

**Recording Studio**

Ocean Way Recording, Hollywood, CA

### HALL OF FAME

Bob Moog

Phil Ramone

Bill Porter

### LES PAUL AWARD

Bob Clearmountain



SSL's Piers Plaskitt (r) accepts the TEC Award from Tom Lord-Alge for Console Technology for the SSL SL 8000.

Photos: Alex Berliner

1992 TEC Awards Cover Illustration and isolated graphics: Jamie Hogan

# WHY

# IS

# EVERYONE

# TALKING

# ABOUT

Today's market is demanding more complex productions and higher audio quality on shorter schedules and with tighter budgets. Studios and engineers need a console that works as fast as they can create. Old analog boards have charm, but they are too big and take too long to reset. The new all digital desks are underdeveloped, complicated and far too expensive. After four years of continuous development, one company is delivering the product that makes sense today. Euphonix has the speed, power and flexibility of Total Digital Control with the simplicity and natural sound of analog signal processing. It's no wonder industry leaders have made the move to the CSII. And when Euphonix introduces the new additions to their product line, you'll realize the last four years were just a warm-up.

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Corporate HQ  
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Palo Alto, CA 94306  
Ph. (415) 855-0880  
Fax: (415) 855-0410



# Euphonix

A nighttime photograph of the Golden Gate Bridge in San Francisco. The bridge's towers and suspension cables are illuminated with a warm, golden light. In the background, the city skyline is lit up, with the Transamerica Pyramid being a prominent feature. The water of the bay is dark, with several sailboats visible. The overall scene is a vibrant and iconic representation of the city at night.

# 1992 AES

Report from San Francisco



## AES: CHANGING TIMES, CHANGING MINDS

by George Petersen

Change. A simple word, but one that eloquently sums up the 93rd Convention of the Audio Engineering Society. A new venue, but one that so impressed the record numbers of exhibitors and attendees that the society is considering a return to the City by the Bay for the 1994 show. And the Bay Area manu-

**I**n the coming months, *Mix* will provide plenty of information on new products that appeared at the AES Convention, but for this initial AES report we asked four *Mix* editors to give their impressions on what grabbed the most attention in their respective specialties. Product editor George Petersen provides an overview of the show and details the most important trends facing the professional audio community. Associate editor Paul Potyten looks at developments in new media and computer-based audio production. Contributing editor Dan Daley finds that manufacturers are paying much more attention to the project studio market. And sound reinforcement editor David (Rudy) Tribitt offers a live sound perspective.

*Thanks, AES, for pulling off an event that can only be considered a success on every level. See you at the 94th AES Convention in Berlin, March 16-19, 1993.*

facturing community did its part by hosting an amazing soiree at the Exploratorium, a hands-on, interactive technology museum for children (a location that seemed ironically appropriate).

The roots of just about every audio manufacturer stem from modest beginnings. AES recognized those roots for the first time by providing a "New Ideas Room," offering free space to deserving local cottage industry companies that otherwise couldn't afford to exhibit. This gesture should become

a tradition.

*¡Un éxito!* Another innovation was the first AES audio forum in Español, sponsored by AES and the Spanish-language edition of *Mix*. Chaired by Elmar Leal of AES Venezuela, the three-hour session was well-attended and warmly received.

It's long overdue, but a group of digital equipment manufacturers met to form the Digital Manufacturers Association. The main purpose of the DMA is to find solutions to the problems stemming from improper or incomplete implementation of the various forms of the AES/EBU and S/PDIF digital interface standards. While no major accords were reached, the formation of the DMA and



**Tascam DA-88**

the recognition of the dilemma of digital incompatibility are important steps toward an industry-wide solution.

On the product front, digital was everywhere, and everybody was talking about the ubiquitous ones and zeros. Clearly, the hit of the show was Tascam's DA-88 (\$4,499), a rack-mount digital 8-track that records up to 100 minutes on Hi-8mm tape. A modular system, the DA-88 can be expanded by connecting additional units for up to 128 tracks. The front panel features a jog/shuttle wheel, switchable 44.1/48kHz sampling rates,  $\pm 6\%$  varispeed, two locate points and auto punch-in/out. The rear panel provides analog inputs/outputs on unbalanced RCA and balanced +4 lines on a 25-pin D connector, word sync in/out, a simple 15-pin D connector for automatically locking up multiple DA-88s, and a proprietary digital I/O port that allows machine-to-machine tape cloning.

# NEW! ADD-ON FULL-FADER & MUTING

## FOR THE CR-1604 16-CHANNEL MIXER

### ADD AUTOMATION IN MINUTES FOR \$799!

**WHAT IT IS.** Mackie's new OTTO-1604 is an internal controller board that installs into any CR-1604 mixer.

**WHAT IT DOES.** The Mackie OTTO-1604 interfaces with hardware or software that "speaks" MIDI to provide full muting and fader control of:

- ▶ All 16 input faders
- ▶ All 4 stereo AUX returns
- ▶ ALT 3/4 buses
- ▶ Master outputs

Yes, you read right. Full fader+muting automation of 28 mixer levels for \$799 suggested retail. Free of "zipper" stepping noise. And without any degradation of the CR-1604's legendary sound quality, dynamic range or headroom. Note, however, that this is not "flying faders" automation. The CR-1604's sliders and pots are set at Unity while OTTO does its work (but can also be used simultaneously).

**HOW IT DOES IT.** All existing CR-1604s are automation-ready thanks to our modular ribbon cable design and robust internal power supply. The OTTO-1604 mounts inside the main chassis and plugs in between the main board and the CR-1604's pod. MIDI cables connect to a small, external box via ribbon cable. Installation takes about 15 minutes and requires only a screwdriver (other drinks are optional). Do it yourself via illustrated instructions or have your dealer perform the installation for a modest fee.

**WE** couldn't resist a plug for the CR-1604's studio-quality mic preamps with -129 E.I.N. & 0.005% THD.

**ONE** more reason that we designed the CR-1604 with a beefy internal power supply: Besides eliminating wall warts or line lumps, it provides power for the OTTO-1604 (as well as +48V phantom mic power, BNC lamp connector & XLR10 Mic Preamp Expander).

**WHAT IT DOES IT WITH.** Simple hardware controllers can use the OTTO-1604 to trigger "snapshot" level/mute settings via MIDI commands. Existing

software sequencing programs with MIDI volume control can adjust multiple channels, returns and outputs\*.

Mackie is also currently working with major sequencing software developers including Opcode, Mark of the Unicorn, Steinberg/Jones, Twelve-Tone Systems, Ellisionics, Dr. T Music Software, C-Lab, Passport Designs, Avid Technologies and others to provide on-screen "virtual CR-1604 sliders" for their programs\*.

**BEFORE YOU BUY A SIXTEEN CHANNEL MIXER,** remember that only the CR-1604 lets you own a great mixer now

and then add internal full-fader MIDI automation at any time in the future. Call us toll-

free for detailed information on the CR-1604 and OTTO-1604 add-on automation board. Then hear them both together at a Mackie dealer soon.



OTTO-1604 MIDI box

**MORE THAN MERE MUTING,** the OTTO-1604 controls gain of input and output faders (plus AUX returns and ALT 3/4 bus).

**THE OTTO-1604** mounts inside the main chassis using the mixer's existing ribbon cables. Installation is so simple that a TV game show hostess

could do it. We also offer a step-by-step video tape for the even more severely mechanically impaired.

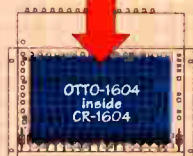
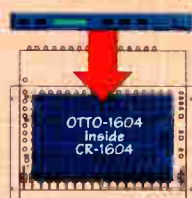
**Meticulously** mouse Mackie CR-1604 mixer mixes via various MIDI Mac, IBM, Amiga or Atari software\*.

\* Any ad that mentions computer software is bound to have an asterisk or two in it. Ours reads: "Consult individual 3rd party sequencing software manufacturers for specific information concerning implementation of features, release dates and availability." Oh yeah...we almost forgot. All company and/or product names are trademarks and/or registered trademarks of their respective manufacturers. Blah bah blah. Yadda yadda.

**EVEN** before you add automation, you're getting one of the finest 16-channel mixers available. Easily changeable 4-way configuration (tabletop or rackmount with jacks to back, top or on the control surface plane), sealed rotary controls, better-than-digital dynamic range, twice the headroom of conventional mixer designs, stereo in-place soloing, constant power pan pots and boo-coo more.

**OTTO's** external box connects via its own ribbon cable, and includes MIDI IN and THRU DIN sockets plus signal present LED.

**EXISTING** add-on MIDI automaters often suffer from zipper noise and/or sluggish response. OTTO avoids these problems with a proprietary, digitally-controlled gain cell.



# MACKIE.

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NEW 8-BUS CONSOLE!  
SEE PAGE 100

The latter supports the optional AES/EBU and S/DIF-2 interfaces. MIDI machine control and a plug-in SMPTE card for chase-lock to video or other time code sources are optional. Time code is derived from subcode data, so no audio track is required. Deliveries of the DA-88 should begin next month.

Things heated up in the Alesis ADAT camp as the company demonstrated digital assembly editing techniques using multiple ADATs and the BRC controller. More significantly, Fostex entered the modular digital multitrack market by announcing a licensing agreement to manufacture digital recorders using the Alesis ADAT format. According to Fostex VP David Oren, the first ADAT-compatible Fostex recorders should debut in the first quarter of 1993. Further support of the ADAT format came from Ampex, which unveiled 489DM, a high-performance S-VHS tape designed specifically for digital recording applications.

Just when it seemed that digital couldn't get any hotter, 20-bit is the new big buzz. And it's not merely hype, with new A/D con-

verters (i.e., Lexicon's new 20/20) coming to market and a growing number of workstation companies (such as Sonic Solutions and Digidesign) supporting 20-bit. But the most important factor is the coming of Sony's Super Bit Mapping process, which preserves much of a 20-bit recording's punch, even when the recording is released on a standard 16-bit CD. (See John Monforte's article on SBM in this issue.)

The dreaded Mini Disc vs. DCC debate was a point of contention on the show floor. Both Sony and Philips had a major presence at the show and tried to convince engineers of the relative merits of the two systems, which are due to be in the stores by the time this *Mix* hits the streets. Who will prevail? No one knows, but the situation should prove entertaining as the marketing gurus on either side start slugging it out this winter.

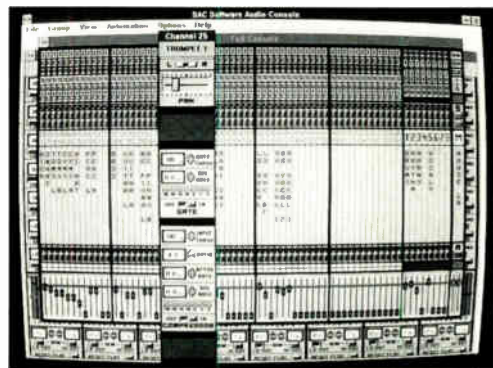
Of course, there were lots of cool products, some of which are spotlighted in this issue's report on analog signal processing and others that will show up in the "Preview" new products column in

future issues.

#### ON THE BYTE BEAT AT AES

by Paul Potyen

Judging from the proliferation of PC-based digital audio workstations at this year's AES show, desktop audio production has come of age. The number of entries was up significantly from last year, and new products were tailored for specific

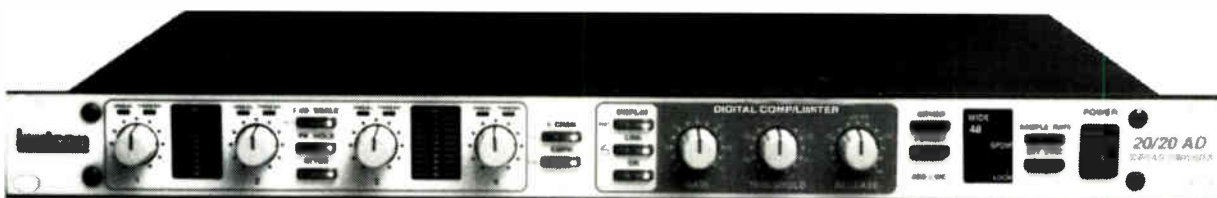


Innovative Quality Software's SAC screen

applications within the industry, such as dialog and effects for video and film, mastering, multitrack music and radio broadcast.

The inherent advantages that

## BETTER AUDIO FOR ANY DIGITAL RECORDER



### THE LEXICON 20/20 AD ANALOG-TO-DIGITAL CONVERTER

Whether you are 16- or 20-bit capable, the new 20/20 AD sets a higher standard in digital conversion. Most significantly, if your recorder can only process 16 bits, the 20/20 can *digitally* compress the signal from 20 bits to 16 bits, ensuring that you get the maximum performance out of your digital recorder.

- 2 Channel 20-Bit Audio, 112 dB Dynamic Range
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- Digital Compressor/Limiter
- Choice Of Dither Spectra

The 20/20 AD offers the finest analog-to-digital conversion available today. Which, coming from Lexicon, should be no surprise. After all, Lexicon has consistently led the way towards improved digital audio. Visit your Lexicon dealer to hear how you can improve the audio going into your 16-bit digital recorder.

1971

Delta-T 101 Delay Line  
World's First Digital Audio Product

1987

480L Digital Effects System  
World's First Widely Accepted 18-bit Processor

1992

20/20 AD Analog-to-Digital Converter—20-bit A-D  
112dB Dynamic Range

# Lexicon

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Macintosh-based systems once enjoyed seem to be diminishing as Atari- and Windows-based platforms have matured to the point where the platform choice is less important than the feature set and performance of a DAW system. Under-



Anatek Radar hard disk recorder

scoring the old saw about the convergence of technology, Silicon Graphics machines were seen at several booths.

On the low end of the price spectrum, Digital Audio Labs (Plymouth, Minn.) showed its CardD system. CardD consists of three components: a clean 16-bit stereo A/D/A card (\$795), a digital (S/PDIF) I/O card (\$250) and recording/editing software (\$295). It will run on an IBM-compatible 286 12MHz computer; however, a 16MHz 386 with 2 MB of RAM is recommended.

First-time AES participant Innovative Quality Software (San Diego) took advantage of the CardD hardware to demonstrate its own software for hard disk editing in a Windows environment. It was obvious that an experienced engineer spent a lot of time designing this incredibly fast and efficient software package. The designer, Bob Lentini, used some clever programming tricks to achieve remarkable compute and redraw times on the 25MHz 386 machine. The software package, dubbed SAW (Software Audio Workshop), is designed for

use with the CardD and is priced at \$599.

Equally impressive was Lentini's demonstration of Software Audio Console, or SAC, a prototype 60-input sound reinforcement console graphically represented on a computer screen that controls a small 19-inch rack of audio circuitry. This concept of digital control of all mixing console functions eliminates the need for large traditional console interfaces. Additionally, all control equipment can be placed backstage with a single cable connection to the computer, thus doing away with huge snakes of mic cables out to the house. As with the SAW interface, the SAC software makes excellent use of the computer screen to manipulate console controls with ease and speed. All that's needed to complete the picture is DSP hardware customized to operate with IQ Soft's SAC package. And several console manufacturers were spotted in the IQ Soft booth.

Possibly the best-kept secret in the world of DAWs is Doremi Laboratories' (Covina, Calif.) Digital

## THE FIRST AUTOMATED MIXER THAT WAS COMPOSED, NOT IMPROVISED.

If you'd rather mix than mess around with a bunch of outboard boxes, we suggest a serious look at the new M-3700 Series from Tascam.

The M-3700 Series is a professional-quality mixing console with a perfect memory of its fader settings. A console whose automation isn't a pain in the pots. And whose under \$14,000 suggested retail price isn't either.

Ours is the only automated console that provides you with both *snapshot* automation (to recall any pre-set levels or switch positions stored as "scenes") and *dynamic* automation (to recall levels and switch positions locked to real-time locations).

The M-3700 also features an onboard disk drive; SMPTE timecode generator/reader; write/update mode; choice of 24- or 32-channel configuration; and the ability to automate the main, monitor and aux send mutes, and EQ ON/OFF for each channel. Without outboard computer screens, wires, mouses or the usual added-on hassles.

From us, you'll get a compact, familiar-looking system that'll help you create the mix you want. And precisely recall any previous mix, so you can tweak some channels without affecting others. All without wasting your valuable time or talent.

The musician-friendly M-3700 Series automated mixing console. Now waiting to wow you at your nearest Tascam dealer.

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USE READER SERVICE CARD FOR MORE INFO  
World Radio History

by Mel Lambert

The new DISQ digital mixer core, developed jointly by AT&T Bell Laboratories, Gotham Audio and George Massenburg Labs, combines the signal processing power of a dedicated audio "supercomputer" with the familiarity of a current analog control surface. The digital mixer core connects to an existing Neve VR or SSL 4000/6000/8000 and operates in a way that is completely transparent to the user. All mixing, routing and signal processing, including EQ and dynamics control, are implemented entirely within the digital domain.

Digital inputs and outputs are SDIF-2 format; all analog I/Os (for monitoring and connection to non-digital outboards, for

## AT&T Enters Pro Audio, Unveils DISQ



example) are handled via an enhanced Harmonia Mundi bw-102 system. The digital mixer core is in a 10U, rack-mount chassis with additional I/O and communications units. In operation, level, mute/solo and EQ in/out data are derived from a modified GML Automation System, which connects to the digital mixer core via a high-speed Ethernet port.

Initial system deliveries to Neve VR-equipped studios were scheduled to begin after the AES Convention; SSL-compatible systems are expected to be available in January. System prices begin at around \$350,000.

Next month: an in-depth, technical examination of the new system and its impact on the recording industry. ■

Audio Workstation Nucleus, which was first introduced in 1988. The new DAWN II system offers eight AES/EBU digital I/Os and eight balanced analog I/Os, expandable to

48. Other features include a built-in SMPTE/EBU time code generator/reader, a built-in MIDI interface and fully variable playback speed. The DAWN II system is particularly

well-suited for film and video post work, and several new enhancements make it even more so: Software was added to allow CMX auto-conform and tape transport



control; production video can now be recorded to DAWN's hard disk and played back in sync with edited audio; and VTR emulation allows control of DAWN from an external editor or controller.

AES attendees also saw the American debut of Random Access Digital Audio Recorder from Anatek (North Vancouver, B.C.). RADAR is a stand-alone 4U rack-mount device (it requires no external computer host) capable of 24-track digital recording and editing. One hard disk is used for each eight tracks of audio. The unit offers 24

discrete balanced ins and outs as well as stereo AES/EBU and S/PDIF ins and outs. The unit is designed to generate and receive SMPTE time code and is compatible with MIDI, RS-422 and NTSC and PAL video.

There were developments from some more familiar faces among the workstation crowd as well. Digidesign demonstrated DINR, its noise reduction software, and Sound Tools ProMaster 20, a 20-bit recording and editing system (see this month's "Byte Beat"). Also announced was the Version 2.0 soft-

ware upgrade to Pro Tools, which incorporates a streamlined, single application interface, improved digital parametric EQs, graphic editing of automation, and improved speed and system performance. It will be available early in 1993.

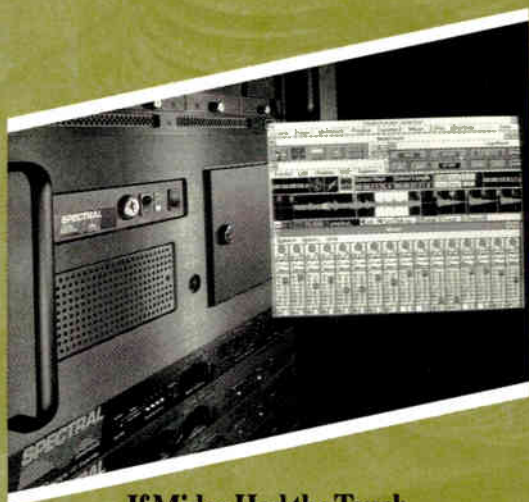
Spectral Synthesis (Woodinville, Wash.) showed its new ADAX 8818 A/D/A converters for its multichannel digital audio workstations. The ADAX provides eight analog ins and outs, as well as stereo AES/EBU or S/PDIF digital I/O. Also on display was the SynClock, which converts multiple clock sources to three discrete digital audio clock outputs to enable synchronization of digital audio systems to other studio components. The single-rack unit is controllable via MIDI or the front panel.

Sonic Solutions (San Francisco) used the AES show to demonstrate its SonicNet fiber optic network for digital audio. SonicNet is designed to address the needs of multiroom facilities that need to share digital audio files and other information via computer. It permits up to 100 channels of CD-quality audio to be transmitted simultaneously on the network. Nodes can be separated by as much as two kilometers, and up to 1,000 nodes can be supported on a single token ring network.

Sonic Solutions and JL Cooper Electronics (Los Angeles) announced a cooperative effort to develop a high-end moving fader controller for use with the Sonic System. The modular CS-1000 will consist of a 9-fader base module with a jog/shuttle wheel plus a number of expansion modules.

JL Cooper introduced several new products of its own. CS-Edit is a 1/4-width, single-space module with MIDI in, MIDI out, and two ADB and GPI connectors that, together with editing software, turn JL Cooper's popular CS-10 controller into a completely programmable studio controller, as opposed to a dedicated controller for a Digidesign Pro Tools workstation. Also shown was the PPS-2+, a firmware enhancement to JL Cooper's PPS-2 synchronizer that allows the device to convert MIDI time code to SMPTE time code. The user-installable enhancement is available for \$49.95.

—CONTINUED ON PAGE 99



### If Midas Had the Touch But Didn't Want to Part With the Cold Cash...

He'd get his hands on a Spectral Synthesis *Digital Studio*.™ Or, if he had really itchy fingers, he'd go for Spectral's fully configured *AudioEngine*.™

After all, any of our hundreds of customers worldwide would agree that a Spectral Digital Audio Workstation is as good as gold to the audio/video pro. Spectral's state-of-the-art technology provides the utmost in speed, flexibility and power at a fraction of the cost of other systems.

Where else can you get a truly integrated real-time digital studio—16 tracks (with 256 virtual tracks!), up to 16 channels of I/O, 16-bit sampling, editing, digital signal processing and mixing, all controllable through MIDI and completely digital—without having to cough up the big bucks.

You don't have to be a King Midas to have the very best in digital recording and editing right at your fingertips and still keep your cash flow flowing.

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MASTERING THE DIGITAL DOMAIN

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**We Wish to Thank  
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Engineers and Friends  
Who Have Made  
Our Dreams Come True.**

**With Love,  
Jackie & Hank Sanicola**

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# M

alcolm X is out! And *Malcolm X* is big! Step back from the controversy for a minute. Forget about Amiri Baraka and the various claims on who can best represent Malcolm X to the world. Forget about flag burning and rights to the Rodney King video. Forget about corporate



budgets and the call to skip work and school. Look at this film. *Listen* to this film.

Spike Lee has pieced together a one-of-a-kind project, certainly his most ambitious to date. The storyline, written by Arnold Perl and Spike Lee and adapted from *The Autobiography of Malcolm X*, as told to Alex Haley, predates Malcolm's birth and continues after his death. Location shoots ranged from the streets of Harlem to the Egyptian desert to the slums of Soweto to the Holy City of Mecca (the first Western film crew allowed in, we are told). And it's beautifully shot by cinematographer Ernest Dickerson and edited by Bary Brown, with that bold

visual style we've come to associate with Spike.

"It's not a totally personal film," Spike says while watching over the final mix, "because Malcolm X was somebody who lived and breathed.

But I think that was the challenge, to make it a personal film and at the same time respect that it is somebody's life. I can't just do anything I want with it. Still, anybody who has seen my work and looks at this film will be able to tell that I did it."

By the same token, anybody who has *listened* to Spike's work will notice similarities in

*X*. The core sound team has been together since *Do the Right Thing*





THE  
LUSH SOUND  
OF SPIKE  
LEE'S BIGGEST  
FILM

# MALCOLM

(1989), through *Mo' Better Blues* (1990) and *Jungle Fever* (1991): re-recording mixer Tom Fleischman, supervising sound editor Skip Lievsay and music supervisor Alex Steyermark. (Lievsay and Fleischman also work together for a number of other East Coast directors, among them Martin Scorsese, Jonathan Demme and John Sayles.) The final mix took place over 13 weeks in Studio D of Sound One, New York City. Fleischman, mixing only his second discrete 6-track film, sat solo behind the 60-input Neve with Necam 96 automation.

This is New York, and unlike L.A., where three people sit down for the final, a single re-recording mixer is the norm. Fleischman, who looks considerably younger than his 41 years, moves like a large cat up and down the board, intensely fo-

# X

BY TOM KENNY

cused on the screen. Behind him or beside him sit Skip, Spike and Alex, with various ears walking in and out of the room. Phones ring silently and constantly. There are no decisions by committee—Spike definitely has final say on whether a particular sound stays or goes or is altered—though there is considerable decision-making by consensus.

X didn't involve any particular revolutions in soundtrack creation, though the process was complex in its subtlety. By all accounts, the biggest difficulties had to do with the sheer size and scope of the project. The film is three hours and thirty-one minutes long, and it's chock full of dialog, music and Foley, which means a helluva lot of material to sort through. As more than one person commented, it was like working on two movies.



When the little door opens,  
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The film is 20 reels long, but the mixing process remains the same: Start with the dialog predub and mix it down to two 6-tracks, one being production dialog and ADR, the other being group ADR. That takes four weeks, which Fleischman admits is a luxurious schedule. Then start on effects, mixed down to three 6-tracks, while monitoring the dialog. Play those back against Foley, which is mixed down to another two 6-tracks, and when the three predubs are finished, bring in music for

**The Malcolm X sound team (seated l to r): music supervisor Alex Steyermark, Spike Lee, re-recording mixer Tom Fleischman, supervising sound editor Skip Lievsay; (standing) dialog editor Kevin Lee.**

the final. On average, Fleischman can get through a double-reel a day (about 20 minutes of film) once the predubs are finished. For X, a double-reel takes a day-and-a-half. The

final print master eventually goes out on a single 6-track, mixed down from three 6-track full-coat stems. If you have the opportunity, see the SR-D (Dolby 6-track digital) print; it's also being released in 70mm and 35mm with Dolby SR.

"This is the third time we've done 70mm but the first time we've done a discrete mix," says Lievsay. "We went out of our way to have as much as possible in the 6-track format. The music, sound effects and voice-over were recorded in 6-track,

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**(At right) James P. Nichols, BMG master engineer.**

piece orchestral cues and some of the group ADR and Foley dance sessions.

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—CONTINUED ON PAGE 102



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4-track, quad and stereo, to achieve something special-sounding. We didn't break any new ground, but I think taken together they make for a very lush soundtrack."

Lush is the perfect word to describe the soundtrack and the picture. Too often we associate "good" sound with explosive, attention-grabbing effects, when the reality is that the best tracks are usually the ones we don't notice. *X* certainly has big sound, and Spike likes it loud, but in no way is the sound distracting. Creative? Yes. Up front? Certainly. But you will remember Denzel Washington's (who plays the title role) oratory long after you've forgotten the sound of the Molotov cocktail crashing through Malcolm's window.

#### DIALOG, ADR AND VOICE-OVER

"Dialog is king," Fleischman says. "If you don't hear the dialog, you don't get the story. The hardest scenes to mix are never the big action scenes—those kind always mix themselves. You just open up what you have and it's a matter of balance. The most difficult, tedious work in any film is a small, intimate scene between two people, particularly if there is no music.

"For example, there's a scene between Malcolm and his wife talking in a room, just the two of them," he continues. "Then the camera pans across the room and there's some dolly motor noise in the track, along with some clothing rustles. When the dialog editors prepared it, they removed as much of the dolly noise as they could and replaced it with clean room tone. The problem was that where those sections were lifted out and replaced, the clothing rustle suddenly popped up. So every time there was a splice, you could hear the clothing pop. Nothing was covering it satisfactorily, and we got to the final before we solved it by adding a little bit of rain."

If that represents the puzzle-solving tedium of film mixing, then the "fun" must come in scenes such as those where there are rapid cuts from live-action, wide-screen 35mm to a grainy, black-and-white, 16mm image. Usually the switch takes place when the press is surrounding Malcolm, offering the illusion of a documentary perspective circa 1965.

"We squeeze down Denzel's lines, equalize them and filter them,"

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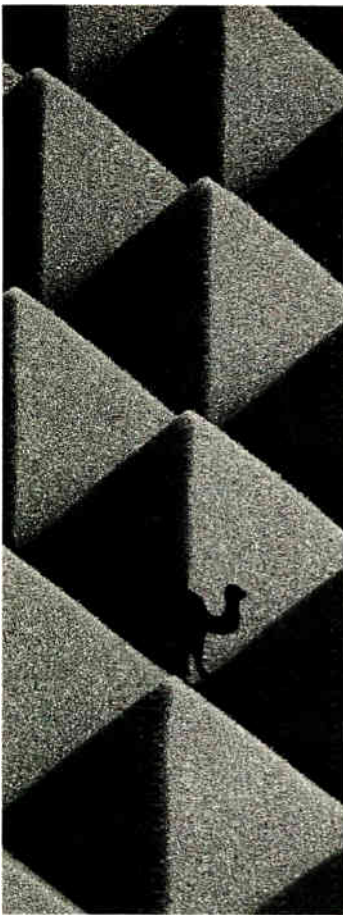
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Fleischman explains. "And we keep it in the center. When we cut back to live action, we used the production track, full-bandwidth, and added some reverb in the sides and surrounds to open it up. It's quite effective, but there again, it's just a matter of experimenting. If you use too much reverb, it sounds canned. You have to find something that fits the image.

"There's another interesting sequence in the film in terms of panning," Fleischman adds, stressing that he normally does *not* like to pan dialog. "[Denzel] is standing on a stoop, and Bobby Seale is up on a ladder, and Al Sharpton is up on a ladder, and they're all giving speeches at the same time on this street corner. The camera pans off Malcolm, moves in a 360-degree circle, and eventually winds up back on him. Unfortunately, the voices of Bobby Seale and Al Sharpton were not separated in the recording, so they're locked. But [Denzel's] voice actually moves from center to left to left-surround to right-surround to right and back to center. I really won't know whether that works until I see the film all together in a theater this weekend. I have my doubts."

Dialog tracks came in on 1/4-inch, were transferred to 35mm mag, then cut on Moviolas by Kevin Lee, Magdaline Volaitis and Philip Stockton at C5 Inc., Lievsay's home-base editorial house that he owns with three partners. ADR (and there was a lot of it) was supervised by Gail Showalter and recorded mainly in Sound One's Studio K by Dave Boulton: six hundred main character lines; small lines; crowd sessions at BMG (see sidebar); and voice-over. Roughly 25% of the film dialog was ADR, according to Lievsay.

"The actors were extremely good loopers," Lievsay says. "I boomed a lot of the looping myself, and we tried to guess where the boom mic was in the sync recording, the idea being to place the ADR microphones in a similar position to match the production track better. And it does. That's a pretty good technique that we're starting to use more and more. Also, that way I have something to do besides sit in the session and say 'Faster, slower. Non-sync, in-sync.'"

Voice-over tends to work best in film when it somehow stands apart

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forcing the 60-input Neve into “fader crunch”—not enough inputs. That was solved by a music premix when necessary.

Despite his relatively sophisticated sense of—and use of—score, Spike revels in the use of source music to help tell his story. Score works its way in subtly through the back door to the brain. Source hits you over the head and makes you dance (like Public Enemy’s “Fight the Power” from *Do the Right Thing*). It can also make you cry. The *X* credits include Count Basie, Lionel Hampton, Duke Ellington, Ray Charles, Ella Fitzgerald, Billie Holiday, the Ink Spots, Jr. Walker & the All Stars, Aretha Franklin, Sam Cooke, and on and on. Spike picks the music. Spike picks the cues.

“When I hear a song that I really love, I always make a mental note to use it in a film one day. I don’t know what film or scene, but eventually I will get it into a movie. This is a perfect example of that, ‘A Change Is Gonna Come,’” he says, pointing to the screen. The camera cuts between people converging on the Audubon Ballroom on the day of Malcolm’s assassination, February 21, 1965. Sam Cooke’s vocals and a beautiful song lead them in. It is perhaps the biggest moment of Spike’s biggest film.

Source music comes from various sources, but it’s all 2-track masters. The mixer’s job is to make each cut sound in line with the rest of the film, to make it as big and wide as the orchestra and as small as the piano or solo trumpet. Because most of the music in the film emanates from a visible source—i.e., a jukebox, car radio, band onstage—Fleischman first narrowed the image by filtering it and squeezing it down to mono-center. Then reverb was added to fill it up theatrically, both left-right and in the surrounds. Once Foley dance steps, clapping and effects are added, as in the Lionel Hampton “Flying Home” ballroom scene, it’s suddenly a full house.

“That recording was made back in the ‘40s,” Fleischman says. “It was originally a mono recording, so we treated it with the Lexicon 480 [and the Vitalizer], using some variations on the set hall programs—one for the left-right, one for the surrounds. That’s probably the biggest source cue in the film. The scene was shot to playback with a live orchestra,



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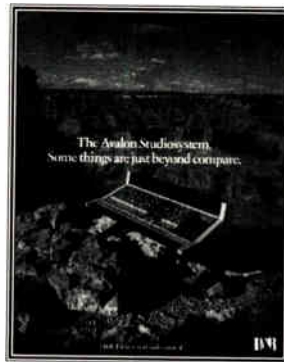
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and if you listen closely you can tell. Spike didn't want to sweeten it at all; he wanted to use the original recording. It's a great piece of music, and I can understand the director not wanting to screw around with it."

One final musical note: Stay for the end credits and you'll hear Aretha Franklin singing "Someday We'll All Be Free." On Friday, September 18, she was in the studio. On Monday afternoon, producer Arif Mardin walked into Sound One with the 4-track masters and a DAT backup under his arm. By Friday, one week later, Aretha was singing over the credit roll, with Blanchard on horn. Who says there's no real drama in a final mix?

Though relatively trouble-free, the final was not without its problems. Some forgotten sounds had to be grabbed, a clock had to be slowed down by removing every other tick, and the effects predub had to be gone through twice. It seems that on Reel 17, Fleischman and Lievsay discovered an effect out of phase. An oscilloscope was brought in, and sure enough, as many as half of the effects were out of phase. Live and learn. Back to Reel 1.

Still, for most of the people who worked on *X*, the relief felt at the end of a long and tiring process will soon be replaced by the realization that they were part of something grand. Spike has said that he was born to direct this picture. Denzel Washington has said he was born to do this part. One person even divided his professional career into Before Malcolm and After Malcolm.

"I learned something about the business," Lievsay says in summation. "I learned that there is a difference between movies like this and other pictures. I probably will never work on another picture quite like this. It was very refreshing, especially in these cynical times.

"You know, I was coming back from Los Angeles and Ossie Davis was on the plane," he continues. "Ossie was a friend of Malcolm X's and he delivered the eulogy at Malcolm's funeral. We have Ossie reading the eulogy in the film. I asked him on the plane if it was the same eulogy, and he said it was. There's something very special with that. It's extremely powerful." ■

*Tom Kenny is a Mix associate editor*

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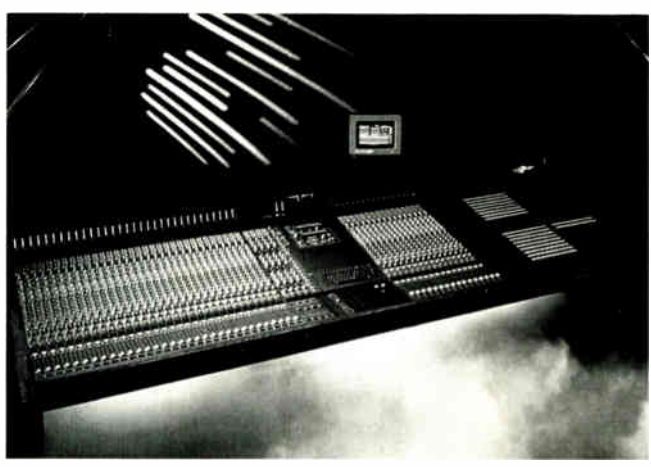
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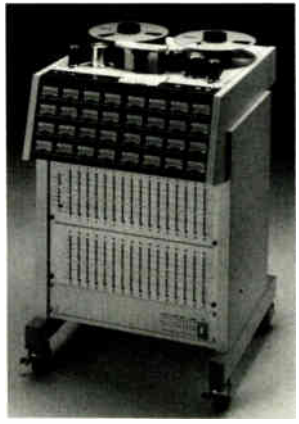
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by Philip De Lancie

# THE FUTURE OF “INFOTAINMENT” DISTRIBUTION

**W**hen the compact disc took its first tentative steps to market a decade ago, few people anticipated its impact. It's not just that the format has become the dominant means of prerecorded music distribution, or that it spurred a revival of catalog material, which then fueled industry growth. It's not even that the CD has significantly shifted the expectations—in terms of fidelity and features—that consumers now have of their music-making machines. Perhaps the most fundamen-

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tal effect is the way that the CD has encouraged the conceptualization of entertainment as data. By reducing sound to binary code and redefining the audio disc as a digital data storage device, the CD's inventors opened the door to cohabitation and interaction among any forms of expression that can be digitized.

For the average consumer, the practical effect of all this, so far, has been minimal. But more pieces are falling into place that could give the “infotainment” landscape a far different look ten years from today. There is the proliferation of CD-based interactive multimedia formats, from business-oriented CD-ROMs to more

consumer-targeted systems like CD-Interactive. Kodak has come up with Photo-CD for storing still pictures on recordable discs, and computer makers are finding ways to download those images into their multimedia systems. Meanwhile, cable systems are offering CD-quality digital audio with multiple channels targeted to different musical tastes, and they are experimenting with pay-per-view, video-on-demand systems of hundreds of channels.

All this activity raises questions that are more fundamental than the competition between configurations like DCC and Mini Disc, or CD-I and VIS. Which technologies and media will be the primary channels for delivering music and other entertainment from content owners to consumers? Will the traditional distribution model of buying prerecorded products coexist with or give way to a network model, in which a vast array of audio, video and interactive multimedia channels are piped into the home via fiber optics or satellite? How will changes in delivery technologies affect the distribution infrastructure in the next decade?

These are more than abstract questions. A quick glance at the dwindling

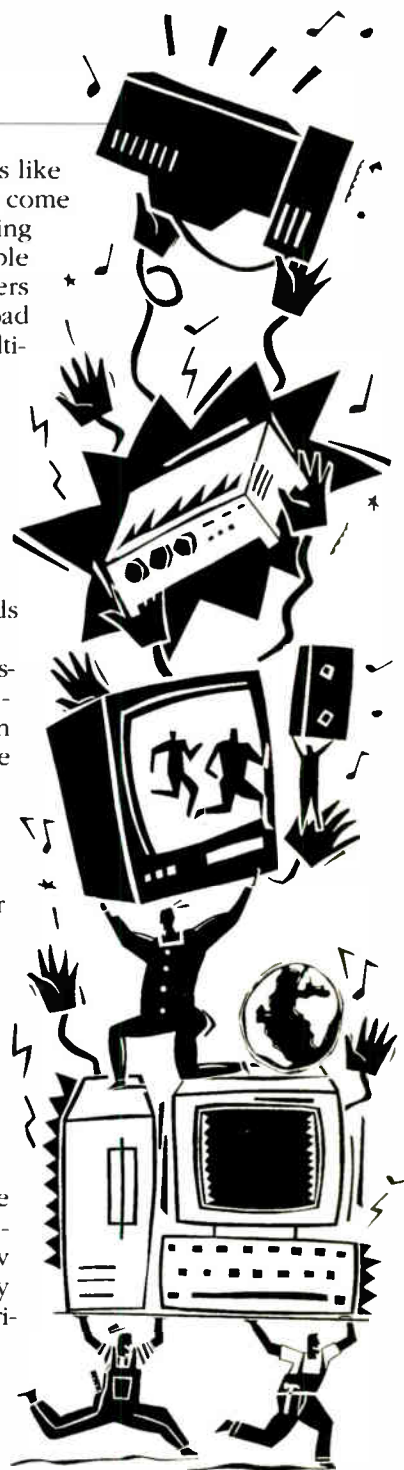


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list of vinyl record pressing plants illustrates the consequences of being caught at the wrong end of a technology trend. Below, three executives, at companies that seem to be working hard to avoid that fate, offer their visions (or at least best guesses) of what the future holds.

Dr. Bernie Luskin, an educator with experience in broadcasting and computer science, is president of Philips Interactive Media of America (PIMA), the company primarily responsible for developing software to run on Philips' CD-I players. Jerry Rubinstein, former chairman of both United Artists and ABC Records, now heads International Cablecasting Technologies, whose Digital Music Express brings CD-quality audio to subscribers over cable TV systems. And Mike Vitelli is senior VP/general manager of the Sony Personal Audio Products Co., which markets consumer audio and multimedia hardware.



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I think that between now and the end of the century we are going to have quite a revolution in entertainment and education in the home. The visions of the future are all about choice, options, alternatives. What the technology is doing is to increase access. This stems from three developments: the advance in signal processing capability, which means the ability to manipulate bits; the advance in chip technology, which allows you to move across all different formats and do everything faster and better; and the integration of off-air and on-air digital signals.

For off-air, I believe that optical disc is going to be the carrier. I think there will be a major publishing industry that emerges in this area. It is the publishing business of the future. If you look at who is becoming involved in this, it is the print publishers, the film companies and the broadcast and cable television companies. They are looking at new forms of prerecorded publishing. So there will be a relationship between broadcast and off-air materials. They are separate businesses, but they will be synergistic.

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There are going to be controllers that handle both disc players and on-air signals, such as broadcast television, pay-per-view and movies-on-demand. Each of these services is a niche business in its own right, but they are going to integrate because everyone is competing for time on the television screen. So I think you are going to have a whole variety of integrated uses of entertainment and educational materials because of the new ways we can handle information.

For example, you could be watching a boxing match broadcast by a pay-per-view company. Now, the director decides which camera angle you see. But you could have four camera angles on your set, and choose to look at all of them or pick one for closer view. Then you might put in a disc of the *Boxing Book of Records* and look up information in one corner of the screen as the match is going on.

At the moment, music is probably the most advanced area of this digitally based home entertainment scenario. The optical disc is already the dominant carrier in the music industry, and digital audio will be, I think, pretty much in the future what it is today. But with the advances in digital technology, the music video is going to come back on an interactive disc, and be significant. You'll have the ability to see the artist perform, to get background information, to set up your own selections. And the "you mix" concept, where you can mix your own instruments and do other things to customize what you hear or see, will certainly be a feature in the home.



**Jerry Rubinstein  
International Cable-casting Technologies**

Digital technology is driving all the new technologies that will be used in media. What it all boils down to is information. We are learning to manage information and put it into a digital form, and to link the various forms.

Music on demand is definitely going to be available. Our digital cable audio service may one day be a jukebox, where you can not only listen to preprogrammed channels but also call up any cut you want to

hear. We are creating the infrastructure to deliver that to your stereo. It could be on a pay-per-record basis, where you download an album or put together a compilation, or a pay-per-listen basis, where you just hear a cut on demand.

The record companies will, of course, share in the revenue from the use of their recordings. Today, royalties go to the music publishers and composers, not the owners of the recordings themselves. I think that will change, which will stimulate these jukebox-type systems. The recorded music companies will turn more into publishers than manufacturers.

We will see an evolution in music similar to what we are seeing now with video rental stores and pay-per-view or video-on-demand entertainment. With video-on-demand, it will be easy to download the "A" titles, the ones they are always out of when you go to the video store. But the video store will still be the place you go when you want to browse and pick up several titles. Similarly, you might buy your music hits by downloading and recording at home, but you would go to a record store to make your catalog purchases.

Ultimately, of course, technology could provide all of it at home, the video browsing and the downloading of audio products. That doesn't mean that you will say, "I don't need to own my own music library anymore. I just press these buttons and I hear whatever I want to hear." In the near future, at least, it is just going to be another way of buying your prerecorded music. You will be able to sit at your personal computer, select the category of music, browse through album covers and liner notes on your screen, and sample the music. This will be via cable, satellite and CD-ROM or CD-I, all tied together to allow you to do this browsing, not only for records but for movies as well.

The technology is already so good, and evolving so rapidly, that it is possible to do all of this right now. And when you add video and audio compression, existing transmission schemes will be able to deliver more and more information without any noticeable degradation. That will allow software suppliers to come up with more things to deliver directly into the home on existing infrastructures. You will see your PC, your

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by Philip De Lancie

# INTERACTIVE MULTIMEDIA

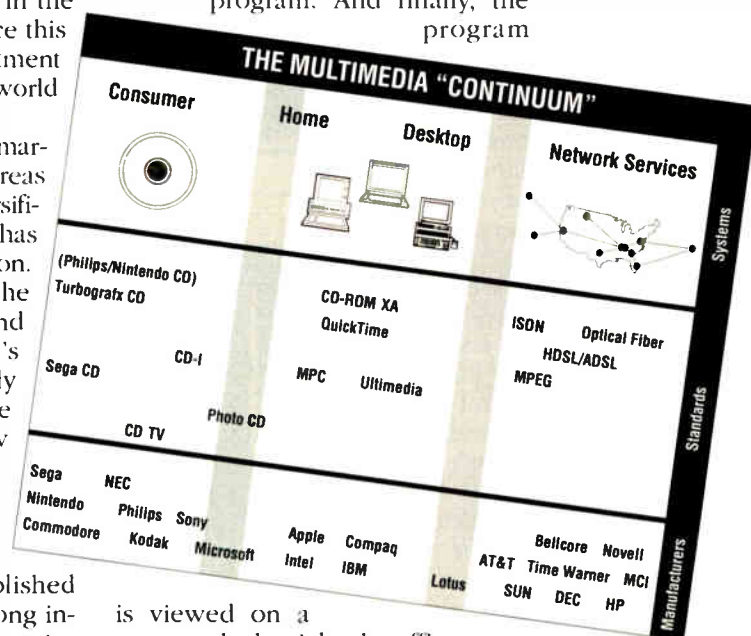
## OPPORTUNITIES FOR THE AUDIO PROFESSIONAL

It's been clear since the bottom fell out of the record market around 1980 that audio facilities are well-advised to broaden their client base beyond the record industry. In the '80s, this emphasis on diversification was focused on audio post-production for video, which helped many a studio to survive and some to thrive. Studios and engineers who invested in the equipment and skills to service this new field found their commitment rewarded with a whole new world of potential clients.

Today, the audio-for-video market is fairly mature, but new areas seem to hold promise for diversification. Multimedia is one that has been getting increasing attention. But the term is so vague, and the spectrum of technologies and applications so broad, that it's difficult even for those deeply involved to know just where the opportunities lie and how real they will turn out to be.

For most in the audio production industry, multimedia is not yet a viable alternative to scrambling for more established types of business. But the strong interest shown by most of the major consumer electronics, computer and entertainment media companies is a good indicator that multimedia is more than a mere gleam in the eyes of a few zany techno-visionaries. Artists, too, have begun to use the possibilities offered by multimedia formats, as evidenced by Todd Rundgren's decision to release an interactive CD of his next album, allowing listeners to re-edit and remix his songs. Interactive multimedia promises to change the entertainment industry in dramatic fashion. Those who prepare now will be best positioned to cope later.

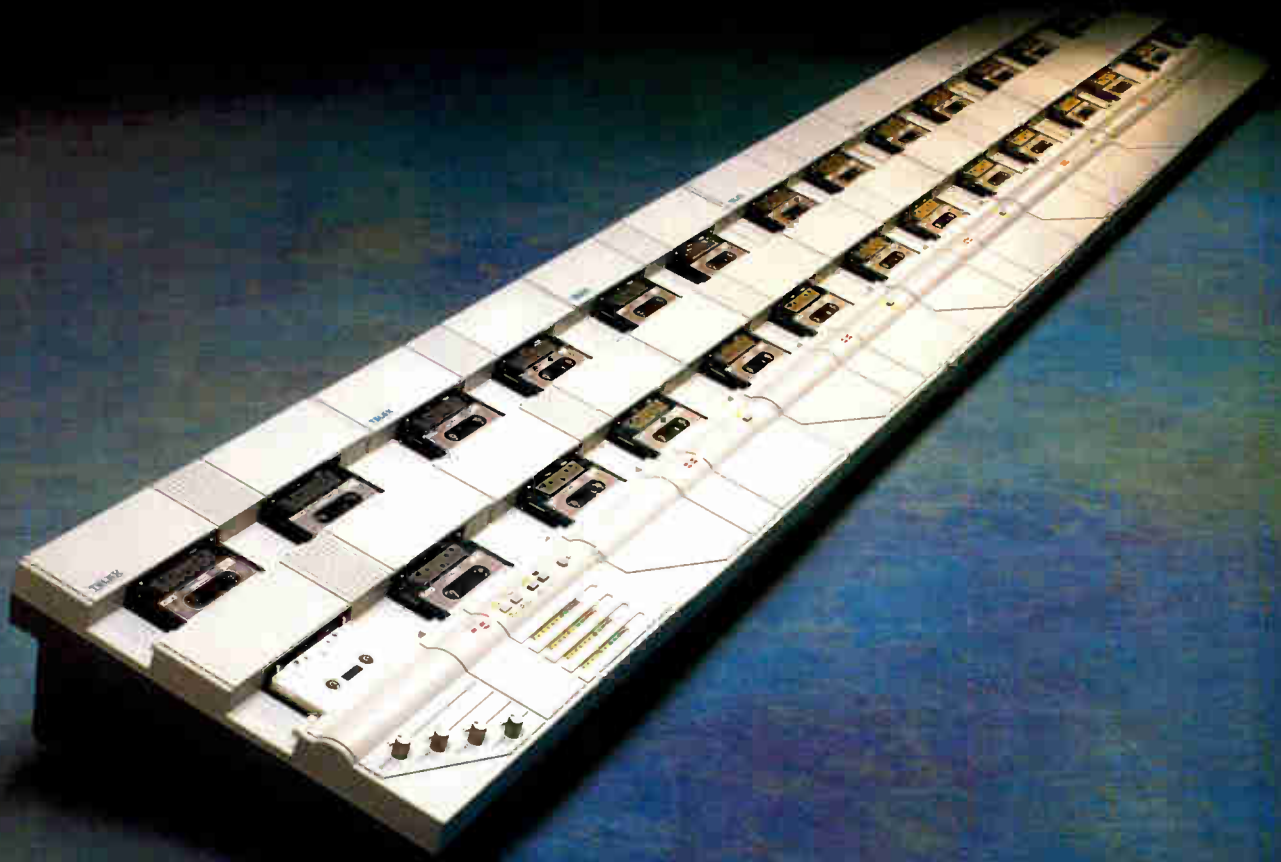
There are only a few common denominators that define multimedia. Fundamentally, the term refers to a program using some combination of audio, text, graphics, animation and motion video, usually with some level of interactivity. The user is not a passive viewer but an active participant in charting a course through the program. And finally, the program



is viewed on a screen, whether it be the office computer or the family TV.

Beyond those basics, the variables begin to multiply rapidly. Content categories include entertainment/games, information/reference and learning/training, with lots of room for cross-over between categories. Publishers, who own, produce and release the content, may be record labels, encyclopedia publishers, toy companies or industrial-training specialists. Programs might be available at book and record stores, video rental outlets or over cable TV. And even within the general category of CD-ROM-based products, the playback "platform"

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could range from a dedicated consumer electronics player like CD-I to a ROM drive hooked to a personal computer or a "local area network" (LAN) serving business workstations.

This diversity of applications suggests a great variety of opportunities for the would-be participant in the field. But it also vastly complicates the task of preparing to dive in. This article sets out to make that task a bit easier by providing some basic answers in the following areas: What are the markets for interactive multimedia? What is the process of "authoring" or putting together a multimedia program? What kind of equipment is required? And what opportunities exist for facilities and professionals currently serving traditional pro-audio markets?

The idea here is to give an introductory overview without focusing too closely on any one delivery platform. I've enlisted the aid of Philip Dodds, managing director of the Interactive Multimedia Association (IMA), a trade group whose members include major interested parties like Apple, IBM and Kodak. I also sought input from Doug Carson of DCI, a company specializing in mastering systems for optical discs, including interactive CD-ROMs such as CD-I.

*The world of interactive multimedia seems to be divided into consumer and business categories. How would you characterize the differences between them and what you can do within them as far as presenting your content?*

**Dodds:** In consumer products you see a trend toward TV-like entertainment, with high-fidelity, high technical quality and, on the game side, lots of color. There is a lot of stuff coming down the pike that will make high-quality audio and video part of multimedia entertainment. CD-I will soon have MPEG motion video, and there are other products coming that will be fun to watch.

On the business side, the ability to do motion video at all, on the desktop or on networks, is a bit remarkable, given the bandwidths that are available in those systems. You see postage stamp-quality motion video, done within the context of existing business applications. So if you make a multimedia title that's action-packed,

designed for fun, and quality is important to you, then you aim at the consumer end of the spectrum. If you want to do the same thing up on the desktop, you can, but you have to expect the end user to have a several-thousand-dollar computing system.

*What considerations go into choosing the appropriate release platform (Mac, IBM, CD-I, CDTV, VHS, etc.) for a particular type of content?*

**Carson:** The main distinction is between business and consumer applications. Consumer applications need to run on stand-alone systems, such

as CD-I, Photo-CD and CDTV. If the consumer has to hook up to a computer, I think you've lost the race. So if you're orienting your content toward consumers, you had better shy away from making it operate only on a Macintosh or IBM. If, on the other hand, you create a business or professional application, then you have to seriously address the Mac/IBM question. You may also want to consider CD-I, which is sort of a transitional thing that can go either way.

**Dodds:** It depends on whom you're trying to sell your content to. For example, there may be thousands and



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thousands of CD-I players out there, but they may be in the hands of the wrong people. So you have to ask, "Which platforms are my target customers likely to have or to buy?" A given type of customer is not likely to be equally well-served by Mac, IBM, CD-I, etc. They are each different distribution channels serving different types of customers.

*Give a general outline of the authoring process.*

**Dodds:** In general, you need to have

a designer envision the interactive strategy and decide what kind of user interface and what kind of interaction will take place. Much of this will depend on the capabilities of your target platform.

All the possible permutations will have to be mapped out: "When I do this, it does that. If I do that, it does this." This interactive scripting process is often done with a flow chart and description. It's as if you were to envision sitting in front of a screen on the delivery platform, with the system slowed down so that you could see everything happen in sequence, and you

could dictate what you want to see.

Along the way, you will be envisioning all the data types you are going to use: "Am I going to have motion video? If so, how much, and when will it appear? Am I going to have buttons that start it? What are they going to look like, and how is the user going to know when to use them?"

When you finish the script, you can generate a list of all the pieces of media you need: the graphic screens, the audio snippets, the motion video clips and the animation. By this point you will have pulled a creative team together that includes a specialist for each of the media types. You go through your list and say to your creative team: "Go do each of these, and load them onto the authoring system when you're done."

In general, the media elements ought to be captured in the highest-quality form that you can afford. Then you digitize or convert for your target platform. That's a separate step, because you can't tell which data format you're going to digitize to until you know for sure which target platform you are going to use.

Once the elements are all in memory on the authoring system, with file names corresponding to their designation in the script, the actual coding process is a matter of translating the written, verbal script into instructions that will make the target platform do what you want. Depending on your preference, and the availability of authoring tools for your situation, the coding can be done by moving around icons that correspond to the files or by actually typing in lines of computer code.

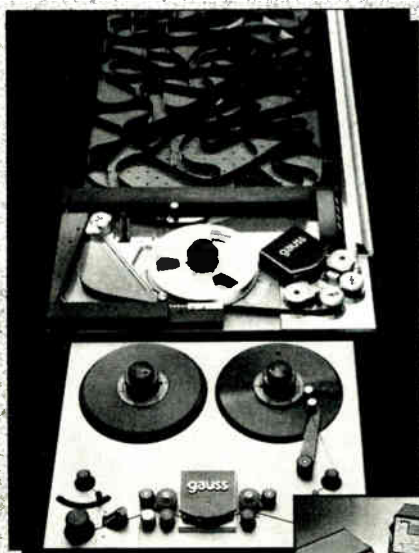
*What are the hardware/software requirements of systems used for authoring, and what peripheral devices (scanner, digital audio players, etc.) are needed?*

**Dodds:** Do you want to develop for lots of different platforms, or are you going to end up picking one? If you pick one or two similar platforms, your requirements are vastly different than if you are going to go across widely different ones. The software development people who author for CD-I, Windows, Apple and so forth tend to have a couple of pretty high-powered workstations with a significant amount of hard disk space and some very high-horsepower tools. So you are going to have to spend \$20,000 to

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\$60,000, or even \$100,000, for a computing development environment.

As far as software, the PC and Mac platforms have the richest, most diverse and most cost-effective authoring tools because there are more of those boxes out there than any other kind, so it's a lucrative area to be involved in. In closed areas like CD-I, very few have gone into the business of selling authoring tools, because they may have seven customers rather than 7,000.

In addition to the authoring sys-

tem, you need at least one of the target platforms for testing the final product. You also need a high-resolution flatbed scanner for still images. And there are a variety of add-on or built-in products for inputting and digitizing the audio.

For video, the format situation is still evolving, and there are many flavors of digital video that are incompatible with one another. That's why laser video disc, which uses analog video, continues to be the publishing medium of choice when motion video is a key part of the content. One option is to digitize your video with

a real-time video card, and use that video as a placeholder until you know exactly which pieces you want in the final product. Then you can send a videotape with just those segments to a service bureau that will redo the analog-to-digital conversion with high-quality processing like DVI.

**Carson:** In selecting an authoring platform, the price differences are secondary. The most important question is the maturity of the authoring tools because the tools are going to make or break your project. If you've got bad tools, they're just going to eat up your development time.

In addition to the authoring equipment, you need to be able to record the authored program to send it to the mastering facility for replication. You used to have to put your data onto 9-track tapes and your audio onto a U-matic [PCM-1630]. Since 9-track tapes hold only about 130 megabytes each, they have to be transferred to another storage medium at the plant before cutting the glass master. That means it's up to the mastering facility to piece everything together and get it all in the right location on the disc, based on written instructions provided by the author.

Today, the trend in mastering is toward the 8mm Exabyte cassette as the preferred interface medium. The tape has sufficient capacity [5 GB] for all the audio and other data at once. It also has sufficient bandwidth [500 KB/sec] for us to record the glass master directly from it. A DDP [Disc Description Protocol] burst is used at the beginning to tell the plant what kind of data is on the tape, where it is and where it goes on the CD. By describing how the mastering machine should handle the contents, DDP makes the mastering process automatable and eliminates human error.

*What progress has been made toward multiplatform compatibility for ROM discs? Are we ever likely to see the day when publishers can release a single disc that is playable on all or most of the target platforms?*

**Dodds:** In the business market, the customers and the publishers are screaming bloody murder about incompatibility. So the dominant players are rapidly approaching agreement on common data formats for the purpose of exchanging data across platforms. This goes much further than the ISO 9660 standard, which defines

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how you lay down bits on a CD, but doesn't tell you anything about the type of data. In the data interchange initiative, which is being worked on by a group within the IMA, all the parties will agree on the types of data and the way files are identified, so the same CD can be read in different environments like Mac or Windows. We'll put a header on the files, identifying one as MPEG video, another as 44kHz 16-bit audio, and so on.

Another group within the IMA is busy working on an agreement under which the various platforms must provide certain compatible capabilities, referred to as "multimedia services," such as synchronizing audio and video files or rendering a graphics file. And a third group is working on taking those services and incorporating them into a language for scripting that everyone will agree to use. Once you all agree that your scripts will use a given word for a given operation, then you can all be compatible simply by making platforms that know how to read that scripting language.

By this time next year, the IMA should have some specific recommendations from each of these three working groups. Most participating companies will support them with new versions of software and operating systems. Hopefully, this will help the market grow. Then the creators of business-oriented content can be less worried about the target platform than they now have to be.

On the consumer side of the market, you won't see much compatibility, because most consumer companies don't really want it. VIS has the best chance of being compatible elsewhere because it is based on Windows, but you won't see it being compatible with CD-I or CDTV or Nintendo, and probably not with Sony's Data Discman. Consumer companies are accustomed to winner-take-all marketing strategies, and they are deeply wary of losing market share to one another. However, what may happen is that the consumer platforms will play both proprietary discs and cross-platform discs like those resulting from the IMA recommendations. A precursor of this is Photo-CD, which does, in fact, work

in consumer products like CD-I and CDTV, as well as on the desktop and on networks.

*What opportunities do multimedia disc formats offer for audio facilities, and how might these facilities prepare to enter the multimedia field? Does having a digital audio workstation give you a foot in the multimedia door?*

**Dodds:** The opportunity for audio and video facilities lies in their knowledge of how to create and capture quality content. Also, facilities that prepare audio for CD could add to their services by offering conversion of audio to the digital formats used on Macs or CD-ROM XA or CD-I. There could be a business there in converting to these local data-types. You would have to decide which of the platforms your service would support and then get the hardware or software to do it.

Offering the authoring services themselves is also something worth considering, provided you have only one or two platforms that you want to support. Otherwise, there are so many permutations that it gets un-

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manageable. If, for instance, you have a decent-horsepower Mac, you could author for the Mac platform. You need to buy some add-in cards, the appropriate software tools and editing packages and...*Bang*, you're in business, but the output will only run on a Mac. If you want it on CD-I, then you have to set up another whole system, probably on a Sun workstation, and all the data formats will be different.

Another consideration is that most creative teams like doing things themselves rather than going to a service bureau. So rather than trying to get outside creative teams to use your services, my recommendation to a facility owner who wants to get into authoring would be to put together a creative team in-house, because that's a big part of what you can offer your clients. Those who understand how to best manage the creative process of recording, producing and mixing good-quality stuff are the same sort of people who could constitute a good part of a creative team for interactive multimedia.

**Carson:** Once DCC is launched, with its ITTS text/graphics capability, consumers are going to get a taste of hooking up to their TV, seeing information on the screen and being able to easily select a track or find out who is playing guitar. And they are going to wonder why a tape can do something that their CDs can't. Also, the next level of CD players to which consumers will upgrade—whether it's Photo-CD, CD-I or something else—will hook up to both the stereo and the TV. There is some thinking at the major record labels that this will provide an opportunity to finally use the CD-Audio's graphics capability.

One opportunity for audio pre-mastering houses in this area is the CD+G format, which uses the R-W subchannel bits to put text and graphics on an audio CD. The text can be track titles, author text, things about the performance, etc. That provision has been around in the Red Book standard since day one, and all the formats that are CD-based have embedded CD+G capabilities.

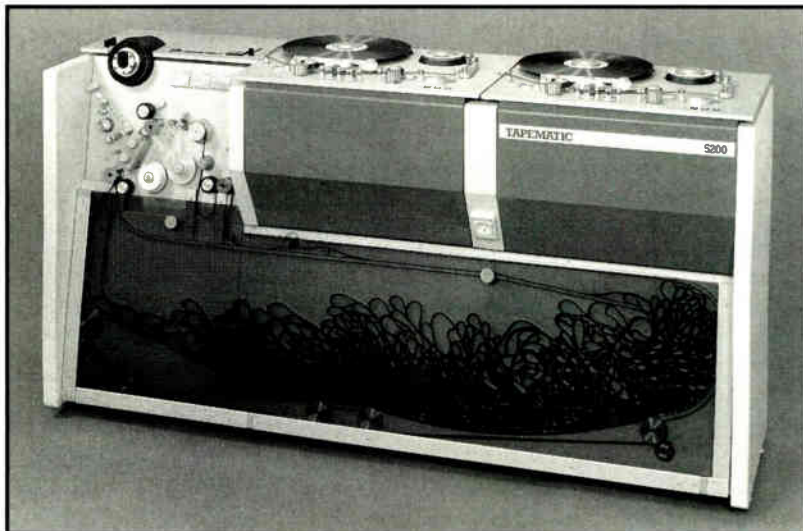
There are already some commercially available PC-based CD+G authoring and editing packages, but

they tend to be fairly expensive. With the advent of DCC, however, there are going to be some inexpensive PC- or Mac-based graphics editors within the next 12 to 18 months. We have worked closely enough with ITTS and the CD+G subcode to know that it will not be that difficult to automatically convert between the two formats. The eventual goal would be to have one master that will contain the audio and the text/graphics data. At mastering time it will be determined whether the data will be mastered for DCC, CD+G or even digital broadcast, all from one master format.

The other pre-mastering opportunity is the CD-I Ready format, which can do a lot of the same things as CD+G. But since the text/graphics are put on the disc in CD-I format, the authoring systems are available today. There is a plan that has been discussed to insert CD-I format text at the beginning of already released CD-Audio programs. Then new CD-I Ready discs can be released that will play exactly like the old CDs, unless you have a CD-I player, in which case you have this bonus information. ■

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# Tape & Disc News

## CONGRESS PASSES HOME RECORDING ACT

The U.S. Congress has passed the Audio Home Recording Act, sending the bill to President Bush for his expected signature. The move clears the way for introduction of DCC, Mini Disc and future consumer digital recorders. Tim Sites of the RIAA, which has long been at the center of the home taping controversy, said the trade group had "worked hard" for the bill, which culminates "ten years of effort."

The legislation was created last year when consumer hardware manufacturers got together with record companies and music publishers to end more than a decade of acrimonious dispute over home taping (see "Tape & Disc News," September 1991). The software side agreed to drop opposition to consumer digital recording formats in return for royalties levied on recorders and blank media to compensate for revenue losses attributed to home taping. Hardware interests agreed to the mandated inclusion of SCMS digital copying limitations in return for the exemption of home taping, analog or digital, from the infringement provisions of copyright law. The two sides have worked closely for passage of the bill, which encountered little opposition.

## PHILIPS DROPS CD-E BOMBSHELL

The Home Recording Act sets an important precedent for resolving conflicts between intellectual property rights and new technologies. But just as the fruit of its compromise was on the verge of enactment, the coalition of strange bedfellows that made the bill possible was rocked by a "September surprise": Philips announced to a group of audio journalists visiting the company's headquarters in Holland that it will market a rewritable CD-compatible consumer recording system in 1996.

CD-E (for erasable) would probably be based on the "phase-change" approach to optical recording that

Tandy boldly announced several years ago (THOR) and later quietly abandoned. Unlike the magneto-optical approach chosen by Sony for Mini Disc, phase-change recordings can be read by the optical pickups in existing CD players. The CD-E system would be capable of recording full 16-bit audio without the data compression schemes used to fit album-length program on MD and DCC.

The commercialization of phase-change would mark yet another technical achievement for Philips. But if the company expected to wow its friends in the music business, it sorely miscalculated. The RIAA's Tim Sites called the announcement "bad timing," saying it would "confuse consumers."

"It's a poor choice to talk about it while we already have two new technologies [DCC and MD] in their infancy," Sites told *Mix*. "There are no current discussions within the RIAA as to what to do, but it does cause us some concern." A spokesperson for the Warner Music Group characterized the news for *Billboard* as "a surprising and unfriendly act to the industry." One of the more ironic statements came from Sony Music, which reportedly damned CD-E for "serving no purpose other than the copying of CDs."

Perhaps in response to the heated criticism, Philips has been working to put the genie back in the bottle. At AES, Gerry Wirtz, senior hardware/software product manager with Philips Consumer Electronics, told *Mix* that Philips had simply intended to demonstrate its confidence that such a product would be technically feasible by 1996. The notion that the company firmly planned to introduce CD-E, he said, was a "misinterpretation." A complementary spin on the story was offered to *Billboard* by Philips spokeswoman Angelique Hoogakker, who said the company was discussing CD-E as a replacement for DAF in the audiophile and semiprofessional markets.

## DELAYS DOG DCC DEBUT

Problems with both hardware and prerecorded software have complicated Philips' efforts to bring DCC to market before Sony launches MD. In mid-September, production was halted on DCC-900 models manufactured at Philips' plant in Sagami-hara, Japan. The decks apparently had trouble accepting some analog cassettes due to variations in shell dimensions. Philips'

Gerry Wirtz told *Mix* that the problems were a normal part of the transition from preproduction to full production manufacturing.

Hardware production has resumed, but problems have now arisen with the prerecorded DCCs. While testing product for compliance with DCC heat and humidity standards, JVC discovered that a felt pressure pad in the cassette mechanism could chemically react with the tape and cause deterioration under extreme conditions (90°C). Existing stocks have been recalled, pushing the Japan software launch back one month to early November. While a Philips spokesperson told *Mix* that the problem is limited to Japan, industry observers believe the recall will affect Europe as well, with perhaps more than 100,000 DCCs pulled from distribution centers.

Meanwhile, limited quantities of hardware have gone on sale in both the U.S. and Japan. Tandy became the first to hit the market when it offered a few Optimus-brand decks for sale at the opening of its massive Incredible Universe superstore in Wilsonville, Ore. The company is not expected to begin wider DCC distribution until after Philips launches here in early November.

In Japan, Philips and Matsushita have already begun selling DCC product. Philips spokeswoman Angelique Hoogakker, speaking to *Billboard*, said the machines are already back-ordered due to better than expected sales.

## SONY REVEALS MD MODELS

Initial Mini Disc launch plans from Sony call for two Walkman personal portables to go on sale in the U.S. in early November. A record/playback version (MZ-1) will carry a suggested list price of \$800, while a play-only machine (MZ-2P) will list for \$600. A car stereo player, including AM/FM receiver, will be available in "early 1993" at a list of \$980. Sony, planning for 300 titles at launch, has so far enlisted three of the six major labels in its MD roll-out: Capitol/EMI, Warner Music Group and (surprise!) Sony Music.

## MID-YEAR MUSIC STATS

The RIAA reports that net shipments by its member companies for the first six months of 1992 rose 6.69% over the same period in 1991, when con-

sumer spending slowed as the nation focused on the crisis in the Persian Gulf. According to the trade association, whose members account for about 95% of the U.S. market, the list value of the 402 million units shipped (less returns) jumped 11.3% to \$3.8 billion.

The latest figures are the first in which CDs, rising 18% to 181 million, have surpassed cassettes in net units shipped. Cassette units declined 3.5% to 165 million, a better showing than the 23% drop posted in the same fig-

ures last year. The fastest-growing configuration was CD singles, up 57% to 3.76 million. The fastest falling were LPs, down 33% to just 1.41 million units, and music videos, which slid 31% to 2.3 million.

**ITA COMES ONBOARD FOR REPLITECH**

The ITA and Knowledge Industry Publications have arrived at a tentative agreement to co-sponsor the Replitech trade show and seminar scheduled for June 15-17 in Santa Clara, Calif.

The ITA has also announced its

1991 figures for U.S. shipments of blank audio tape and videotape. Total volume rose 7.7% in units and 3.7% in dollar value over 1990. Blank cassette units fell .3% to 437 million for the year. The figures do not include tape supplied in pancake form to duplicators or blank tape loaders.

**SONY BOWS MMCD PLAYER**

Sony has announced a self-contained, portable player for CD-ROM XA standard discs, expected to be introduced last month. The Multimedia player, previewed at the Multimedia Conference in San Francisco in March, also plays CD-Audio. It combines a CD-ROM drive with an LCD display panel, speaker, keyboard and cursor pad into a package measuring 7x6x2 inches. The 2-pound unit also features an audio jack for headphones or speakers, a video output for display on a TV, and a serial port for a printer or modem.

At \$999 list, the MMCD unit is likely to be marketed initially to business people who can use it both for presentations and entertainment/learning while traveling. Sony announced more than 60 titles that will be available at launch from companies like Random House, IBM and Compton's NewMedia. Hinting at the company's view of the future, Sony Corporation of America COO Ron Sommer called MMCD "an important step in the strategic integration of consumer electronics, personal computers and communications."

**WCES ADDS MULTIMEDIA CATEGORY**

The EIA reports that its Winter Consumer Electronics Show, set for January 7-10 in Las Vegas, is showing a 19% increase in demand for exhibition space over 1992. The event will be the first CES at which multimedia has been designated as a separate product area. Apple Computer is among the noteworthy first-time exhibitors, while manufacturers returning to the show after an absence include Sony, Motorola and Yamaha.

**IN THE JANUARY "TAPE & DISC"**

Philips and Sony used October's AES convention in San Francisco to try to build industry support for DCC and Mini Disc respectively. How are other companies lining up in what is sure to be a heated battle of the formats? Find out next issue.

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World Radio History

by Paul Potvin

# MASTERING FOR THE MASSES

Considerable dust has been kicked up lately concerning the advent of 20-bit digital recording. Improvements in converter technology have made possible the genesis of powerful 20-bit systems at a fraction of the cost of those developed even a year ago. Digidesign Inc. (Menlo Park, Calif.) took advantage of a similar cost-benefit formula when it created Sound Tools, the most widespread digital audio recording and editing system in use among audio professionals today. Now the company hopes to effect a repeat performance with its recently released ProMaster 20 system.

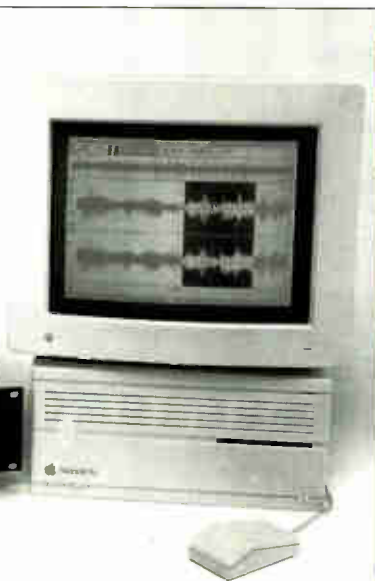
ProMaster 20 is based on the Sound Accelerator II card that is used in the Sound Tools II system. However, it's also compatible with the Pro

Tools Audio Card. And in place of the Pro Tools Audio Interface, ProMaster 20 incorporates a 20-bit A/D and D/A box and a special version of Sound Designer II software that records and processes 24-bit data.

I spoke with Evan Brooks, Digidesign's vice president of engineering and developer of ProMaster 20, about the product, which was unveiled at the recent AES show. We also talked about the Digidesign Intelligent Noise Reduction System (DINR), the company's new noise-reduction software package.

**Mix:** For whom is ProMaster 20 intended?

**Evan Brooks:** It's designed for anybody who needs a mastering or mix-down recorder and archiving with greater fidelity, precision or headroom than 16 bits can offer. It's the same reason you would move to 16 bits if you had an 8-bit system. There are the same attendant increased



Digidesign's ProMaster 20 system and developer Evan Brooks



benefits.

**Mix:** Can you elaborate on those benefits?

**Brooks:** ProMaster 20 gives you 20 bits of headroom and fidelity to work with. You can take advantage of that in the recording, the mixing and the playback part of the chain. When you write out to your final output device, you need to take your 20 bits and dither it down to what you want as your output. But that doesn't negate the fact that you've used 20 bits all

along.

Imagine that you're used to working with a 16-bit signal. You typically fill the entire dynamic range, so you've got 16 bits worth of headroom and signal-to-noise ratio. Let's compare that to a 20-bit system. The difference is the four extra bits. At roughly 6 dB per bit, that's an extra 24 dB.

Depending on the level that you record your sound, you can choose to allocate that extra 24 dB between increased headroom and increased

signal-to-noise ratio, and better low-level linearity. A 20-bit system allows you to generate 16-bit masters that have 16 bits of linearity, which you can't do with 16-bit systems. Even the best 16-bit ADC has a SNR of only 92 dB. A 20-bit system can generate 16-bit masters that use the entire available 96 dB of SNR.

The extra headroom afforded by a 20-bit system allows you to record at safe levels without sacrificing SNR. With digital, it's es-

## Chip Shots

### ANTEX DSP BOARD

Antex Electronics (Gardena, CA) has introduced a PC add-on digital audio board with Dolby AC-2 coding, providing real-time, broadcast-quality, stereo sound. The Antex Model SX-20 is said to provide real-time storage or transmission of 20Hz-20kHz

### MIDIMAN SYNCMAN REMOTE

Syncman Remote is a desk accessory for the Macintosh from MIDIMAN (Pasadena, CA) that allows any MIDIMAN sync product to be controlled from the computer. The user can set SMPTE write offset, select SMPTE format and set SMPTE user bits from the DA. Suggested retail price is \$19.95.

Circle #202 on Reader Service Card.

### SUNRISE 8-TRACK, 16-BIT AUDIO BOARD

SunRize Industries (Campbell, CA) has started shipping the AD516 digital audio card with Studio 16 Version 2.0 editing software for the Commodore Amiga. The AD516 supports eight tracks of audio recording, playback and editing at 16-bit resolution, up to 48kHz sampling frequency, and SMPTE synchronization. A 10MIPS sound accelerator chip also allows the AD516 to perform digital effects in real time. The card is designed to run on Amiga 2000 or 3000. List price, including Studio 16 software, is \$1,495.

Circle #203 on Reader Service Card.

### ARDAT TURBO PYTHON DAT DRIVE

The ARDAT division of Archive Corporation (Costa Mesa, CA) is shipping its Turbo Python DAT drive for computer data storage. With a transfer rate of 366 KB/sec, the unit offers twice the per-

formance of any other DAT drive available. When combined with industry-standard Digital Data Storage data compression, the Turbo Python drive stores up to 8 GB of data on a single cassette with a maximum transfer rate of up to 1.46 MB/sec.

Circle #204 on Reader Service Card.

### COMMODORE AMIGA 4000

The newest in Commodore's (West Chester, PA) line of Amiga computers, the Amiga 4000 features a Motorola 68040 processor; a dedicated slot for video devices; selectable NTSC scan-rate compatibility; four-voice, dual-channel digital audio; high-speed animation capability; and full hardware video overscan. Suggested retail price is \$3,699.

Circle #205 on Reader Service Card.



audio at a rate of 128Kb/sec, making transmission over T-1 phone lines possible.

The SX-20 features software-selectable storage formats, including PCM, ADPCM, DVI and CD-ROM XA, as well as Dolby AC-2. Input resolution is 16-bit with 64-times oversampling; output is 18-bit, 8-times oversampled. List price is \$2,195.

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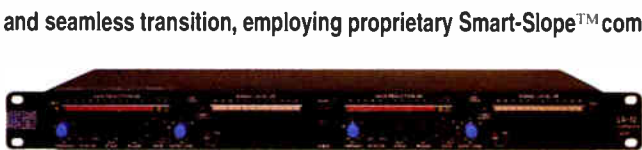
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pecially important to think about that because you don't have that nice, soft upper limit that you have with analog tape. If you record 6 dB down on a 16-bit system to allow for peaks, your average program material is being recorded with only about 86 dB of SNR. A 20-bit system in the same situation will give you about 110 dB of SNR. When converting from 20 to 16 bits for the final master, the Pro-Master system preserves the low-level information in the lower four bits by using a proprietary dithering algorithm.

system has allowed you to do your manipulation at as high a quality as possible without incurring a hit in the headroom department. And it allows you to save the file as a dithered 16-bit signal from a much higher quality 20-bit signal.

**Mix:** Can DAT machines take advantage of this increased resolution?  
**Brooks:** In terms of the data that's sent across the digital interfaces, AES/EBU can accept up to 24 bits. But the DAT specification calls for 16-bit resolution and no more. You can feed 20-bit digital data to the DAT, but it will ignore the last four bits. So your archive choices are hard disk,

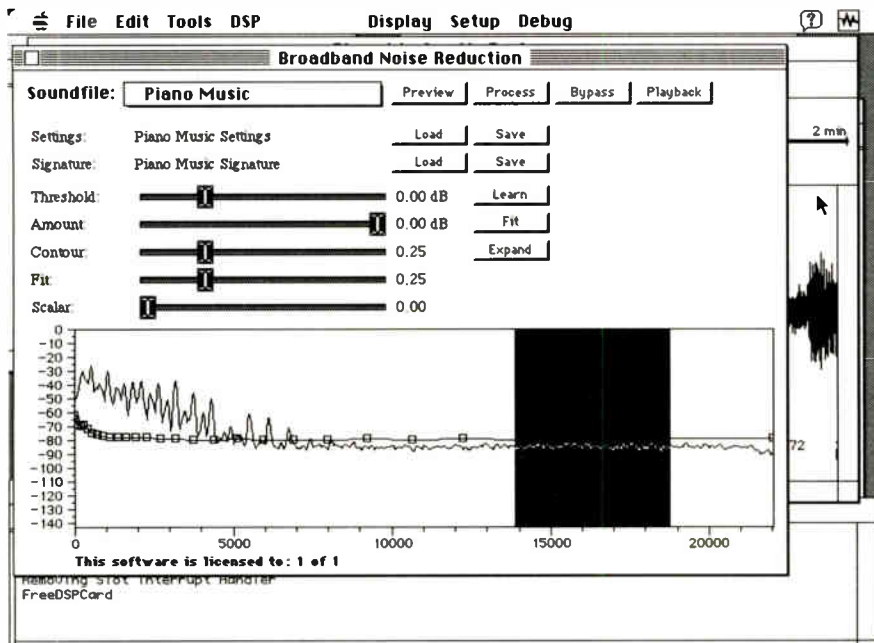


Figure 1: DNR's broadband noise-reduction window

Here's an example: Let's say you're going to be using a system to master a CD. If you know that you'll be doing some compression and EQ to the final data before it goes out, then you should record it into the system so that the peaks are 12 dB down. That gives you 12 dB of headroom and 12 dB better signal-to-noise ratio (than with a 16-bit system). Then you do your editing and EQ. You won't use up more than 12 dB of your headroom in that process unless you've been really extreme. Then, by normalizing the final result, you put everything in the upper 16 bits of the 20-bit word. At that point you've probably got more than 16 bits worth of data, so you have to dither it down to the final output device, which in most cases is a 16-bit CD. The 20-bit

magneto-optical or dataDAT, but not DAT.

**Mix:** How is it different from other systems?

**Brooks:** In terms of comparing our system with other commercially available choices of mastering media such as 1/4-inch analog tape with and without Dolby, or DAT, the benefit is fairly obvious from an economic standpoint. The quality of a system is typically determined by two factors: signal-to-noise ratio and headroom. For most of these alternatives, frequency response is fairly adequate. However, crosstalk and distortion are extremely low in digital systems. When you're looking at 16-bit, good-quality 2-track analog tape with Dolby SR is a very good alternative to 16-bit digital. Once you move into 20-

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bit digital, the signal-to-noise and headroom are far better than can be achieved with other mastering media.

**Mix:** I understand that Digidesign uses an alternative method to AES/EBU to transfer audio data from the 20-bit audio interface to the DSP card. Can you explain?

**Brooks:** The audio interface box does have an AES/EBU connector on it, and both AES/EBU and S/PDIF are designed to accommodate at least 20 bits of audio. But the way that box—as well as all of our other I/O boxes—hook up to our DSP cards is via a cable that has a connector on it. The DACs and the ADCs are all in the box, and they're driven with clocks directly to and from our card via this cable. That's also where the AES signal is generated.

A lot of other systems, in the absence of their own ADCs and DACs, allow you to hook up any standard ones you want, using the AES/EBU port to make the connection. For example, on the Sonic System you have AES/EBU connectors directly on their

card. The difficulty with that approach is the quality of the clock that's passed around. With AES/EBU, the clock and the data are intermingled—they're transmitted on the same signal. A phase-lock loop is used to recover both the data and the clock from that signal. [See *Mix*, October 1992, "A User's Guide to Digital Audio Interconnects."] If that clock then plays back data and drives your DACs, any jitter that's in that clock is going to come out as intermodulation and harmonic distortion on your signal. When you use AES/EBU to pass your clocks around, everybody who recovers it adds jitter because that's the nature of phase-lock loops. They're designed to be accurate over the long run, but in the short run there is jitter. Clock jitter is an extremely significant component of the overall noise floor when you go beyond 16 bits. We circumvented that problem by having separate lines for clock and data that go between our card and our converters.

**Mix:** Why do you need to process/store at 24-bit resolution if you are using 20 bits?

**Brooks:** A couple of reasons, some obvious and some not. The obvious one is that it's a nice, even unit for everything to deal with—the computer, the disk—all the elements that deal in byte quantities. The DSP system that we have is a 24-bit digital audio system. The digital audio bus that we've developed is a 24-bit bus. It's the standard that we've been using all along. It makes sense not only from a convenience point of view, but also from the point of view that 24 bits is the resolution of this particular technology. There's no way for us to store information as 20 bits because the overhead it would take just to juggle bytes is not worth the space savings involved.

The other reason is that as far as any standard sound file formats go, and certainly as a natural extension of our own, to record 20 bits you have to stick it in a 24-bit word. An additional benefit is that subsequent processing will generate more than 20 bits of information, and the 24-bit format allows us to retain that. For example, that's how AIFF works. Everything is justified to bytes and

# CONTROL FREAK



The DC 24 is the first dynamic controller with a built-in 24dB/octave crossover to allow separate dynamic control of high and low frequencies. This *bandsplit dynamic processing* delivers tighter control more transparently than conventional compressor/limiters. It reduces "pumping," "breathing" and other annoying side effects that can result from a single side-chain trying to accommodate both high- and low-frequency demands simultaneously. The DC 24 gives you the choice of re-combining the split program to a single output for studio/broadcast applications, or leaving the highs and lows separate for biamped live sound performance.

And with separate, individually controlled stereo ServoLock™ limiters, stereo compressors and stereo noise gate/expanders—that can all operate simultaneously—the DC 24 provides a degree of transparent dynamic performance that is simply not possible with any other controller on the market.

But then what else would you expect from Rane?

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you just zero-pad the low end.

**Mix:** Another recently announced product is your noise-reduction package, DINR. Can you describe it?

**Brooks:** It is a software plug-in module for Sound Designer II, Version 2.4, which will ship with ProMaster 20. It's also compatible with Sound Tools II and Pro Tools. Once you have that version, you drop the special file in a folder and it shows up in Sound Designer as a couple of additions to the DSP menu. There are two specific modules that it ships with. One is for broadband noise removal, and the other is for hum removal.

The broadband noise removal is good for getting rid of tape hiss, ambient background noise such as HVAC, and any semi-stationary broadband noise. The hum removal is obviously for getting rid of harmonic and enharmonic tones that are in the signal—anything from light dimmers, computer monitor radiation and AC noise to car horns. You can do that with the broadband module but it's not quite as effective.

**Mix:** Who is the intended user?

**Brooks:** Anyone who has a noisy recording. We expect that a very big application will be in cleaning up single tracks on multitrack recordings. Especially guitar tracks, which tend to pick up so much noise. It's also effective in cleaning up older recordings.

Anybody who works with music and sound that is corrupted with noise will find this useful. There are a ton of people out there who have 1/4-inch tapes they would like to clean up, and if you're recording new tracks you've got board noise, mic preamp noise, line amp noise and then you've got all the attendant hums from dimmers and air conditioners. Even if you're recording digitally, I'll bet your mic preamps are noisy. And this can remove that kind of noise.

**Mix:** How would you describe the difference between this product and other noise-reduction products?

**Brooks:** Frankly, it's hard to talk about the differences people see because only a handful of people in the world are ever going to use these other systems—they cost \$30,000 to \$50,000. We have a no-compromise, fully featured system at an aggressive price.

As far as the differences that you

can't see, we're able to do on a single DSP what other people are taking literally a dozen DSPs to do. The major reason for that is our algorithm development. We've started from scratch, rather than piggybacked on top of a bunch of university work. Our constraint was that we *have* to make this thing work on a single DSP in real time.

**Mix:** Do you have plans to implement pop, click and other transient-removal features?

**Brooks:** Yes. Mostly that's dependent on what we see as the perceived need of users. By far the vast majority of our customers need to clean up music tracks with ambient noise. While it's got some utilitarian value, click and pop removal is not as important as broadband noise and hum removal is to our customers.

**Mix:** Let's say somebody has Pro Tools and they want to clean up a guitar track. Would they just switch over to Sound Designer II to do that?

**Brooks:** Yes. The sound files are all the same format. They would need to get Version 2.4 of Sound Designer II.

\* \* \*

The creation of 24-bit audio files on hard disk raises some issues. If you're finally used to the massive size of 16-bit files, prepare to allow for another 50% of your space to be gobbled up by that same program material in 24-bit resolution. And if you've enjoyed the convenience of archiving your digital files using DATa backup software to your conventional DAT recorder, be aware that it won't preserve the integrity of your 24-bit files. At this point your options are magneto-optical or tape backup archival media such as a dataDAT.

Despite these unpleasant side effects, the availability of mastering tools "for the rest of us" promises to make ProMaster 20 a welcome tool for professional music recording studios, music-oriented project studios and mastering studios.

Available now, ProMaster 20 is priced at \$5,995, and for a limited time includes DINR. (Who said there's no free lunch?) A special limited discount of \$500 off the retail price of \$995 is being made on the stand-alone version of DINR. ■

*Paul Potyten is an associate editor at Mix.*

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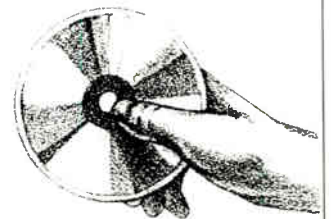
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DECEMBER 1992, MIX 81

by Dan Daley

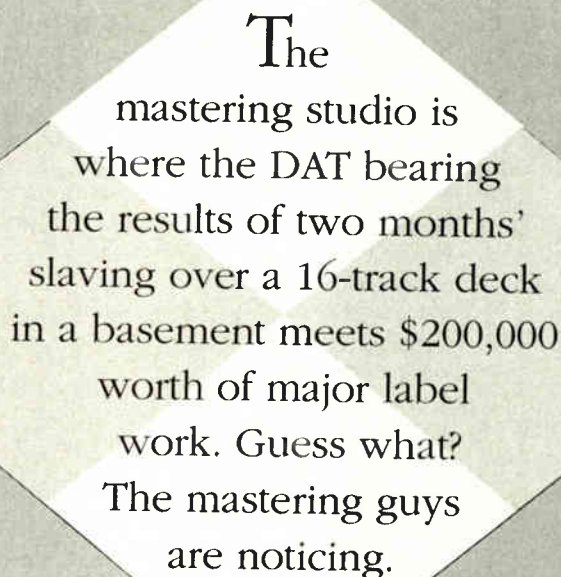
# PREMASTERING IN THE PROJECTS

**F**or all their initial novelty, project studios have evolved fairly conventionally. The concept of recording projects on your own equipment, at your own pace, in a familiar environment was—and remains—a rush. But beneath the surface flows the same circulatory system as the conventional recording world: tracking, overdubbing, sweetening, vocals,

months' slaving over a 16-track deck in a basement meets \$200,000 worth of major label work. Guess what? The mastering guys are noticing.

#### STARTING WITH THE MIX

The first considerations of premastering need to take place during the mixing stage. An overly wide dynamic range is one criticism of proj-



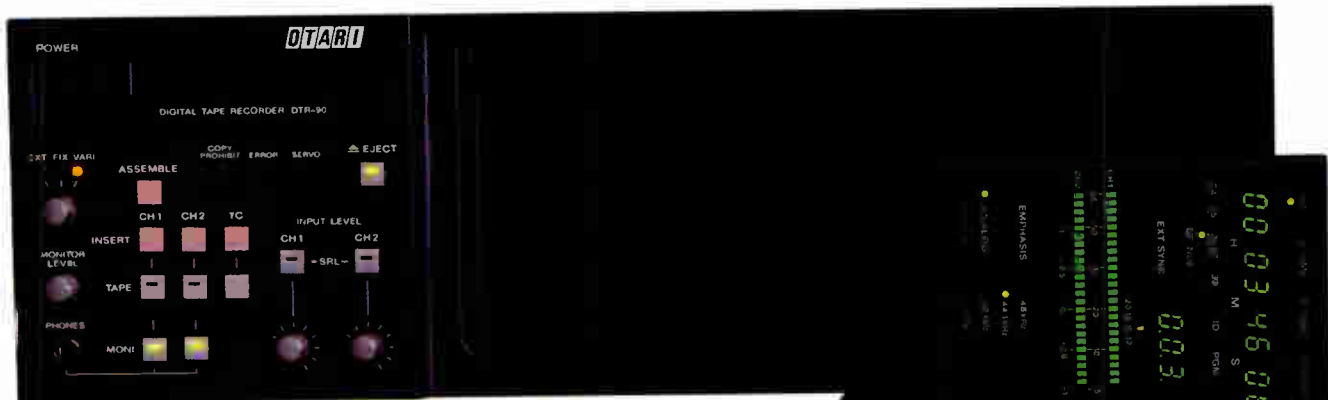
The  
mastering studio is  
where the DAT bearing  
the results of two months'  
slaving over a 16-track deck  
in a basement meets \$200,000  
worth of major label  
work. Guess what?  
The mastering guys  
are noticing.

mixing and...

Mastering, or more precisely, premastering, is a topic that many project studios have been running up against lately. Independence is also a form of isolation, and nowhere does that become more apparent than in the mastering studio, where the DAT bearing the results of two

ect masters that mastering engineers and duplicators point to. This is the result of a failure to, at least, slightly compress and/or limit a mix, as well as keep levels between mixes referenced to a common value. A tone generator is an invaluable tool, since you not only need to have a common reference between mixes, but

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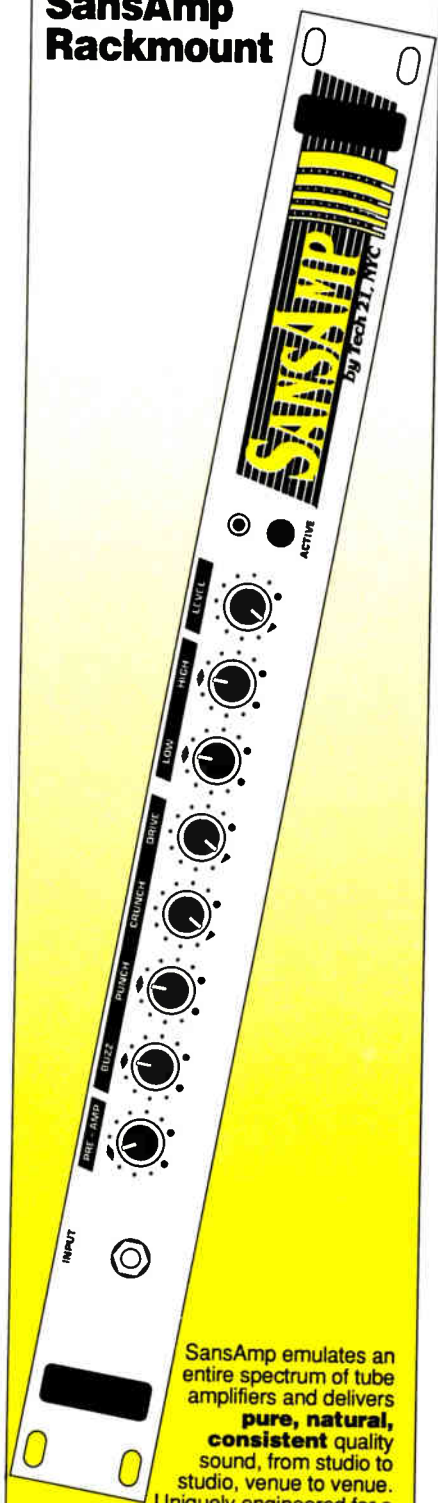
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the mastering house needs to have something to reference against. Tone generators can be purchased for under \$100, and in a pinch a synthesizer sine wave can produce a 1kHz tone.

There doesn't need to be a lot of compression on a mix, just enough to round off the extremes of the dynamic edges. Keep in mind, however, that compression has a timbral effect as well as a limiting one, and a very subjective one at that. Some people like more, some like less, some like none at all. The kind of compressor, another subjective area, makes a difference too. I've used both the dbx 166 and the Alesis compressors on mixes with excellent results, at a ratio of a little over 2:1, and a variable threshold, depending upon the type of program material.

Denny Purcell, owner of Georgetown Masters in Nashville (a city that has seen an influx of project rooms lately), has run into the phenomenon. He agrees that the yin-yang effect is enhanced musical expression with a demonstrably lower level of technical chops. Purcell describes the mastering stage as an opportunity for a fresh perspective, a new set of ears listening in a new environment. "We're familiar with the trauma," is the way he puts it.

Before you get to this stage of the game, he also has a few suggestions. For starters, mix on close-field speakers with a monitoring system that includes a good amp and good speaker wire. "Check it in more than one location before you decide to master, and don't mix at loud levels," he says. "A loud mix falls apart at low volumes; a quieter mix holds together at higher volumes."

### DAT AS THE MASTERING DELIVERY FORMAT

The number of potential mix and mastering formats out there is getting bigger all the time. (Don't even *think* about using DCC when it becomes available. That might seem obvious, but there are a lot of people out there still mixing to analog cassettes. The move to a digital cassette might seem like a step up, but the data compression that DCC uses kills its digital advantage.) DAT seems to have become the choice of many

studios, project and conventional. The problem, though, is that many project rooms have opted for the less-expensive consumer DAT decks.

The SCMS copy protection circuit isn't a problem; that's circumvented by the pro decks at mastering houses. The key is interchange and sampling rate. Interchange problems exist, and there's not much that can be done about them, particularly between professional and consumer decks. Purcell recommends that people bring in their own DAT decks for the transfer, either first to analog for EQ and compression or directly to the digital 1630 format for final touch-up. Purcell's suggestion is based on aesthetics; if you really like the way your mix sounds on your deck, that's the deck that the master should be generated from. (He says the same about analog decks and SR units.) The collateral benefit is that you avoid interchange problems.

The sampling rate is easier to address. Just use 44.1 kHz, the same as the rest of the world. Using a 48kHz rate isn't likely to increase the fidelity noticeably in most cases, so there's little reason to use it. At 44.1, you avoid a messy conversion process that adds yet another digital transfer stage (digital has its own kind of generational degradations, which manifest themselves as a kind of sonic graininess) and adds to the overall cost of mastering.

The DAT sample rate problem is one Bob Ludwig (of Masterdisk) has run into more than once in dealing with project studios in New York. He also finds that quite often project studios mix to analog and then transfer to DAT just to be in the digital domain. That, he asserts, is unnecessary. "Just use whatever the actual source is for mastering," he says.

Ludwig also has seen bad fades off hard disk systems. "A digital fade is a different story, and you really need a very quiet environment to check them," he explains. "When a digital signal is not properly dithered, the bottom of the bit word gets truncated, and it can add some distortion to the signal. A fade without proper dither has more harmonic distortion on it, and once you've done the fade you can't fix it."

### DUPLICATION AND REPLICATION

Ultimately, the mastered product is



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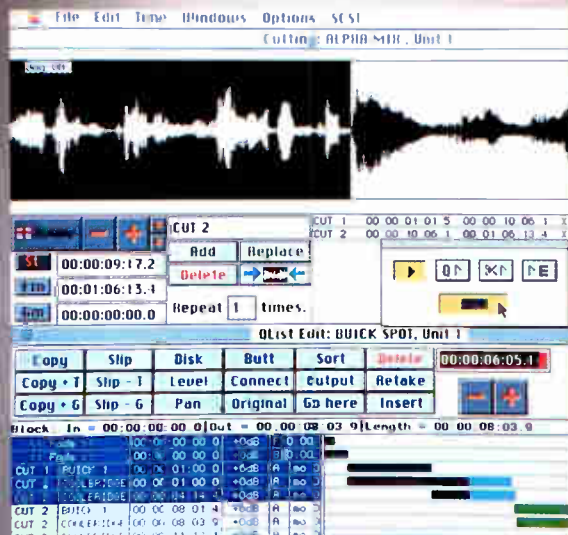
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Jack Renner  
and the ATM35 on

# Bass, Brass, and all that jazz!

Jack Renner needs little introduction. As co-founder, Chairman, and Chief Engineer of Telarc International he has been nominated 11 times and won 5 Grammys just for classical engineering alone. Jack Renner and the Telarc team pioneered digital orchestral recording and the minimalist microphone technique that is now the standard for premium-quality classical CDs.

But when Jack recently decided to create a series of jazz CDs to complement the superb Telarc classical library, he knew – from his years of location recording – that he would need a new approach to solve the difficult acoustic and performance problems posed by live recording in jazz night clubs.

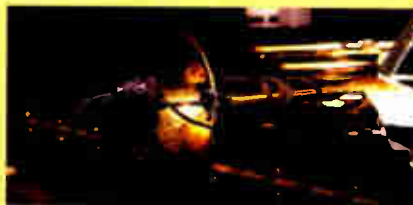
After an intensive search, he has found exactly the string bass sound he needs... with the Audio-Technica ATM35. This small cardioid condenser microphone can be clipped directly to the instrument. Its unique mount is readily positioned for best balance and consistent level all night long.

The cardioid capsule can also be easily replaced with an omni element when needed. Its low noise is impressive and the smooth extended response is both realistic and musical. Everyone loves the results: the musicians, the technicians, the record buyers, and Jack. But he also found the ATM35 has another role to play.

When Jack Renner clips the ATM35 to a trumpet or trombone he finds it equally musical, even with very intense playing. He gets very low distortion and noise, and consistent high quality no matter how much the musicians move around. Jack's goal of recording brass exactly as it is heard in live performance has been met simply and precisely.

He notes that while the microphone is actually quite close to the instrument it sounds farther away, with acoustic "air" that provides an amazingly natural perspective. And the ATM35 offers almost no restriction to the freedom of movement and expression that is so important to live jazz.

Location photos: Frank Micolotta



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going to a duplicator for analog cassette copies or to a replicator for compact discs. The Sony 1630 format has been the primary CD mastering format since about 1982 and probably will remain so for a while. Analog tape duplication uses a range of mastering formats, from DAT to 1/4-inch tape, and most sizable duplicators can handle multiple formats.

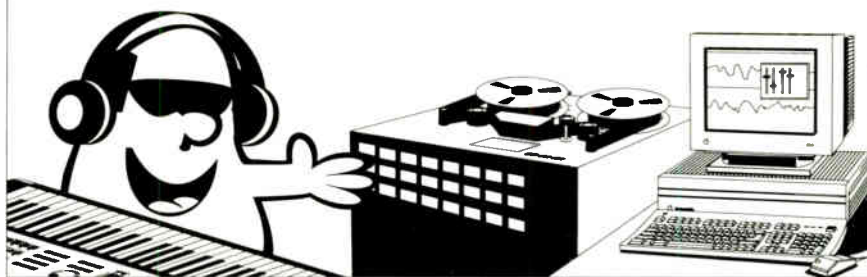
Jim Stern (executive VP of operations at KABA, a Northern California duplicator and manufacturer) says that he gets more DAT than anything else these days, from both project studios and record labels. Analog masters still come in, but their rate is diminishing, he says. Project studios also bring in 1/4-inch tapes and, in some cases, analog cassette masters, which is the last format you'd want to use for mastering short of an Edison cylinder. "The project studios cause us to see a lot of music that wouldn't otherwise have gotten made, like a lot of rap records done in living rooms," Stern says. "They're creating their own market and going around the system. But the result is that we see a lot of questionable masters coming in."

The biggest problems, according to Stern, are a tendency to have large peaks in the recordings that saturate the tape, and a lack of understanding about the damage that generational loss causes. His suggestion is to keep peaks at no more than 10 dB above the average of the rest of the program. On DAT, don't allow the digital PPM meters to exceed 0 dB. And definitely include reference tones.

As project studio work matures, more attention is going to have to be paid to premastering. The same types of grumbles from traditional studios regarding project studio recording techniques (or lack thereof, in their opinion) can now be heard from mastering houses. The freedom that personal recording has unleashed needs to be counterbalanced by a responsible approach to meeting the standards of professional recording. ■

*Dan Daley is Mix's East Coast editor. He's running short of clever closing tags and is accepting donations.*

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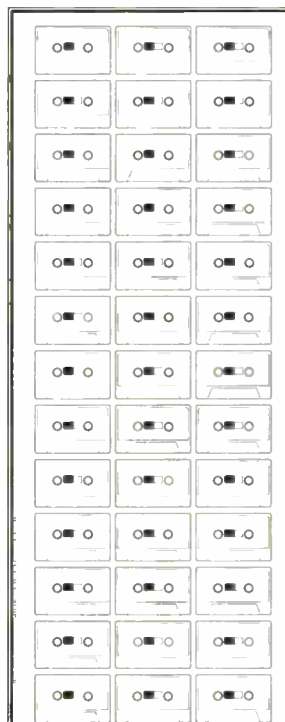
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IN A  
16-BIT  
WORLD**

by **John Monforte**

Even the most diehard analog recording enthusiast has to admit that digital recording offers a vast improvement in dynamic range. We have adapted our recording techniques to exploit this virtue. Now, careful listening reveals that the limiting factor in the dynamic range of a recording system remains in the recorder. There is still room for some advancement in this area.

The ultimate fidelity limitations of any pulse-code-modulated digital audio system are determined by its sampling rate and its word size. The sampling rate directly affects the bandwidth of our system, and the

word size determines dynamic range. To make any fundamental progress, at least one of these factors needs to be increased.

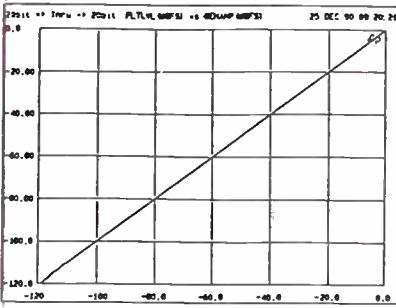
Among the complaints about the sound of digital recordings, low-level resolution and linearity have frequently been cited as problem areas. Even converter noise can be heard in recordings, especially in classical music since it often calls for dramatic dynamic contrasts. These factors are directly controlled by word size. Each time we take a sample, we must measure it for its amplitude value. The more digits (bits) we use, the greater accuracy we can achieve.

This can be expressed as the signal-to-error ratio, which is directly related to the signal-to-noise ratio or dynamic range of the system.

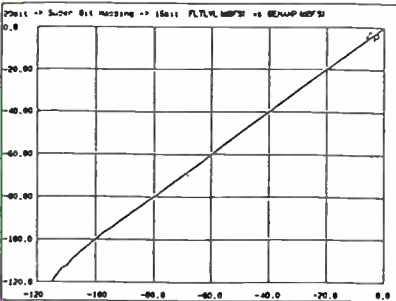
A 16-bit system can assign one of 65,536 amplitude values to a sampled signal for a total dynamic range of around 98 dB. This is large compared to analog tape recorders, but it is still the weakest link in the recording chain. If we increase the resolution to 20 bits, 1,048,576 values are possible, resulting in a dynamic range of 122 dB. This compares favorably with good analog electronics.

It can be difficult to appreciate

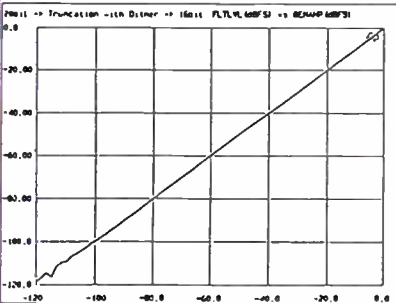
**FIGURE 1:  
LINEARITY COMPARISON**



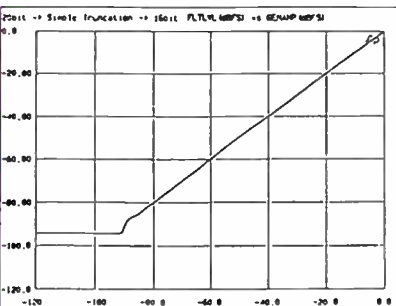
**20-BIT ORIGINAL**



**16-BIT SUPER BIT MAPPING**

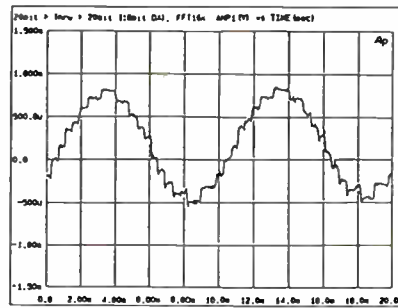


**16-BIT DITHER**

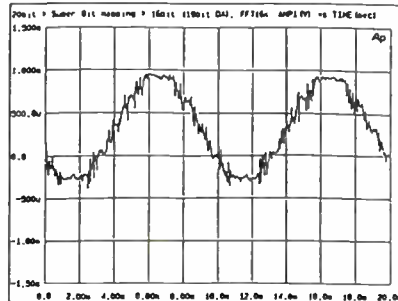


**16-BIT TRUNCATION**

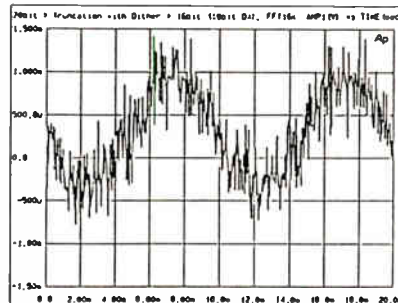
**FIGURE 2:  
WAVEFORM COMPARISON**



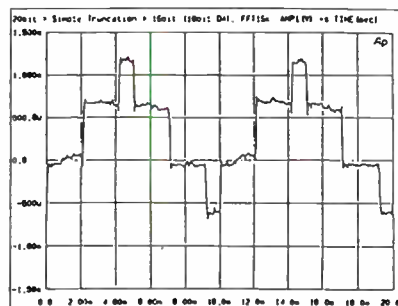
**20-BIT ORIGINAL (100HZ -90DB)**



**16-BIT SUPER BIT MAPPING (100HZ -90DB)**

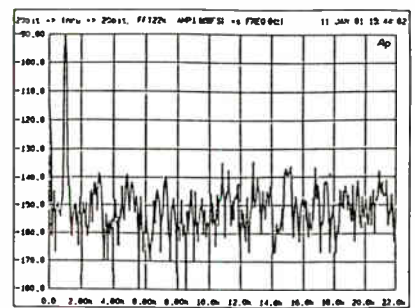


**16-BIT DITHER (100HZ -90DB)**

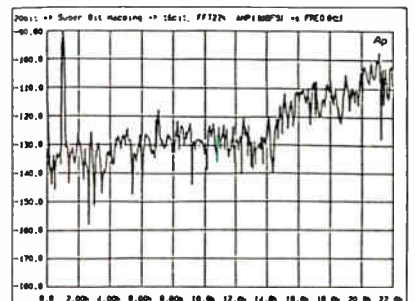


**16-BIT TRUNCATION (100HZ -90DB)**

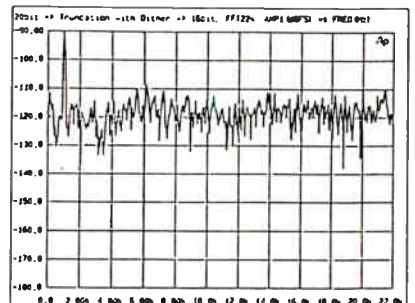
**FIGURE 3:  
HARMONIC DISTORTION**



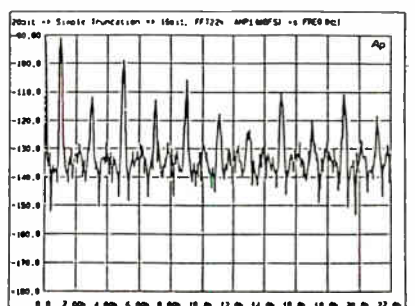
**20-BIT ORIGINAL (1KHZ -90DB)**



**16-BIT SUPER BIT MAPPING (1KHZ -90DB)**



**16-BIT DITHER (1KHZ -90DB)**



**16-BIT TRUNCATION (1KHZ -90DB)**

what it takes to get such precision in a measurement. Let's say we want to build a truck scale having extremely high accuracy. If it had 16-bit precision, it would be accurate to around one part in 65,000. Such a scale

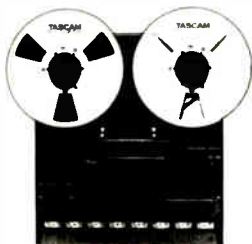
would be able to detect whether the keys were in the ignition. At 20 bits we could recognize that a flake of paint had chipped off. To build a device with this one-part-per-million accuracy, we need components with

tolerances at least this good.

It is certainly a tribute to the acuity of human hearing that we can hear such a dynamic range, and it is an incredible feat of engineering to build devices with this sort of sensitivity.

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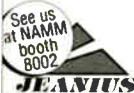
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The Pentagon should be ashamed for accepting weapons systems built to tolerance specifications that are slipshod compared to what we require for our audio recording systems.

For several years, our 16-bit converters were not actually capable of an honest 16 bits of performance, but improvements have steadily increased the precision to the point where we are able to coax 18 bits of performance from some of the latest generation of converters. Sony is developing 20-bit DASH recorders and has been using them for classical recordings on the Sony music label. This does not mean that we average folks can't also have high-precision recordings. Another way to get a genuine 20-bit signal is to combine many signals of lesser accuracy through a mixer.

There are still other ways of getting 20-bit word lengths, but there may not be any real resolution at that level. Digital signal processing almost invariably results in data words that are larger than those used at the input, but that does not necessarily mean there is more information in the signal.

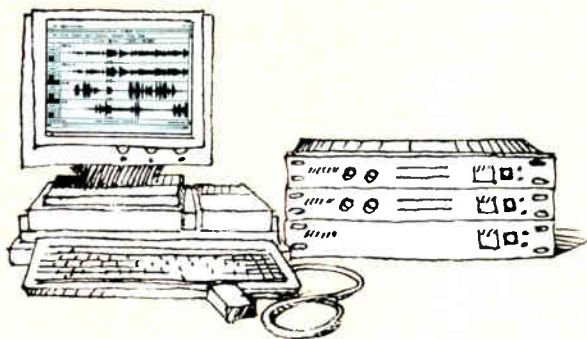
Probably the simplest form of digital signal processing is a gain change, which multiplies each sample value by a fixed number. If we divide 1 by 2 we get 0.5. If instead we divide it by 3 we get a number close to 0.3333333, and we will use every available bit our computing register has to offer. If our original number was only accurate to one decimal place, it would be wrong to assume our new result has improved to infinite accuracy.

Modern low-bit (oversampling) converters use digital filters and thus are capable of generating numbers with 18 or more bits, even though the actual samples were taken with lower accuracy. Bruce Jackson of Apogee calls these superfluous bits "marketing bits" because they mislead the buyer into thinking there is more precision than what is actually being obtained.

Of course, we would all eagerly adopt these new high-precision converters in the interest of higher fidelity, but CD and DAT do not allow for any more than 16 bits of storage in their current configurations. So what happens when we need to pass our fabulous 20-bit signal on to 16-bit media? Obviously, some of the



*Cut & Splice.*



*Cut & Splice,  
Record, Loop,  
Mix, Undo,  
Punch-in,  
Punch-out,  
Bounce, Copy,  
Paste, Erase,  
Trim, Fade-in,  
Fade-out,  
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finer details will be lost after transfer, but there is some hope of retaining more information than 16-bit precision would suggest by using a new algorithm introduced by Sony called Super Bit Mapping. But before getting into that, let's see what details need to be addressed.

As you probably are aware, dither is important in the sampling process in order to reduce low-level distortion. It also allows for resolution of signals that are lower in level than the noise floor, just as an analog system would do. Without dither, signals of extremely small amplitude would be assigned the same numerical value, and they would not register at all. The trick with dither is to add just enough noise to eliminate these quantizing artifacts. We also have some choices as to what sort of noise is optimal. The only penalty is a noise floor that is raised around 1 dB or so.

Dither is also essential whenever a number is rounded to fewer bits. Whether our 20-bit signal comes from a super A/D converter or is the result of mixing, signal processing or some other mathematical operation,

we have to add some sort of noise to it when reducing the word length. If we were to merely strip off the four least significant bits—a process called truncation—tiny signals would be removed and the result would be identical to a 16-bit sampler with no dither. Clearly, truncation is the wrong thing to do, but it is the simplest procedure and serves as a point of departure to compare the other methods.

In order to see just how bad it is, look at the linearity graphs (Fig. 1). The ideal is similar to the 20-bit original curve where the output changes 1 dB per dB input change over a range of 120 dB. In the truncated 16-bit curve, the output drops entirely as soon as the input drops below -90 dB. In the re-dithered and Super Bit Mapped transfers, linearity is largely preserved.

The next series of figures (Fig. 2) compares a tone that was recorded 90 dB below maximum. The 20-bit waveform shows a fairly clean sine wave, with apologies for the slight amount of staircase characteristic, which indicates that this converter needed a bit (no pun intended)

more dither. Nevertheless, truncation to 16 bits shows how bad things really can get at low levels for undithered signals.

When dithering is used in the transfer, we can see the sine wave clearly even though it is bathed in noise. After all, at about 6 dB per bit, we lose 24 dB of dynamic range when moving to 16-bit data words. The Super Bit Mapped version shows noise levels that belie the fact that only 16 bits are at work. The noise is more comparable to the 20-bit original!

How can this be possible? Well, actually, there are a few approaches that can be used. As alluded to earlier, there is a choice of what we can use for our dither signal. Good old Gaussian noise is the easiest to obtain and is truly random. This is what is shown in the example, but there are better choices. Stanley Lipshitz and John Vanderkooy demonstrated that noise with a triangular distribution can be used in smaller quantities and perform the job of dithering perfectly well. Triangular-probability density noise adds the least noise amplitude while still

# Your assistant is here.

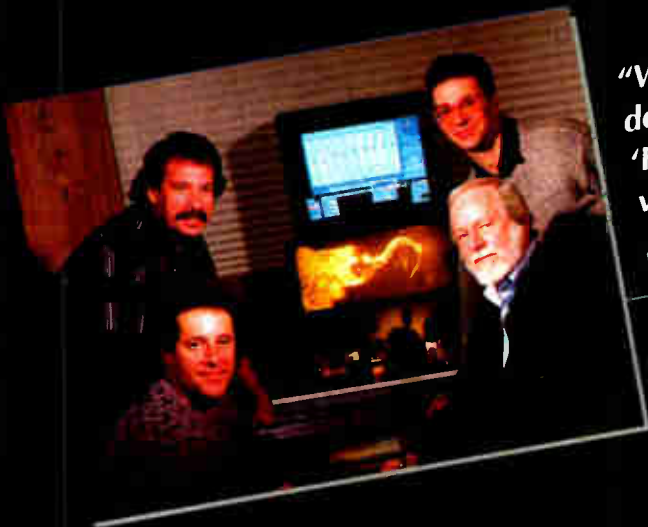


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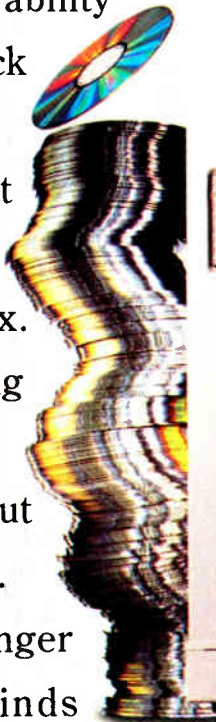
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dithering adequately.

We can do still better than that. According to the Fletcher Munson effect, our hearing has a frequency response that is far from flat. This also changes with level. For the very lowest-level sounds, our hearing is very sensitive in the middle frequencies and much less so at the ends of the spectrum. This is certainly a result of evolutionary forces—we can better hear those predators creeping up on us even though wind noise is actually louder. If we pick a noise for our dither that follows the response of our ears at low levels, it would sound quieter even though technically it is larger than other dither choices.

Still, a great deal more improvement can come from a process called noise shaping. When signals are in the digital domain, we can apply algorithms that skew the spectrum of our dither noise in a manner that pushes most of it above the highest frequencies of the audio band, even though the total amplitude is the same. We use noise that is statistically dependent on the four bits we will be removing. Thus, we essentially retain our signal information by using it to dither the remaining portion.

The third set of graphs (Fig. 3) shows this happening. Here we look at the spectra of a 1kHz sine wave that is recorded 90 dB below maximum. Note that this is not the conventional way of showing frequency response; the frequency scale is linear, not logarithmic, and therefore dwells on the higher octaves. Remember, the middle of the audio spectrum is around 2 kHz, which is far to the left of center. Now, ideally we should see a spike at 1 kHz and nothing anywhere else, but noise is present at the other frequencies.

The 20-bit version shows noise around -140 dB. The amount is fairly constant across the graph, which means it is white and has a hissy sound that is different from pink noise, which has the same amount of noise in each octave. When all the noises at all the frequencies are added together, we obtain our -120dB noise level. The truncated version shows lots of spikes at harmonic multiples, which is yet another way of saying this is distorted and worthless.

The 16-bit Super Bit Mapped signal, on the other hand, does not have constant amplitude vs. fre-

quency. In the last octave (10 to 20 kHz), the noise actually is larger than the 16-bit dithered example, but remember that our ears are not very sensitive to this at low levels. The level still keeps rising outside the audio band and ultimately adds up to the total amount needed for good linearity. Since a large portion is not in the audio band, we don't have to listen to it.

Sony's Super Bit Mapper is available in a little box called the K-1203 and can be purchased for \$15,200, but keep in mind that it is actually an algorithm. The algorithm is being

patented and is available for license. It can be used in a digital console or workstation without any additional hardware for transfer after processing, and it may even be built into high-precision A/D converters for 16-bit recorders. Of course, a readily available, cost-effective 20-bit professional recording format is what we all want. Such a device is surely just around the corner. ■

*John Monforte teaches at the University of Miami and is wondering if anyone in Louisiana has seen his lawn mower.*



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# Audio Production Facilities Report 1992

by **Elise Malmberg**

The *Mix* 1992 Audio Production Facilities Report includes information on geographic location, years in business, types of clientele, facility resources and equipment ownership, computer usage, staffing and salaries, gross revenues, and expenditures on equipment, supplies and construction.

Although the majority of respondents describe their primary function as owner/manager or sound engineer/mixer, most are also involved in secondary job activities such as production/direction, music composition or performance, technical/maintenance work, and sales or marketing.

The greatest concentrations of fa-

cilities are located in the Northeastern U.S. and on the West Coast. Among urban areas, the Los Angeles region has the highest concentration of production facilities.

The average facility is on the small side: usually more than a single production room and fewer than seven. Almost half of all production facilities consist of two to three rooms. Fifty-one percent of the production facilities surveyed have been in business less than ten years.

Most production facilities surveyed include at least one dedicated control/music production room. In addition, almost half of the facilities include isolation booths; over one-third have small studios or stages,

and about the same percentage have mid-sized studios or stages.

Artists and artist management are the most common primary clients for audio production facilities. About one-third of the facilities report additional business from each of the following categories: corporate clients, video directors/producers, music producers or engineers, and advertising agencies. In general, facilities depend on a diverse clientele for their existence.

Though it was asked as a single-response question, more than 25% of all respondents checked more than one facility description under "primary business environment." This response further illustrates the diversity of functions currently performed by facilities. Almost 35% of all facilities describe themselves as project or private production facilities.

Despite an average of nine full-time employees for all production facilities surveyed, the majority of facilities have significantly smaller staffs. Over 55% of the facilities employ only one to three people full-time.

Gross annual salaries for production staff are highest in those facilities that specialize in commercial video/film production and television broadcast production, and lowest in audio project studios and radio broadcast production facilities. Average salaries for recording engineers range from \$29,000 at audio project studios to \$41,000 at commercial video/film facilities; second engineers can expect to make between \$23,000 at audio project studios or radio broadcast facilities and \$30,000 at commercial video/film production facilities.

Multimedia/computer graphics services and CD premastering or digital editing are the most prevalent planned additional services. Very few facilities plan to discontinue services; among those who do, the most common deletions are remote recording and equipment sales and rental.

In general, audio production facilities appear to be planning moderate

## METHODOLOGY

The *Mix* 1992 Audio Production Facilities Report is based on the results of a survey mailed at the end of June 1992 to 1,000 randomly selected (*n*th name) domestic subscribers in the following circulation categories on *Mix*'s qualified subscription form, in quantities representative of the total number of subscribers in each category. (see below)

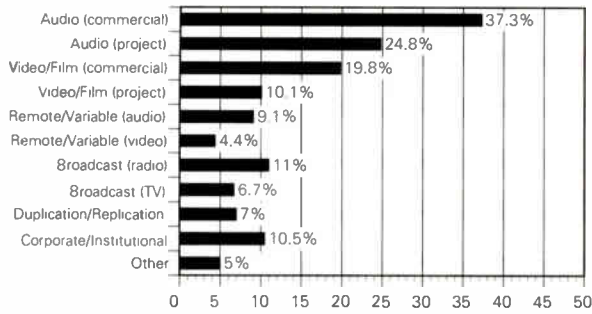
The questionnaire packages, which were mailed by an independent mailing service, each contained a four-page questionnaire, a cover letter, a \$1 bill and a stamped return envelope. A re-

minder postcard was sent to the list two weeks after the initial mailing. All completed questionnaires were returned directly to The TabLab, an independent market research firm based in Portland, Ore., for processing and tabulation. A total of 527 completed questionnaires and 13 undeliverable questionnaire packages were returned by the survey deadline of July 31, 1992, for a total response of 53.4%.

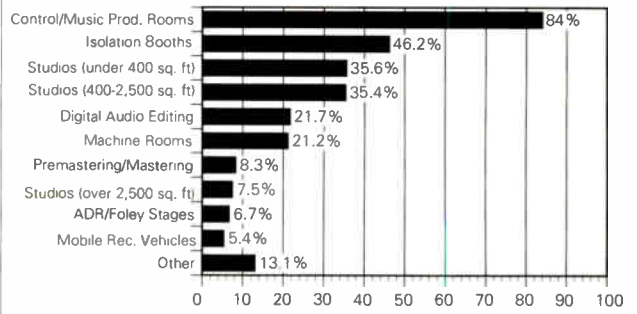
For a copy of the complete survey report, please contact Elise Malmberg, *Mix* marketing manager, at 6400 Hollis Street #12, Emeryville, CA 94608; (510) 653-3307; fax (510) 653-5142. ■

FACILITY TYPE	TOTAL NAMES BY CATEGORY	% OF LIST
Recording studios (includes MIDI production, digital recording and remote trucks):	514	51.4%
Video/Film (production, post-production and other video/film):	226	22.6%
Mastering-only facilities:	7	0.7%
Broadcast Production (radio, television and other broadcast):	154	15.4%
Educational/Institutional:	99	9.9%

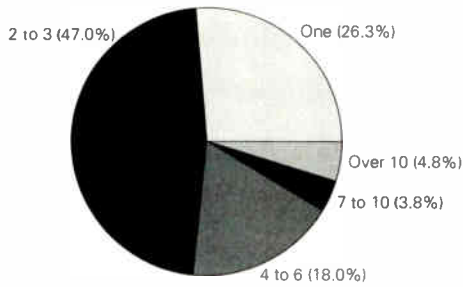
### PRIMARY BUSINESS ENVIRONMENT



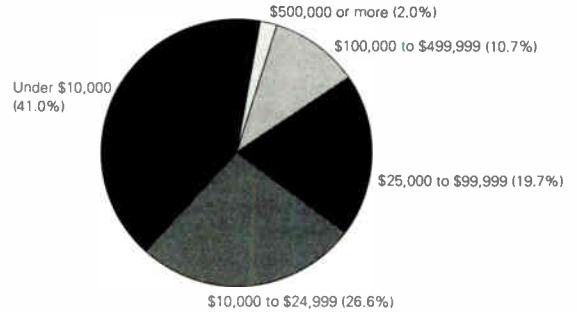
### TYPES OF ROOMS



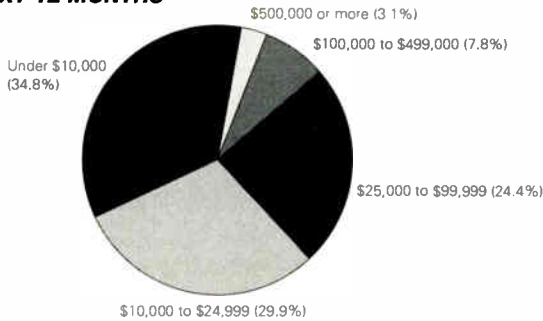
### PRODUCTION RELATED ROOMS



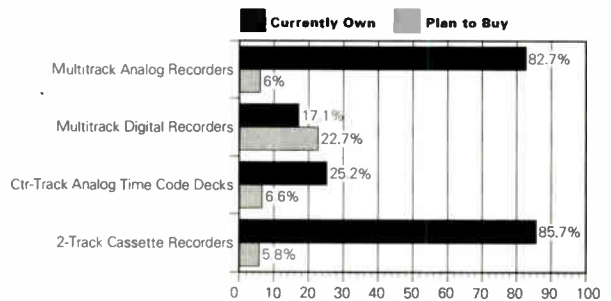
### EQUIPMENT EXPENDITURES IN THE PAST YEAR



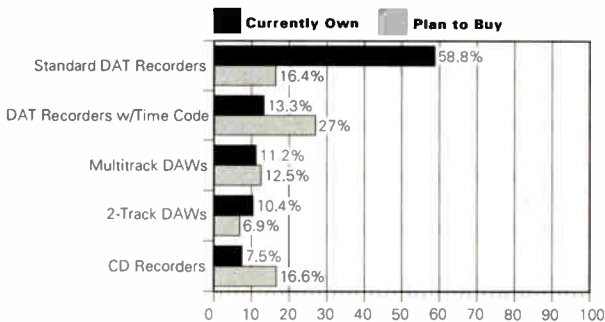
### EQUIPMENT EXPENDITURES PLANNED FOR THE NEXT 12 MONTHS



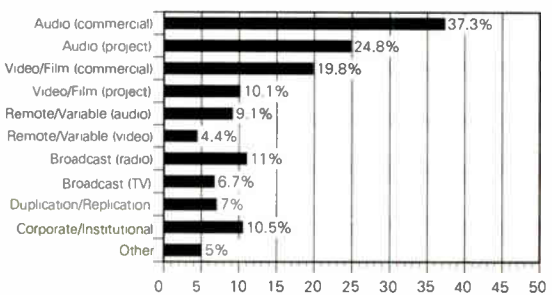
### RECORDING DEVICES



### DIGITAL RECORDING EQUIPMENT



### MUSICAL INSTRUMENTS & MICROPHONES



increases in equipment expenditures for the coming year. The mean amount spent on audio equipment in the coming year per facility is expected to increase by \$13,000; the median expected increase in equip-

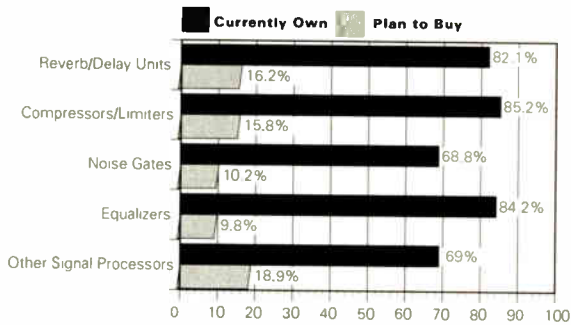
ment expenditures is \$3,000.

Digital recording equipment is high on the list of planned purchases for audio production facilities. Notable items in this equipment category include multitrack digital record-

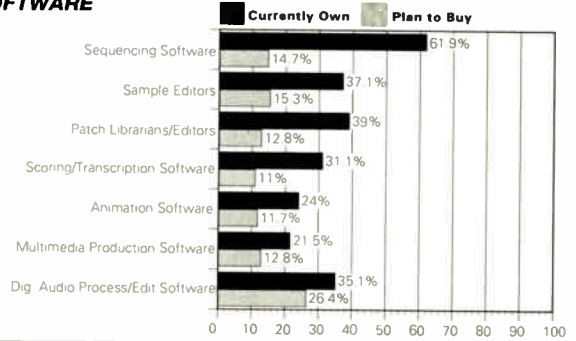
ers, multitrack digital audio workstations, standard DAT recorders, DAT recorders with time code, and recordable CD units.

Signal processors remain popular items for future purchase, especially

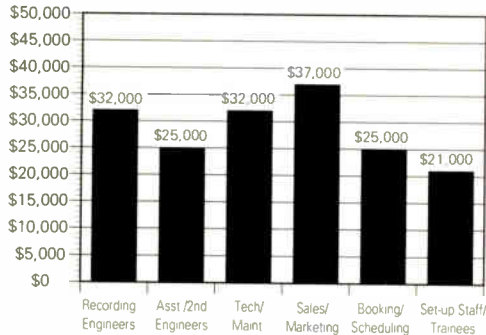
## SIGNAL PROCESSORS



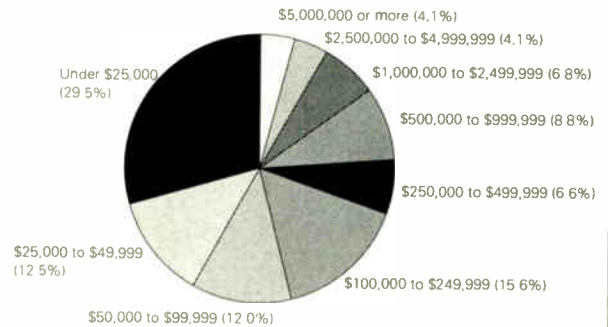
## MUSIC/VIDEO/MULTIMEDIA SOFTWARE



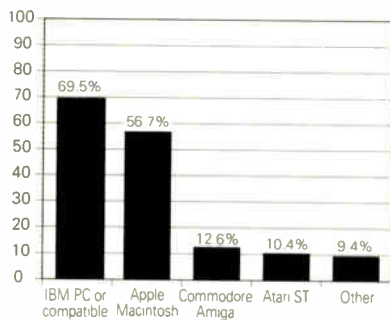
## GROSS ANNUAL SALARIES



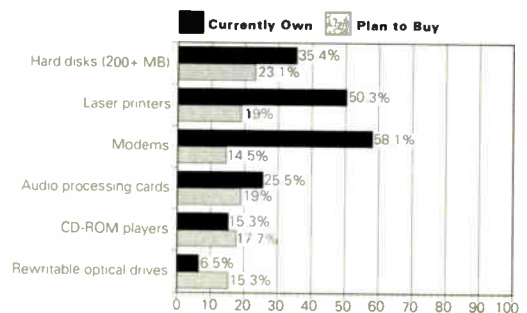
## GROSS ANNUAL REVENUE



## COMPUTERS USED



## COMPUTER PERIPHERALS



reverb/delay units and compressors/limiters. Significant percentages of facilities also plan to purchase new microphones, soundproofing/acoustical materials and samplers.

Some increases are also expected in facility construction, renovation and remodeling expenditures for the coming year. The average amount spent on construction is expected to rise by \$4,000, though the median remains stable.

An overwhelming majority of audio production facilities currently use computers. IBM PCs and compatibles are the most widespread platform, though Apple Macintosh is also a popular choice. Commodore Amiga and Atari ST take a distant third and fourth place among production facilities.

Business applications such as word processing and spreadsheet software are widely used in production facilities. A notable percentage of facilities plan to purchase scheduling/studio management or audio and acoustical analysis/testing software.

A number of facilities report plans to purchase computer peripherals such as laser printers, modems, audio processing cards, CD-ROM players and rewritable optical drives.

Two of the most popular computer-related products for future purchase are digital audio processing/editing software and 200+ MB hard disks. This indicates a strong interest in modular PC-based digital audio workstations among audio production facilities.

Almost half of all production facil-

ities report gross revenues of \$100,000 or more for the past year. Though almost 30% of facilities made under \$25,000, 15% had gross revenues of over \$1,000,000 over the past 12 months. Revenues for audio production facilities in the U.S. vary as widely as facility size and types of work produced.

Overall, the facilities surveyed express a cautious optimism about future growth in revenues for their businesses and in their segments of the industry. Over 54% planned to attend the Audio Engineering Society convention, and almost half plan to attend the National Association of Broadcasters show.

*Elise Malmberg is the Mix marketing director.*

—FROM PAGE 38, AES REPORT

Opcode Systems (Palo Alto, Calif.) demonstrated StudioVision 1.4, its most recent revision of the breakthrough Macintosh software package for MIDI and digital audio. StudioVision provides four tracks of digital audio along with virtually unlimited MIDI tracks when used with Digidesign's Pro Tools card or AudioMedia II card.

And finally, a word about MIDI Machine Control. Accepted by the International MIDI Association last January, there is growing support for the MMC specification as shown by a well-attended workshop on the subject. Chaired by Jerry Lester of TimeLine Vista, the workshop included participants from Opcode, Fostex, Tascam, JLCopier and Roland, and it included demonstrations of various implementations of the MMC spec. Panelists hinted at future possibilities for further integration of studio tasks such as console automation via a standard MIDI protocol. Watch for more on this subject in months to come.

### PROJECT STUDIOS COME OF AGE by Dan Daley

This year project studios were viewed as an integral part of the recording industry. Manufacturers have embraced project rooms, and digital multitrack recording options are proliferating with Alesis' ADAT system aimed squarely at that market. That product was announced at last year's show, but the big news this year is the alliance

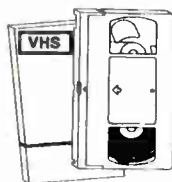
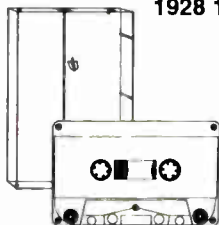


3M 966

between Alesis and Fostex, one of the seminal down-scaled recording manufacturers. Fostex took a license on the ADAT digital 8-track technology, with a product introduction anticipated in early 1993.

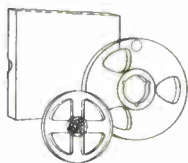
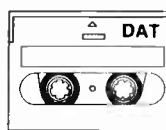
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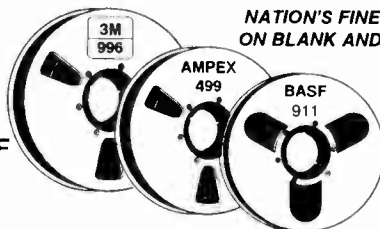


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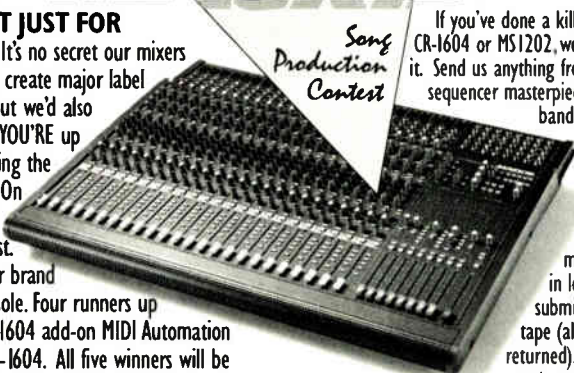
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That move will go a long way toward pushing the S-VHS tape format Alesis opted for as a digital (tape) standard for project studios. It also sets up the battle lines with Tascam's new DA-88 8mm 8-track system, announced on the eve of the show. The DA-88 uses the Hi-8 tape format, narrower but with a more densely packed formulation than S-VHS, a factor in digital information storage. The DA-88 will hold up to 100 minutes on a standard 120 tape, aimed at allowing CD-length projects and film work, a growing area for project studios.

Speaking of analog tape, 3M released 966, a new mastering tape that's bias-compatible with you-know-who but keeps the chemical components of 3M's hotter-running 996. Offering a +6dB operating level with lower print-through, 966 is ideal for older machines that can't handle 996's +9dB levels.

The lines between MI and pro keep blurring. There were more products that would only have been at NAMM three years ago. Zoom is one of them; its new 9000S is an enhancement of the 9000 box I discussed earlier this year as part of the trend toward new DI interfaces. Aspen Pittman of Groove Tubes showed off new, inexpensive tube microphones. The stainless-steel housing holds a shock-mounted capsule with a separate power supply for \$850. Not a U-87, but it brings a new level of sound to project-level prices.

Other product news for projects: Tannoy's Bill Calma said smaller speakers—a new PBM-5 in that existing series and smaller members of the new NFM family—are aimed at project studios specifically, with new spatial sound technologies that he believes will become more accessible in the near future. Meyer's Peter Soper said that powered monitors are gaining popularity with project studio owners as the need for more aural standardization comes about through increased interfacing with commercial facilities.

**SOUND REINFORCEMENT DEVELOPMENTS**

by David (Rudy) Trubitt

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ber of technical seminars and panel discussions focused on the live side of our industry. The seminars included sessions on rigging safety, grounding and power, digital system controllers and fiber optic technology for touring applications.

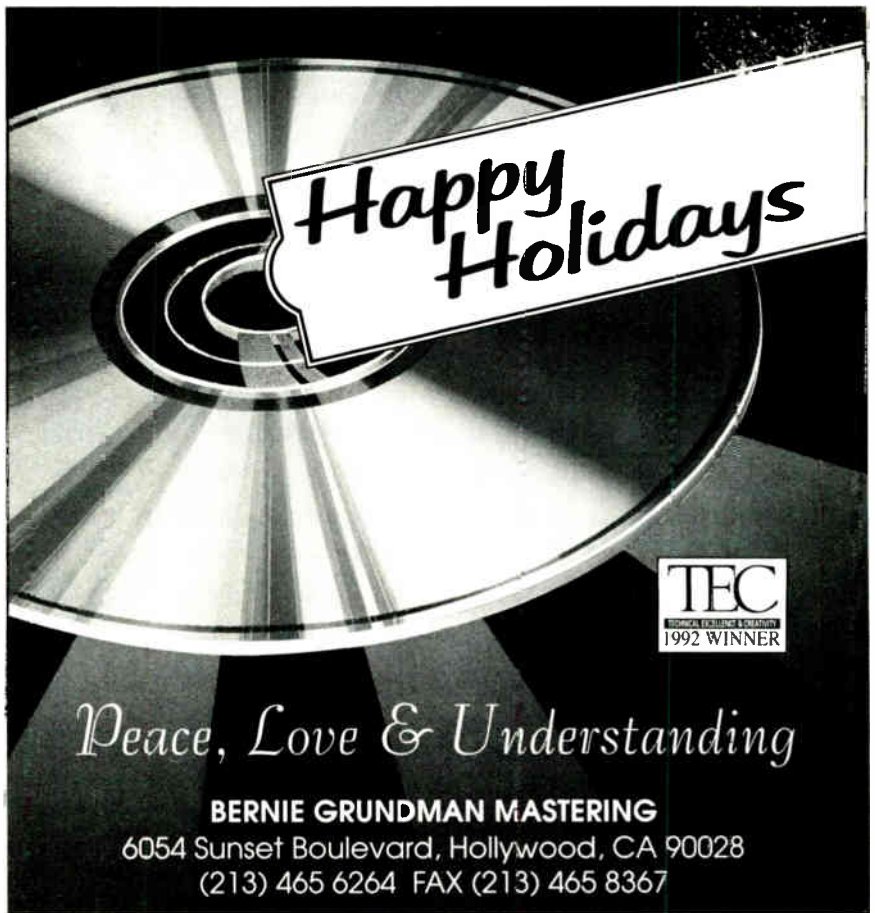
Many manufacturers released monitor versions of existing house consoles. Yamaha's new PM4000M is available with 44 or 52 inputs, eight VCA groups, eight mute groups, and is capable of 22 discrete mixes—18 mono and two stereo. Also new from the company is the SU4000, an automatic power supply switching unit for the house or monitor version of the console. Yamaha also showed two additions to the MC Series: the MC3210M and MC2410 monitor consoles. These 12-bus mixers are slated for late 1992 delivery.

Soundcraft was on hand with a new Vienna monitor console, available in frame sizes up to 44 inputs with 18 monitor mix buses. It can also be used as an FOH board with eight subgroups and eight aux sends. On the Spirit front, the Spirit Live 4 offers four subgroups and will be available in 12-, 16-, 24- and 32-input versions. A third-party automation system for the Europa was also shown, including optional moving faders. Designed by Outboard Electronics, the package can control all aux on/off, EQ, insert in/out, channel outs and VCA assignments on the board. Scenes can be recalled via a keypad remote or external serial control.

Crest entered the SR console market with the debut of its Century line. The top-of-the-line GT, designed for touring FOH applications, boasts a 4-band sweep EQ and eight buses plus a discrete stereo and mono bus. The Century SP offers similar performance with fewer features and a lower cost. One highlight of the Century LM monitor console is the availability of four mono and eight stereo monitor mixes, ideal for in-the-ear monitoring systems. Pricing ranges from \$5,000 to \$30,000.

TAC showed its SR6500, a monitor console complementing the popular SR6000. The 6500 shares the same frame as the 6000 and features 18 discrete monitor outputs, eight VCA groups and the

—CONTINUED ON PAGE 118



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1989 THE RECORDING WORKSHOP



—FROM PAGE 43, THE BMG CONNECTION

cause we approached the score as a multitrack recording and live mix date at the same time," says James P. Nichols, BMG master engineer. "We have 48-track analog SR, with another 24-track mix machine. The mics come up in mic position and you bus them; then you bus them and monitor in another position; then you in turn bus to your mix machine. Since we have in-line faders on the Neve VR60, we monitor the mix machine on the monitoring position. So you have microphone-bus, monitor-bus, monitor. And the monitor is then sent to the surrounds."

All the recordings were miked similarly, with the discrete 6-track format in mind. Five mics captured the room: three Neumann TLM50s out front and two outriggers. KM140s were used as close-mics on individual instruments (87s on percussion), laid down to the 48-track for possible sweetening later. According to re-recording mixer Tom Fleischman, they weren't needed.

"It was excellently recorded," Fleischman says. "Very beautifully done. To my way of thinking, [a live mix] is the best way to do it if you have a composer and engineer who can keep an eye and ear on making sure the orchestra stays in balance. If one section is playing louder or softer than they should, then you have to sweeten that section with the spot mics. We didn't have to do that. They were diligent about keeping the orchestra in balance, and it worked out very well."

The same mic configuration was used on the Boys Choir of Harlem overdubs (with some additional close U67s mixed into the five channels) and the Terence Blanchard and Branford Marsalis overdubs, just as it was used on the big band, jazz trio and solo piano sessions. It was altered slightly—two mics held the front, two in the middle, and two in the rear—for the group ADR sessions, when Denzel Washington delivered his lines from a podium to a live audience, complete with audience response. Men were on the left, women on the right, just as actual Muslim rallies were at the time.

Perhaps the most authentic and stimulating group session involved the Fruit of Islam, the security force, if you will, of Louis Farrakhan's Harlem chapter of the Nation of Islam. Spike wanted authenticity for

the Black Muslim rallies of the early '60s, so who better than the Nation? According to everyone involved, their responses to the speeches on-screen were genuine and loud. Right on cue with little or no prompting. As they were leaving, Nichols got an added treat.

"As the people were filtering out, the brothers from the Nation started going through their march cadences, their mathematics for the day. We had the microphones on them and we got it all. It was just like armed services march cadences, about 20 minutes of marching around the room. It was incredible."

Finally, there are a number of dance hall scenes in the movie, including a huge Roseland Ballroom scene early on with Malcolm doing the Lindyhop. A choreographer and about 18 dancers were brought into Studio C for Foley. Another 25 people surrounded them for crowd effects, just as you see it onscreen. Distant room mics were used to capture the thumps, and Shure SM57s captured the steps.

"You find a group that's going pretty good, that's got the right rhythm," Nichols explains. "Then you mike them about knee-high, three feet away. Just like recording Broadway tap dancing. My assistants were Major Little and Sandy Palmer; couldn't have done it without them."

Big hits, little hits, all kinds of hits have been recorded at this incarnation of BMG over the past 23 years (RCA Studios have been around in one form or another since the Camden, N.J., days in 1901). The sad truth, however, is that the studios are being shut down on March 31, 1993. BMG International is moving the New York operation to smaller quarters on West 45th, where administrative offices and tape mastering rooms will soon be moved. Apparently, BMG was willing to keep the studios open, but the landlord wants to sell all 12 floors of Sixth Avenue real estate as a package. Once those walls are touched by a new owner (provided it's not a studio owner), the unique sound is gone forever.

New big rooms will open up in and around Manhattan to fill the void and meet the demand. But when the last music stand is loaded on the elevator and taken down to the truck, a chunk of New York recording history will be gone forever. ■

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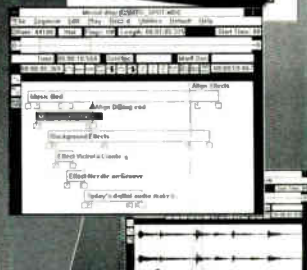
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# ENSONIQ DP/4 PARALLEL EFFECTS PROCESSOR

In the late 1970s, the number of digital signal processors more sophisticated than simple delays could be counted on the three fingers of Django Reinhardt's left hand. Today, Reinhardt would need both hands and feet just to count the number of functions a single typical effects processor can perform. But that is old news. These days, the headlines are for the new breed of digital boxes that house several independent processors in one chassis.

The DP/4 (\$1,495) is Ensoniq's first entry into the digital signal processing arena, and it likely will have as much impact as the Mirage did on the proliferation of sampling. The DP/4 is a two-rackspace piece of gear with busy, but not cluttered, front and rear panels. Inside, it houses four signal processors capable of operating separately or in conjunction with each other in a number of ways.

On the left of the front panel, next to the handle, is a 1/4-inch jack

labeled "Input 1." This is the electrical equivalent to the rear-panel input 1 jack, designed for convenient input of an electric guitar or other instrument. There are also input and output level knobs along with signal present and peak LEDs for each processor. Paging through software or pushing a button to select the processor that you want to adjust works for most editing functions, but I really appreciate having separate knobs for each processor's level functions. Although most urgently needed for live performance, this level of accessibility is equally helpful in the studio.

A two-character LED display for program numbers, a 32-character backlit LCD for text, and a large parameter adjust knob occupy the center of the front panel. Beneath these are the basic mode select and cursor buttons. The right side of the panel has the processor select buttons and the power switch along the bottom, and a printed display of the four

by Larry Oppenheimer

available processor architectures above.

The rear panel is straightforward, with unbalanced 1/4-inch jacks for the four inputs and outputs, two 1/4-inch jacks for footswitch and footpedal inputs, and MIDI in/out/thru jacks. The input jacks have a very high input impedance (spec'd at 1 megaohm), which means that electric guitars, basses and other high-impedance output instruments can be plugged in directly.

Although the DP/4 contains substantial digital circuitry, it never ran very warm during my tests. This ventilation could well be what keeps the unit happy and healthy for a performer playing in a hot club with the DP/4 mounted in a rack full of gear.

The biggest problem with the DP/4 was learning how to configure it. There are many possibilities with four processors in one box, so presenting a simple, intuitive way of making choices is no trivial task. For example, the DP/4 can use one, two, three or four sources, and the processors are apportioned by that selection. But a configuration using two sources might accept two stereo sources or two mono sources; in that case, the number of sources is not directly related to the number of inputs used. In other cases, it might be. The input jacks are automatically switched as stereo pairs, so plugging into inputs 1 and 3—but not 2 and 4—automatically routes the used inputs to the unused ones; i.e., input 1 is fed to input 2 and input 3 to input 4.

In any configuration where one source feeds more than one processor (such as the above-mentioned situation where two processors are assigned to each source), the processors can be configured serially or in parallel. A single source feeding all four processors has even more possibilities. When you figure out your input configuration, there are still outputs to consider. In a four-in, four-out mode, the DP/4 can still produce stereo output from each processor, but, of course, there are only four outputs, not eight. Consequently, the outputs of each processor can be summed to mono and fed discretely to the four output jacks, or

they can be mixed internally.

So, given that having four processors is a challenge in presentation, how did Ensoniq do it? Within the DP/4, the user starts by pressing the "config" button and either pressing the "select" button to choose one of the existing configuration presets or pressing "edit" to create one's own. Assuming that the user is creating a new configuration, the first step is defining the number of sources,

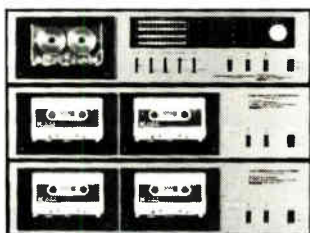
from which a number of other parameters will fall out. For example, when a one-source configuration is selected, it implies that only input 1 (or inputs 1 and 2 for a stereo source) will be used; hence, no mono/stereo source select parameter is available for inputs 3 and 4. A two-source configuration would have this parameter available for inputs 3 and 4 as well as 1 and 2. The processors, which Ensoniq refers to

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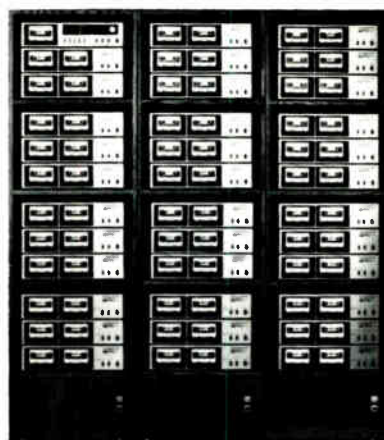
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as "units," are, like the inputs, treated individually or paired: A and B being one pair, C and D being the other. If a configuration assigning more than one processor to a source is selected, the next step is to decide if a pair will use parallel or serial routing. (In serial routing, the output of the first processor feeds the input of the next, while in parallel they are fed the same input and their outputs are summed.) Processors can be individually bypassed or killed (no signal passes through it).

Finally, pressing "select" and one of the processor select buttons lets you choose an effects preset for the selected processor. Only the presets that are appropriate for that processor, given the chosen configuration, are available. Thus, with a four-source configuration, each processor can be selected individually, and all of the 1U presets (presets involving a single processor) are available. In a two-source configuration, 2U presets are available in the Select mode. With only a very few exceptions, 2-, 3- and 4U presets are combinations of 1U presets, so if you don't like any of the 2U presets, pressing "edit" lets you choose different 1U presets for each processor, then store the whole mess as a 2U preset. Whew!

This may sound confusing. I devote this much space to it because I was rather baffled by it for quite a while, and I see and use a lot of equipment. I don't find fault with the architecture, but I think the whole process could have been a bit smoother. As is usual with programmable devices, once you manage to carve out and store a few configuration and effects presets that meet most of your everyday needs, life is a little simpler—most of the time. Let's hope that somebody makes an editor for this device, because that would make the whole thing a snap.

Can we move on to signal processing now? The DP/4 lists 11 reverb algorithms; four delay algorithms; six algorithms that provide distortion, amp/speaker simulation or Leslie simulation; an eight-voice chorus; flanger; three pitch shifters; six dynamics processors; two EQs; an exciter; a test source (sine wave/noise generator); and eight algorithms combining delay with one

or two other effects (chorus, auto-panning, EQ, etc.). These are all 1U effects, including combinations like EQ-Chorus-DDL. The effects are not generally simplistic implementations; the signal paths are often complex and offer many parameters. The DP/4 is certainly a tweaker's paradise: The Leslie simulation alone has ten parameters (not counting MIDI patches), and several reverbs have more than 20!

Even with that much functionality, the DP/4 does not compromise the features that one might expect. For example, the EQ-Chorus-DDL program still offers up to 1.5 seconds of delay per channel, plus a separate regenerating delay for each channel, also up to 1.5 seconds. The guitar amp simulations include gating and both input and output EQ.

Perhaps the most complex algorithms, not surprisingly, are the reverbs. The room and hall algorithms have the expected parameters (overall and LF decay, HF damping and bandwidth, discrete reflections, etc.), but there are two stages of diffusion (one being the main reverb stage) and a detuning parameter for breaking up unwanted resonances in the

reverb. Although these parameters are not especially new, to find them in a four-processor box at this price is impressive.

Tweakage and flexibility are all well and good, but the acid test is always how it sounds. The DP/4 does very well on that score. I put the unit through its paces primarily with drums, guitar, synthesizers and vocals. The reverbs would not be enough to make me give up a Lexicon 300, but they sound dense and smooth, if not entirely without coloration. If this device did only one effect at a time, I would consider the DP/4 a worthwhile investment for the quality and flexibility of the reverb alone.

The delays, chorusing, flanging and other standard effects sound good as well. I would not regard the sound of any of the DP/4's individual effects to be incomparable, but most of the time effects are used in combination and appear in the context of a mix; in that context the DP/4 sounded great.

Two of the most difficult effects for a device of this type are pitch shifting and distortion/amp/speaker simulation. The DP/4's 2U pitch

shifter (which uses two processors—one to determine splice points and one for audio processing) certainly sounded better than the 1U pitch shift programs, but the 1U programs were usable as long as they weren't too exposed or required to shift large distances. I created some very interesting sounds by putting a pitch shifter before and/or after a reverb. The DP/4 does not offer the same level of parameters for achieving pitch shift as the much more expensive Eventide UltraHarmonizer, nor does it offer pitch shifting that is sensitive to the musical context (sometimes called "intelligent" pitch shifting), allowing the user to define a tonality within which pitch shifts will fall.

The manual proudly announces that the algorithms of the Guitar Amp simulation programs "re-create the warm sound of a guitar amplifier. They do this by emulating tube distortion characteristics." In other words, the DP/4 is the Rich Little of signal processors. Well, I have never found a digital distortion device that sounds as sweet and singing as a real tube, and the DP/4 is no exception. Generally, digital distortion can



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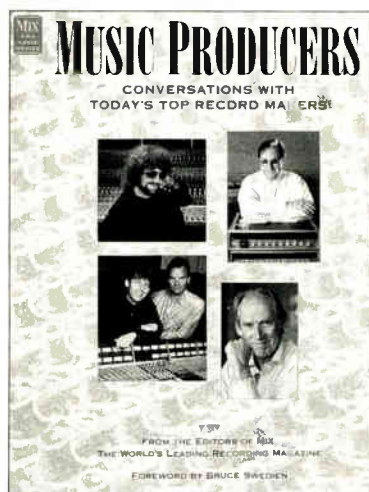
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be set to a maximum level to get a useful metal guitar sound, but anything less sounds wimpy and lacks character. But the DP/4 has a saving grace not found in other digital devices I've heard: equalization. The EQ in the amp-simulation algorithms went a long way toward helping me get something that fell between David Gilmour's soaring tone and Eric Clapton's Les Paul-based "line of sound" on Cream's *Disraeli Gears* album. I used some heavy boost in the low midrange (approx. 370 Hz) and the high-mids (2.7 kHz) to get it, then (having put the DP/4 into a one-source configuration) followed that with the Rotating Speaker simulation (where I added yet a bit more distortion), MultiTap Delay and a Hall Reverb, ending up with a huge, swimming guitar sound.

I would not trade in my dbx's or Aphexes for the dynamics processing algorithms here. But when used in a non-critical context, such as a 4U conglomeration of effects, they sounded fine. While the reverbs and the dynamics processing algorithms can be used as single effects, more specialized devices may sound better. I would much rather, for example, use the DP/4's compressor than the one in my old Yamaha SPX90, and I've used that one plenty of times when I needed one more compressor for the mix.

I regret that I did not have much chance to play with the Vocoder in the DP/4. Vocoding is one of my favorite processes, and there are all too few such devices available. The Vocoder preset uses each processor to cover part of the frequency spectrum, using three frequency bands per processor for analysis. There are not a lot of parameters for this algorithm—certainly not like the fine Vocoding program that was available for Eventide's old SP2016, or even the UltraHarmonizer series. (Again, these devices cost much more than the DP/4, but I have never had the chance to check out the Vocoder in the Boss SE50, which costs much less, so the Eventide products are my best point of comparison.)

The noise performance of the DP/4 was very dependent on the combination of algorithms being used. For example, Guitar Amp sim-



ulations apply a great deal of gain to the signal and tend to produce a lot of hum and noise, but while simply running a 1U reverb, the DP/4 produced quite acceptable noise levels.

The DP/4 has an excellent MIDI implementation: Each processor can be set to respond to a separate MIDI channel and can receive program change and volume information (controller 7) on that channel. Additionally, the DP/4 itself can be addressed on a separate channel (as a unit called "config"), and a sixth channel is used for MIDI messages (controllers and notes) intended to modulate DP/4 parameters in real time. Up to eight controllers, from MIDI or one of the rear panel controller jacks (CV pedal and foot-switch) can be selected for modulating parameters. In each processing algorithm, any two of these controllers can be selected as sources and two of the algorithm's parameters chosen as destinations, with scaling of the modulation for each destination.

There are a number of other less important yet useful features that there simply isn't room to cover here, like the alternate bank of ROM presets that can be loaded into RAM or the extensive MIDI filtering. The manual is very good, with many pages of documentation and explanation, lists, forms and so forth. There were only a few pieces of information I was unable to find. A reference list of effects and configuration presets, provided in a plastic cover, proved to be invaluable.

In sum, the DP/4 is a little monster: a \$1,495 box offering four channels of superb processing power, with substantial flexibility, excellent sound and thoroughly MIDI-savvy operation. I have very few complaints. For the home studio that can scarcely afford one digital toy (not to mention four), the guitarist who wants studio sound without lugging a giant rack around, or for the big-time room that uses signal processors like candy, the Ensoniq DP/4 will more than earn its space in the rack.

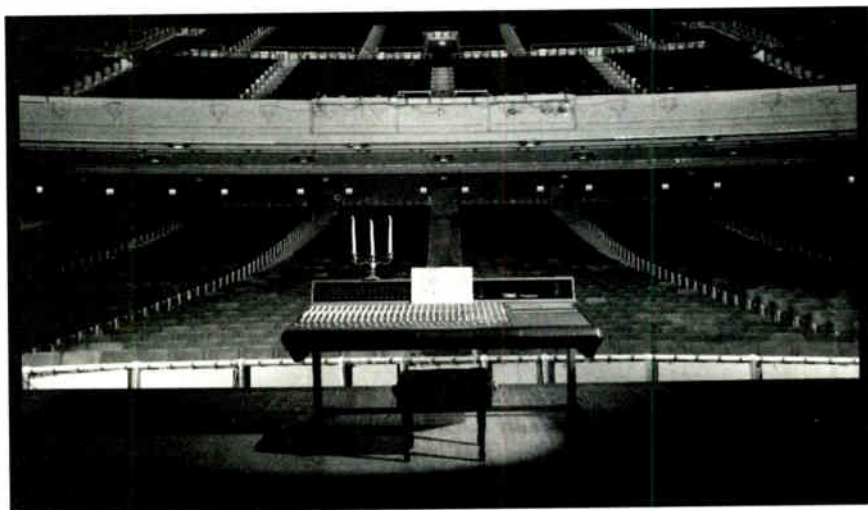
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SIGNAL

PROCESSING

**H** by George Petersen

Insight is a wonderful thing. Ten years ago, everybody said that analog signal processing was going the way of the 78 rpm record lathe and a decade hence we'd all be creating audio with thought processors and digital bioplasma cubes. Well, here we are, ten years older—and hopefully ten years wiser—yet our old friend analog signal processing is still around, perhaps stronger than ever.

Is the sonic degradation of routing analog audio through A/D and D/A converters an acceptable trade-off just to use a digital device to limit a vocal or EQ a kick drum? Probably not, although running through those same converters is a small price to pay when digital effects such as reverb and delay are the result. As we edge toward the concept of the all-digital studio, nagging

questions—especially in the area of interfacing digital outboard gear—will keep analog signal processing well ensconced in production racks for years to come.

Ironically, the demands of digital recording have increased the need for analog signal processing. When you want to squeeze every dB of dynamic range out of a digital recording system, sometimes only an analog peak limiter—such as the Aphex Dominator II—will fill the bill. Digital-overload distortion is both brutal and unforgiving, requiring the engineer to be doubly careful as those sweet analog sounds make the transition into zeros and ones.

Still, digital control of analog processing certainly does make sense. For years, digital control has provided an ideal method of storing presets on analog synthesizers, and this same technology has been used with success on analog equalizers—i.e., the MicroAudio (Bend, Ore.) POD Series—so why couldn't this approach be used for storing favorite (or frequently used) settings on analog compressor/limiters?

One new frontier for analog signal processing comes from the advent of fiber-optic network control in sound reinforcement systems, such as the MediaLink standard from Lone Wolf (Redondo Beach, Calif.). The system allows dynamic changes in amplifiers, crossovers, equalizers and other equipment, as needed by system requirements. In the not-too-distant future, this or some other systemwide protocol may creep into studio applications.

Wanna buy a used Pultec or Fairchild? A dozen years ago, you could pick 'em up for 50 bucks each. Today, tubes are hotter than ever (pun intended), the vintage gear market is soaring, and all that 50-spot gets you these days is a couple replacement knobs, *if* you're lucky enough to find the genuine article. Currently filling the void are dozens of modern tube products, from Demeter (Santa Monica, Calif.), DeMaria Labs, Drawmer, Summit, Tube-Tech, Vacuum Tube Logic/Manley (Chino, Calif.) and others. The Tube Works (Denver, Colo.) product line even includes a spring

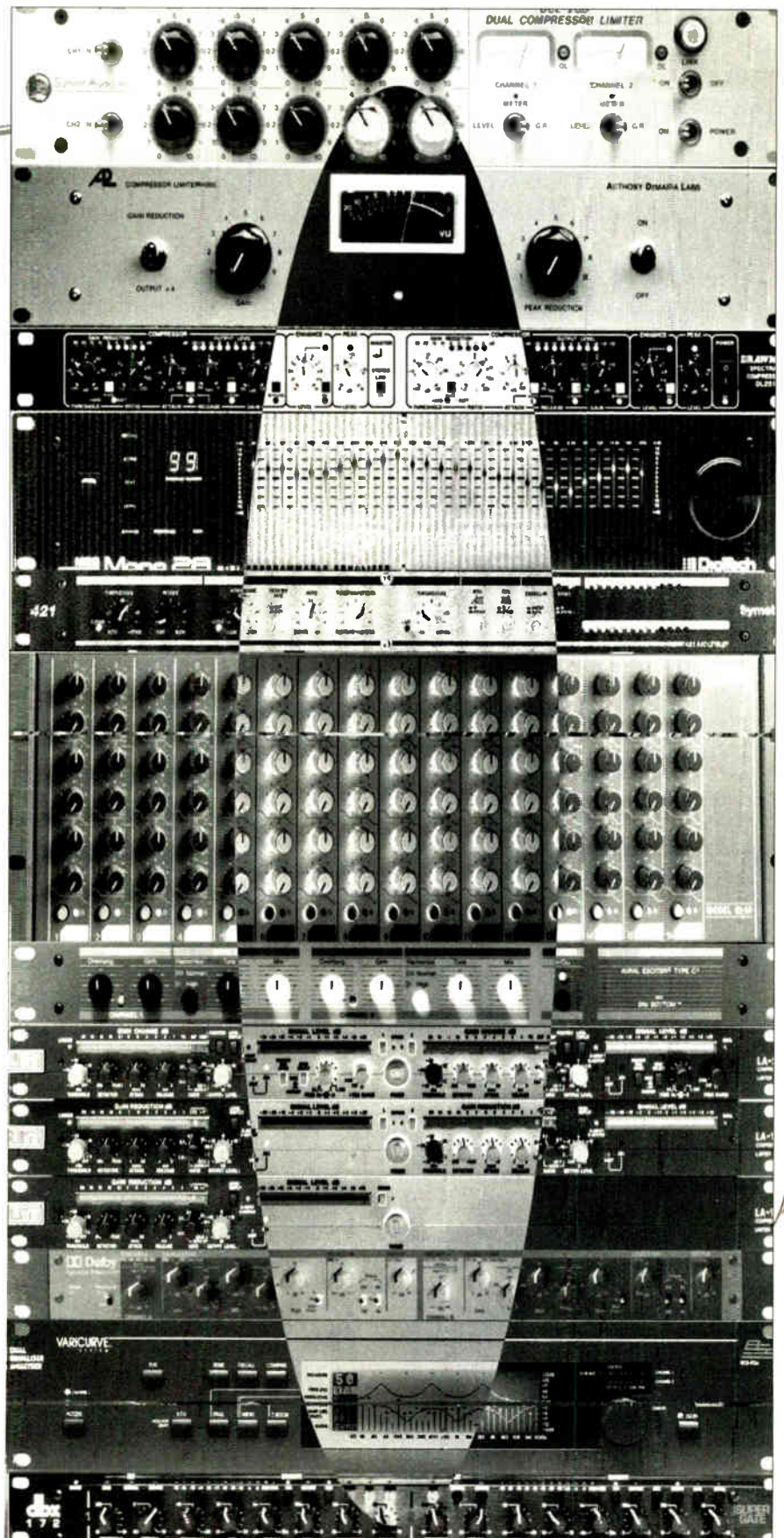


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reverb with tube electronics, for those occasions when only a vintage sound will do.

More common of late is the repackaging of console electronics into rack and module form. Getting a particular mixer's sound is easy if you have a couple of modules in a portable package, such as the API Lunch Box, Neve Prism rack or Solid State Logic's Logic FX Series.

De rigueur for rap and hard rock production onstage or in the studio are bass-enhancement devices. Among these are the Punch-10 from Furman Sound (Greenbrae, Calif.) and the dbx 120XP. Launched at AES, the latter is a new version of the popular 120X "boom box," formerly in the dbx consumer line but updated in a pro package.

The following section details 20 products released over the past couple of years that represent significant advancements in some aspect of analog signal processing, whether it be program-dependent operation, digital control parameters, superb audio performance or merely a new way of looking at processing. As such, this section (listed alphabetically) is neither complete nor comprehensive, but is presented mainly as a way of discovering where the future lies by looking at the state of analog signal processing today.

### APHEX

Aphex Systems (Sun Valley, Calif.) recently unveiled the Type-C, a low-cost unit combining the famed Aural Exciter™ circuitry with Big Bottom processing. The latter is said to improve bass in the same way that an Aural Exciter enhances the high end. The 2-channel, single-rackspace C uses a psychoacoustic process to increase the perception of bass without vastly increasing amplitude or generating subharmonics that can burn out speakers or oversaturate tape.

### AVALON

This Australian company created quite a stir with its mic preamp/equalizer a couple of years ago. Avalon now offers the A19 system, a Eurocard rack that holds up to six all-discrete, Class-A modules. Distributed in the States by Avalon Designs of San Clemente, Calif., the series includes a soft-curve parametric EQ, opto-leveling amplifier and stereo mic preamp. Bandwidth is

said to extend to 500 kHz (-3 dB).

### BSS

Distributed by AKG (San Leandro, Calif.), the BSS VariCurve System provides two channels of 6-band parametric equalization, operable independently as a matched stereo pair or as a 12-band mono EQ. The digitally controlled analog filters can be manipulated manually or via MIDI, PA-422 or SMPTE, with all parameters and EQ curves displayed on a large, backlit LCD. Fifty memory locations are provided, and an onboard 30-band, real-time analyzer is standard. Recent system additions include a single-rackspace "slave" unit with no front panel controls and a full-function wireless remote control.

### DBX

Unveiled at this fall's AES show (distributed by AKG) is the dbx Model 172 SuperGate™, a 2-channel expander gate. The 172 combines 24dB/octave voltage-controlled key filters with parametric controls for frequency-selective gating. The gate action is nearly instantaneous through a Transient Capture Mode™ (TCM), which uses a linear phase, all-pass filter to insert 0.3 ms into the delay path, resulting in precise gating that preserves transient waveforms.

### DEMARIA LABS

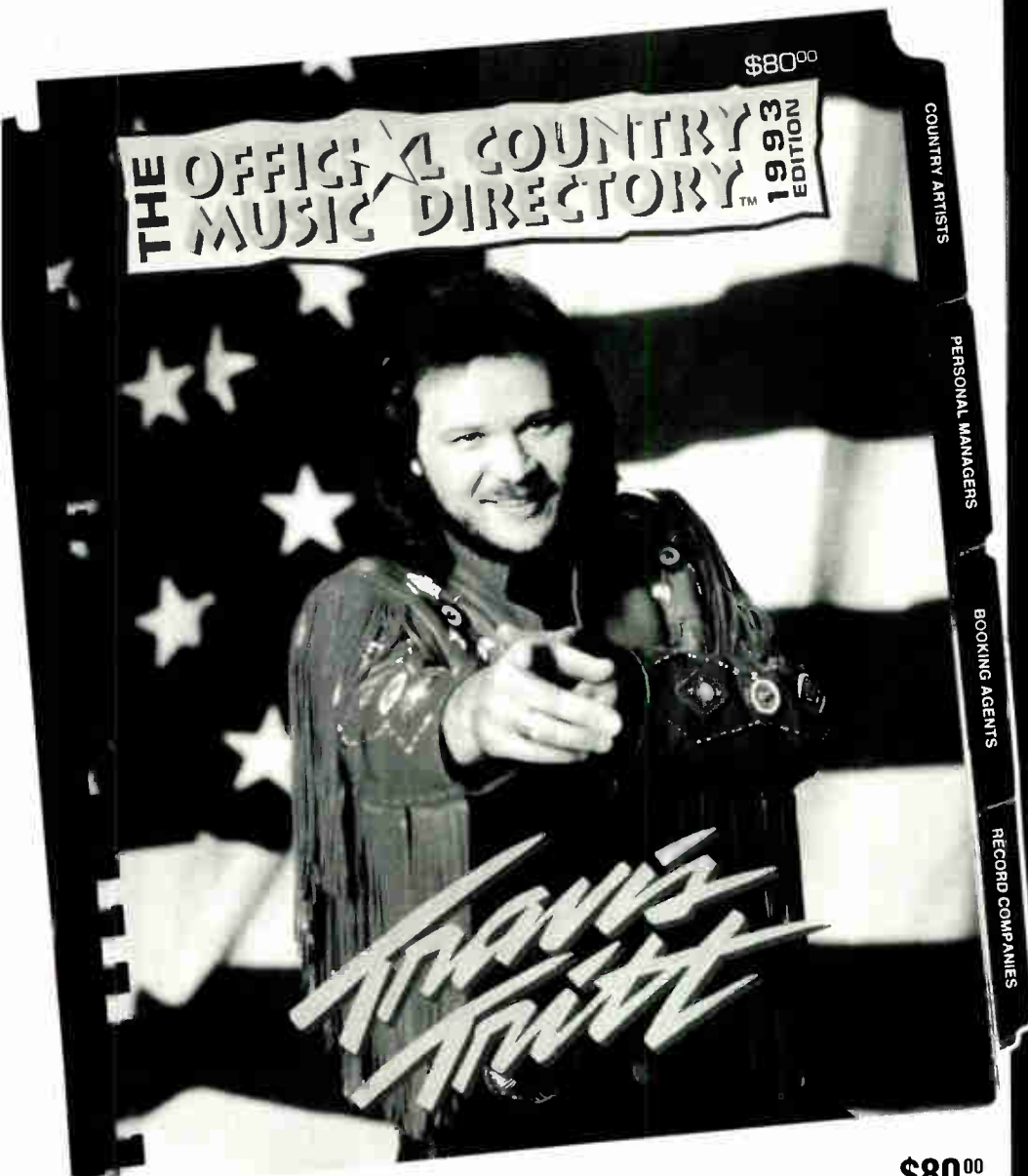
Representative of the new wave of tube signal processing, the Model 1000 from Anthony DeMaria Labs (New Paltz, N.Y.) is a two-rackspace, single-channel compressor/limiter, featuring transformer-balanced XLR connections, gain and peak-reduction controls, large VU meter, and a stated frequency response of 15 to 30k Hz (±0.5 dB).

### DIGITECH

Despite the "Digi" prefix in the name of this Salt Lake City-based company, DigiTech does make some analog gear. The MEQ Dual 14 and MEQ Mono 28 are MIDI-programmable graphic equalizers for studio, live performance and contracting applications. These digitally controlled analog units feature either stereo 2/3-octave or single-channel 1/3-octave bands on ISO centers, along with 99 non-volatile memory locations, ±12dB cut/boost and a 20 to 20k Hz bandwidth.

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## DOLBY

San Francisco's Dolby Laboratories recently debuted its first entry into creative studio processing. The Spectral Processor is a stereo/dual-mono dynamic equalizer offering the ability to raise low-level signals in three frequency bands without affecting high-level signals. This occurs via eight processors that partition the signal in terms of frequency and level. As noise may be boosted along with the audio, the unit has single-ended noise reduction on each channel. The equalization combines three boost controls (LF/MF/HF) with two pots that ad-

just the crossover points between the three bands, operating in a similar manner to a crossover in a three-way loudspeaker system.

## DRAWMER

The DL251 Spectral Compressor from Drawmer (distributed by QMI of Natick, Mass.) incorporates Dynamic Spectral Enhancement circuitry that is said to restore the HF energy lost during compression. The 2-channel unit features switchable hard/soft-knee compression, variable-threshold/zero-offshoot limiting, switchable peak/average stereo linking, balanced XLR inputs/out-

puts, switchable +4/-10 operation and a hard-wire bypass.

## FOCUSRITE

There's no doubt that the Rupert Neve-designed Focusrite signal processing modules represent the cutting edge of analog technology. New from this Bourne End, Buckinghamshire, UK-based company is the Red Range, complete with a quad mic preamp and stereo equalizer. These two-rackspace units sport radical red-anodized front panels, but more important is the circuitry behind, offering a nearly inaudible noise floor and a 5 to 150k Hz (-1 dB) bandwidth that no digital device could hope to match.

## GML

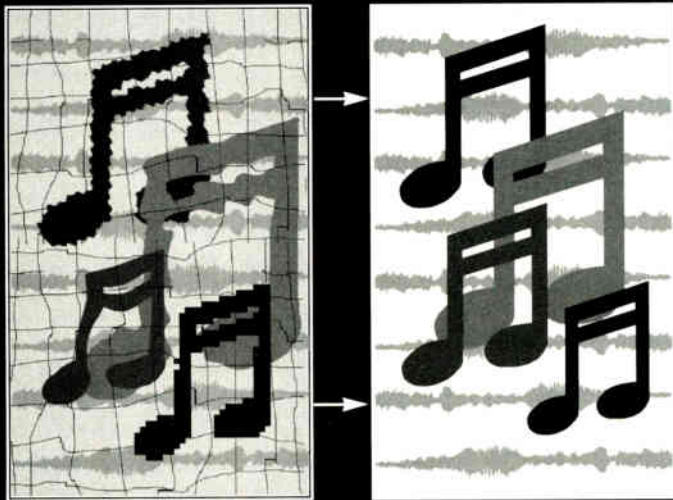
Formed by the noted engineer/producer/inventor a decade ago, George Massenburg Labs (Van Nuys, Calif.) markets a wide range of high-performance analog gear. The Model 8900 Dynamic Range Controller is a 2-channel, all-discrete unit featuring two RMS and one peak detector per channel. Don't expect to find any electrolytic interstage or output-coupling capacitors inside, which add to the extremely flat frequency response of 16 to 68k Hz ( $\pm 0.1$  dB) and overall bandwidth that extends to a -3dB downpoint at 260 kHz.

## LA AUDIO

From LA Audio (Hertfordshire, UK), distributed in the U.S. by Promusica Sales (Keene, N.H.), is the Classic Compressor, a dual-channel compressor/limiter with balanced XLR inputs/outputs, 1/4-inch sidechain connections and illuminated VU meters. The stereo-linkable, two-rack-space unit features two compressor/limiters with independent controls for input, output, attack, release and ratio controls.

## MARTECH

Analog reverb...today? You bet, and it's better than ever, thanks to Martinsound's Martech Division (Alhambra, Calif.), which offers a package of modern, low-distortion electronics for upgrading EMT 140 plate reverbs. The kit includes all electronics (including new pickups) and is stereo, so it's perfect for upgrading mono units. Best of all, the system preserves that inimitable EMT plate sound: rich and dense.



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## RANE

You wouldn't expect much by looking at the blank front panel of the NEQ 28/56 Network Equalizers from Rane (Mukilteo, Wash.), but the unassuming one-rack-space facade hides either a mono or 2-channel 1/3-octave equalizer. The NEQ units can be controlled via the Lone Wolf MediaLink™ Virtual Network Operating System (VNOS) by a Macintosh or IBM-compatible computer (PA-422 or fiber optic links, as well as with RS-232 and MIDI protocols). For simpler applications, 16 nonvolatile memories/channels are provided, and an optional wall switch allows remote recall of any memory setting.

## SHEP

What's old is new again. The classic 31105 equalizer/mic preamp modules made by Neve in the mid-1970s are now being manufactured by Shep Associates (Herts, UK) and distributed by Valley Sound of Burbank, Calif. The 31105 is a discrete, 4-band EQ/mic preamp with  $\pm 18$ dB cut/boost, a choice of two Q settings on the mid-bands, and HP/LP filters. Racks are available to hold nine vertical modules or two/four horizontal modules. Valley also stocks other modules (such as the 1073, 32264A and 31102), parts for older Neve mixers and a reissue of Neve's 2254 compressor/limiter, packaged with two units in a rack-mount case.

## SOUND PERFORMANCE LABORATORIES

The SPL Vitalizer (distributed by Sascom Marketing Group, Pickering, Ontario, Canada) is a 2-channel "Psychoacoustic Equalizer" unit that combines dynamic equalization, phase shift manipulation and harmonic enrichment. The one-rack-space unit provides independent controls for process depth, sub-bass boost and sweepable harmonics enhancement, along with stereo-width contouring.

## SPECK

The EQ16 Series from Speck Electronics (Fallbrook, Calif.) provides 16 fully sweepable 3-band equalizers in a three-rack-space chassis. Bandwidth is said to exceed 200 kHz, and the overlapping bands adjust to cover a range of 50 to 15k Hz. Three models are available: 16 mono EQs; 8 mono/8 stereo EQs; and 16 stereo EQs.

## SUMMIT

The DCL-200 from Summit Audio (Los Gatos, Calif.) is a stereo/dual-mono compressor/limiter incorporating a modern vacuum tube design. Each channel features individual gain, threshold, slope, attack, release and bypass controls, as well as LED clip indicator and switchable output level/gain-reduction VU meters.

## SYMETRIX

From Symetrix (Seattle) comes the 421 AGC-Leveler, a single-channel device that acts as a "third hand" to reduce the dynamic range of wide-range signals and provide peak limiting, downward expansion and speech curve filters to improve intelligibility. A proprietary Activity Release Monitor circuit distinguishes between music and speech and undesirable signals, so noise is not boosted and soft phrases are not cut off. Features include XLR, 1/4-inch and barrier strip I/O, TRS sidechain connection, stereo link switch, and 12-segment LED meters on input and output.

## TUBE-TECH

Unveiled at the AES show is the Tube-Tech LCA-2A from Danish manufacturer Lydkraft, distributed in the U.S. by Audio Techniques (NYC). The LCA-2A is a vacuum tube-based, stereo/dual-mono compressor/limiter in a two-rack-space chassis. Frequency response is stated at 5 to 50k Hz ( $\pm 3$  dB), and the unit features a six-position attack/release switch similar to that used on the classic Fairchild 670.

## UREI

JBL Professional (Northridge, Calif.) offers a new line of UREI processors. In addition to being a 2-channel compressor/limiter, the top-of-the-line LA-22 can compress or expand part of the frequency spectrum (from 1/6 to 3 octaves) without changing the rest of the signal. All units in the series include transformer-balanced outputs and LED displays for gain reduction and signal level. The LA-12 is also 2-channel but lacks the expander and frequency-dependent capabilities; the LA-10 is a single-channel unit. ■

*Mix products editor George Petersen lives with his wife and two musical dogs on an island in the San Francisco Bay.*

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# NEW PRODUCTS



## SANSAMP BASS DI

From New York City's Tech 21 comes the SansAmp Bass DI, offering the benefits of a direct box without sacrificing the warmth, presence and punch of a properly miked bass amp system. Internal trim controls tailor the sound from crystal clear to full-tilt overdrive. Retail is \$195.

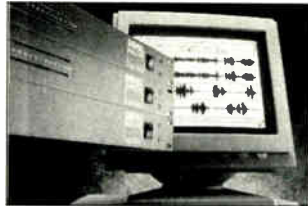
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## KURZWEIL K2000R

Available from Young Chang (Cerritos, CA) is the Kurzweil K2000R, a rack-mount version of the K2000 sampler/synthesizer. The K2000R has 8 MB (expandable to 24 MB) of onboard sounds and adds Variable Architecture Synthesis Technology with 31 algorithms for creating new sounds. Features include 24 voices, internal signal processing with up to four simultaneous effects (reverb, chorus, delay, flange, EQ, etc.), ten analog outputs and two SCSI ports for connecting external drives. A sampling option adds stereo analog inputs and AES/EBU and S/PDIF digital input/output capability.

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## DIGITAL MASTER EX

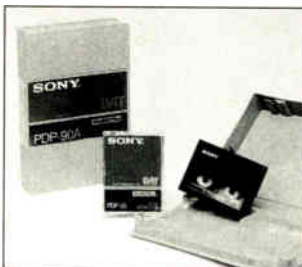
Digital F/X (Mountain View, CA) announces Digital Master EX, a 4-channel, disk-based recording/editing system priced at \$4,995. Hardware requirements are an Atari ST, STe or TT computer with at least 4 MB of RAM, monochrome monitor and hard disk (SCSI or DMA/ACSI). The hardware system is contained in three single-rackspace modules, which provide four balanced 1/4-inch (+4/-10 switchable) inputs and outputs, S/PDIF optical input, SMPTE in/out and coaxial RCA digital I/O said to be AES/EBU- and S/PDIF-compatible. Features include SMPTE sync/chase-lock, graphic waveform editing, variable-speed playback/recording, playlist editing and DAT backup/restore. A hardware remote controller with scrub wheel and transport controls is optional.

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## STUDIO CITY SOUND VOCAL SPLICER

From Studio City Sound (Canoga, Park, CA) comes the Vocal Splicer, a compact unit designed for bouncing two vocal tracks into a single composite track, without having to go through the console electronics. The versatile switching box also includes an external processing loop for adding effects—such as pitch shifting or equalization—while track-bouncing. Separate level controls for the two tracks are optional.

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## SONY PRO DAT PLUS TAPE

Designed specifically for pro applications is Sony's (Montvale, NY) Pro DAT Plus™ tape, which features improved signal-to-noise performance and a new binder system to reduce dropouts. Shells now have anti-static lids and larger windows. The tapes are available in 30/46/60/90/120-minute lengths, either in individual packs or in a new album pack, which is an archive-sized case with room for storing two tapes.

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## NEUTRIK A2 TEST SYSTEM

From Neutrik USA (Lakewood, NJ) comes the A2, a complete 2-channel audio measurement system for studio, lab or field use. The A2 can function as an oscilloscope or measure level, THD+N, phase, noise, crosstalk, wow and flutter, frequency or IMD (optional). Features include large, true-graphics display, transformer output stage, Centronics output for hard copy printing, internal DSP signal generator for sine and square waves, white/pink noise, and multitone signals.

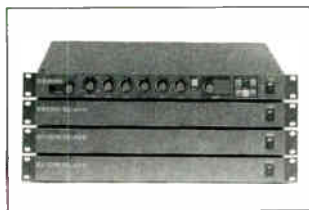
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## ANATEK RADAR

RADAR (Random Access Digital Audio Recorder) is an expandable 8/16/24-track disk-based recorder from Anatek/Creation Technologies of North Vancouver, BC, Canada. A three-rackspace, stand-alone system with no external computer required, RADAR features VGA color graphics capability, +4/-10dB analog I/O, AES/EBU and S/PDIF digital I/O, SMPTE chase-lock, word clock or DARS sync, Ampex VPR3 and Sony serial protocols, MIDI Machine Control, and an internal 600MB hard disk.

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**SOUNDTRACS EXIOM**

A revolutionary approach to mixing console technology is Exiom from Soundtracs, distributed by Samson (Hicksville, NY). The system provides up to 64 stereo channels, with recall automation controllable from a MIDI sequencer, and is based on one-rackspace master and expander modules, each having eight stereo inputs, 2-band EQ, aux send, pan mute and level. Fader moves, mutes and EQ changes can be recorded dynamically and stored for later recall.

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**AUDIRE AMPLIFIERS**

Well-known in audiophile circles, Audire, distributed by Audio Intervisual Design of Los Angeles, debuts three amps for pro monitoring applications. The \$725 Crescendo-Pro delivers 75 watts per channel into 8 ohms; true dual-mono amp designs include the \$1,350 Forte-Pro (125W/channel at 8 ohms) and the \$3,150 Otez-Pro, with 250W/channel at 8 ohms or 1,000W bridged mono. All models state a frequency response of 2-100k Hz (-1 dB) and are covered by a three-year warranty.

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**E-MU SP-1200 RETURNS**

Due to significant demand from rap, hip-hop and industrial music producers, E-mu Systems (Scotts Valley, CA) has reintroduced the SP-1200 (\$2,795), a 12-bit digital sampling drum machine with ten seconds of sample time, onboard sequencer, eight programmable outputs with mixing capability, and SMPTE read/write facilities.

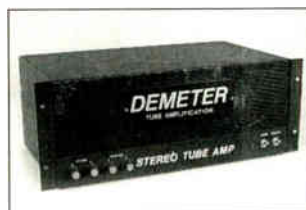
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**QSYSTEM II**

A compact and upgraded version of the original QSound™ 3-D sound localization system, QSystem II now includes MIDI-compatible automated joystick panning to SMPTE/MTC, and autopanning with adjustable shape, rate and triggering. Los Angeles-based QSound Corp. will handle rentals to the pro audio market.

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**DEMETER TUBE AMP**

Best known for tube pre-amps and direct boxes, Innovative Audio Systems (Santa Monica, CA) has released the Demeter VT2751HF, a 75-watt/channel stereo tube amp for control room monitoring. Pro-net price is \$1,795.

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**HOT OFF THE SHELF**

A major software revision for Solid State Logic's Screen-Sound adds multiple-input recording, instantaneous audio storage/retrieval of audio clips, MO working disks and serial VTR emulation. New hardware options: patch bay routing matrix, high-speed MO drive and a faster Exabyte tape streamer for backups at 5-times real-time. Call (212) 315-1111... **Studio Business Forms** (\$32.95) has 44 forms for the recording or MIDI studio, with track sheets (4 to 32 tracks), contracts, invoices, booking orders, DAT and

cassette J-card templates, tape box labels, take sheets and more, all ready for custom printing with your studio address/logo. Also offered: a \$39.95 volume of 40 standard music industry contracts. Call (818) 287-7424... **"A Poke in the Ear with a Sharp Stick"** (\$199) is a CD-ROM with more than 1,600 samples: rhythmic loops, textures and percussion; melodic sounds, all 16-bit linear mono or stereo AIFF files sampled at 44.1 kHz. Call (415) 252-0460... **The Benchmark MP-3** (\$95) is a balanced-input/output mic pre-amp circuit mounted on an XLR-3F chassis connector.

Bandwidth is said to be over 200 kHz. Call (315) 457-6500... **The ARX DI-1 active direct box** can be powered by battery, phantom or external DC sources, and offers up to 20 dB of gain, battery-check LED and ground lift switch. Call (714) 469-2346... Produced by TV and commercial composer Bob Duncan, **"Time Signature"** is a new library of production music with two CD volumes out and another three expected by year's end. Call (212) 371-3780 for a free demo... **RZ Cybernetics' H3000 Editor** (\$175) is a Macintosh-based program for creating new effects for the Eventide

H3000 UltraHarmonizer. The program also allows the H3000 to be controlled remotely. Phone/fax: (818) 760-8055... **A free booklet explaining Rivera's Combo Line** of tube amplifiers is yours by writing "Rivera - Guide to Killer Tone," Rivera R&D, 8500 Balboa Blvd., Northridge, CA 91329... **The Project Manager** is a Macintosh program for parameter editing and control of the Yamaha DMC1000 digital mixing console, adding eight additional fader groups, effects editor/librarian and display of all parameters on the Mac screen. Call (714) 522-9375 for info.

—FROM PAGE 101, AES REPORT

ability to fully link the buses and VCA controls of multiple boards.

Soundtracs continues to expand its cost-effective Solo line with the Solo Monitor desk. The 10-output board is available in 24- and 32-input configurations and features 4-band EQ with two sweepable mids.

EAW introduced its ultra-compact JF Series. Available in road and permanent versions, the line is designed for front-fill, tucked in front of floor monitors or under balconies. Also new from EAW are install versions of the company's Virtual Array line. The MH Series mid- and high-frequency systems are designed especially for large installations.

JBL introduced a new 3-inch, midrange, bi-radial horn and driver, as well as two additions to the Array Series: the 4893 (a compact subwoofer) and the 4894 (a high-power two-way enclosure).

TAD showed a more compact line of main and monitor loudspeaker enclosures. The TCM-1122 uses four 11-inch cones, a compression driver and a high-frequency dispersion horn. Its frequency re-

sponse covers 30-20k Hz with a maximum SPL of 135 dB. TAD also showed two low-profile wedge monitors, the TWM-1122 and TWM-1622.

Meyer unveiled a follow-up to its HD-1 studio monitors, the HD-2, which is also available with flying hardware for live use. The company also introduced the cost-effective MeyerPRO Series, a line of sound reinforcement speaker systems and controllers. Models range from the MPS 305 with a single tweeter and 5-inch cone to the 15-inch/1-inch UPA-like MPS 715 and MPS 718 18-inch subwoofer.

On the computer control/networking front, Lone Wolf's MediaLink system is building steam. QSC's booth included several MediaLink amps connected by fiber to Lone Wolf's booth. TOA also had MediaLink on display. Covering all bases, Rane showed IQ and MediaLink-compatible gear. Crest showed a load monitor for its NexSys system, which can detect a variety of speaker failure modes by monitoring their impedance in real time.

Crown showed a fiber optic ver-

sion of IQ (now in use on Neil Diamond's tour) and demonstrated the IQ System's ability to dial into a remote system via modem from an off-site suite to venues across the country. Third-party support for IQ seems to be growing, strengthening Crown's well-established position. The effort to arrive at a single standard in network control has had its ups and downs. Fortunately, we may not be doomed to a world of competing, incompatible systems. In a welcome development, Crown offered support for the AES's standards effort in computer control. Perhaps Pandora's box can be closed, or at least not opened any farther.

Last but not least, BSS Audio showed an impressive-looking remote for its Varicurve equalizer. The FPC-900 controller will be capable of controlling up to 16 FCS-926 EQs and/or FCS-920 slaves via a single XLR cable or standard wireless radio-mic link. This should provide some competition for TC Electronic's moving fader EQ control unit, which has found favor with many touring monitor engineers. ■

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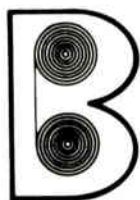
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by Chris Stone

# DIVERSIFICATION

## A DICEY QUESTION



Adding a tape duplication service is a temptation for any studio, since every client needs cassette copies during the process of recording a project. And sometimes—particularly in the case of jingles—that is where the studio makes its profit. In other projects, it's tempting to make the 20 or so copies that the client requests, only to find out that your price is not competitive because you are not really set up to provide that service.

eration: real-time tape duplication.

"Your facility should be able to duplicate one, two or ten great-sounding reference cassettes at the end of a session as a service to your client," Costa says. "Making 20, 50 or 100 or more is a different story altogether. The logistics of producing a top-of-the-line cassette at a reasonable price is a study in Murphy's Law. Getting a couple of tapes right is easy, but doing it 100 times in a row is next to

### OPERATOR'S TIP OF THE MONTH:

The professional tape duplicator—real-time or high-speed—buys tape in large quantities, and therefore pays much less per cassette than you do, while keeping custom lengths in inventory. Be sure you take that into account when deciding whether to make the copies with your equipment or use a professional duplicator.

I asked two former Society of Professional Audio Recording Services presidents—Guy Costa, who has the best real-time cassette and premastering operation I have seen, and Dave Porter, who is the top person in high-speed duplication that I know—to comment on when you should do the duplication for your client and when you should subcontract it to a pro. Let's start with the simplest op-

impossible unless you follow the first rule of production: The more quality you put into a product, the higher quality you get out of it.

"When does it pay to get into the real-time tape duplication business?" Costa asks. "Basically it is a numbers game. If your clients can afford your rates for duplication and you feel you can fully amortize your investment over the next 18 months (don't forget

about obsolescence), and you have the skills and talent in-house, then go ahead and invest. Otherwise, consider brokering your larger-quantity orders to a professional duplication facility and profiting with a markup of 15 percent or higher—with little or no headache.

"One last caveat," Costa warns. "Never forget that the tapes you produce are a reflection of your facility's overall performance. If you can't afford to maintain the highest quality and service, and put out the best tapes, then your clients can't afford it and won't trust their careers and product to your studio." Costa's company, Quadim, specializes in the duplication of real-time advance and promotion cassettes, and CD and cassette mastering for the major labels.

Dave Porter is in a different part of the business. With Music Annex, which he has operated for many years, he pretty much controls the high-speed duplication business in the San Francisco Bay Area and has learned how to make it profitable, even in these tough times. His advice

is very straightforward.

"There are a few simple rules of thumb with regard to the real-time vs. high-speed decision," Porter says. "At some point, when producing between 200 and 750 units, opting for high-speed is far more practical than real-time. This is somewhat length-dependent. Duplicating 200 C-90s is a very labor-intensive job and may not be practical to do in real time. Duplicating 500 C-5s is very practical to do in real time and might prove to be very profitable.

"Another issue is packaging," he continues. "If the client requires APEX imprinting [printing on the shell] as opposed to a paper label, then a high-speed duplicator is a more appropriate choice. Most real-time duplicators offer only paper labels; some may offer pad printing, but setup charges on either APEX or pad printing in small quantities may prove to be cost-prohibitive.

"Cost vs. quantity is the essential factor in choosing high-speed duplication. At 200 units of a chrome C-60, APEX-imprinted with Norelco-style box and overwrapped, your approximate cost, including setup

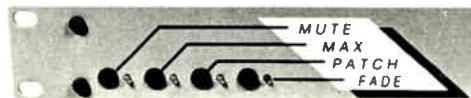
charges, would be around \$2.55 per cassette. However, at 1,000 units, the price is only 98 cents.

"The key point," Porter concludes, "is to establish a relationship with a duplicator that allows you a professional discount as long as you take financial responsibility for your client. Under those conditions, you should be able to mark up high-speed duplication 15 to 30 percent. But remember, if there is a problem, the customer will perceive you as the source from whom they will expect satisfaction. This is just one more reason to establish a relationship with a duplication house—real-time or high-speed—that has the same concern for quality as you do."

Tape duplication, just like any other diversification of your business, requires consultation with experts. Look before you leap. There are good people out there who are ready to advise you about the "make or buy" decision. Use them. ■

*Chris Stone, former studio owner, is president of Filmsonix, a consulting firm serving the professional audio industry.*

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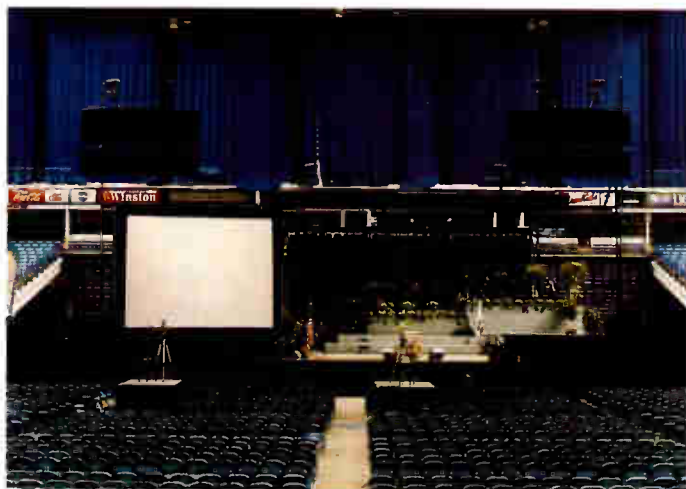
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by David (Rudy) Trubitt

# MULTIMEDIA LIVE



**Group 20 Productions' stage sets for two different INA events.**

**N***ew playback formats like laserdiscs and writable CDs are finding their way into more and more industrial presentations. But how are these multimedia tools affecting sound reinforcement? To begin to answer that question, we look at two unique applications and the interdisciplinary skills of the people who run them.*

## GROUP 20 PRODUCTIONS

Group 20 Productions (Yuba City, Calif.) takes a turnkey approach to live presentations. In addition to handling all of the sound, lighting, staging and projection equipment, the company creates the music and video content required for the event. Group 20's primary client is International Networking Association, a support group for Amway distributors, whose events play to audiences ranging from 7,000 to 15,000.

"We start with a budget," explains Group 20 head Ken Miller. "Part of it is for presenting the weekend event—typically a two- or three-day convention in a place like Arco Arena (in Sacramento), Anaheim Convention Center or the Long Beach Arena. The second part of the budget is for creating all the video and audio components. They have an agenda of speakers, and our job is to make it flow from beginning to end. It's very similar to a TV awards show, where you have a number of hosts and featured speakers. The video production is used to wrap their talks, mix things up and keep it alive."

Group 20 technical director Pete Adams' work begins a couple of months in advance. "I start at Cloud Nine Studios in Chico, California, producing the music," Adams explains. "Ken puts together a keyboard and vocal demo of what he wants, and we have a number of people who do our finished [musical] arrangements."

INA presents three seminars a year, each with a slightly different focus. As each show date approaches, Adams works with

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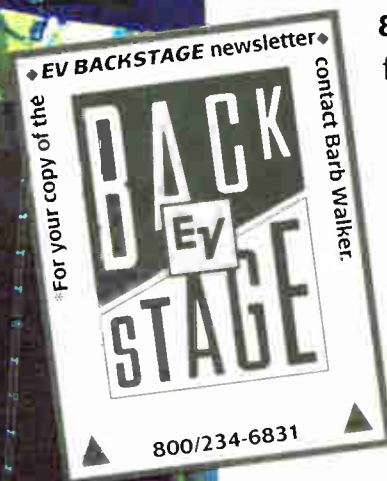
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## LIVE SOUND

Mark Wayne of EAR to spec the sound system. "We've tried just about every configuration Mark's P.A. will go in," Adams notes. "From left and right stacks on the stage to flown center clusters and everything in between." The year's first show is a straight-ahead educational event, with minimal flash. A single large video screen sits onstage, flanked by EAR's M-2000 loudspeakers, a two-box, three-way tri-amp system (see photo, p. 121). Speakers are typically flown on the downstage edge, sometimes with a row on deck.

The year's second event is something of a reunion with a motivational focus. This event calls for a bit more flash. "We have a little more music in the transitions," Adams says. "moving lights, usually a cyc with a moving scrim—it's more Las Vegas in appearance. For this seminar, the entire sound system is flown left and right; it's usually in-line with the big screen [which places the speakers well behind the lectern]. They're flown four high and six wide in an arced array, so there's real good coverage" (see photo, p. 121).

All the stops are pulled out for the year's third show, which adds a live band to the mix. The sound system is essentially the same as for the second show, with the addition of a rack of basic out-board gear to accommodate the band.

Adams runs the Soundtracs M Series 32x8 console during the shows: "I usually have from 12 to 16 inputs for the band, four wireless Shure L4 microphones with SM85 heads, a CD player, a cassette deck, a DAT input, stereo video feeds, a backup mic next to the podium, and an offstage announce mic for Ken." Monitor mixes are run from the house. EAR S-100 wedge monitors are used, a two-way passive 15-inch

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1-inch JBL-loaded design. Power in all loudspeakers is provided by EAR MOSFET amps. Each amp rack shares a common power supply, which draws three-phase current. Most of the time the P.A. idles comfortably, but its extra headroom is definitely called on at key points throughout the weekend.

Precise timing makes the show flow. "You have to stay on top of it," Adams stresses. "If a speaker is introduced and the

fanfare isn't there by the last syllable of their name, there's a dead spot. Then you have to make sure the fanfare is being faded before the energy of the crowd starts to fade. Little things like that—if you're on top of it at those points, the energy stays in the room. Those aspects, as well as the overall [sequence of the] show, which Ken is responsible for, make the difference between an exciting seminar and a boring one." DAT had been used for fanfare and prelude music play-

back, but Group 20 is now moving its music to recordable CDs, which offer instant access to individual selections.

Large rear-screen video projection is used for both playback of prerecorded material and live reinforcement of the speaker at the podium. Several camera angles are recorded during the show, both for live use and to allow an edited version of the weekend to be assembled after the fact. For the second and third shows, still images are used in conjunction with video. Rear-projection slide screens are set up on either side of the video. Prerecorded Betacam tapes hold the video, with the format's hi-fi audio tracks accommodating a stereo music bed. One of the two remaining linear audio tracks carries a sync tone, which is fed to an Arion slide projector control computer. Although manual operation of the slide projectors is possible, they normally run automatically.

All in all, it's certainly an unusual situation for one organization to provide both technical and creative services, but Group 20 seems well adapted to doing both. "My expertise is in performance [as road musician and one-man band]," Miller explains. "When I put a show together, I'm looking at it from a performer's standpoint and how it affects the audience. Our goal is to make the shows entertaining. If we can touch people's emotions, then the message will get through. Everything that we do focuses on that."

#### TEMPORIAL ARTIFACTS

Steve French of Temporal Artifacts (Gardenia, Calif.) creates much of his own automated lighting, audio and control equipment for a variety of industrial and touring musical clients (recent lighting clients include Tom Petty and Genesis). He is currently prepping an industrial for Cadillac, a longtime client. Touring the auto-show circuit, the Cadillac presentation demos the new model year with sound, video, live announcers and, of course, the cars themselves.

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Laserdisc playback forms the heart of the show. "We have four players," French says. "Their audio outputs feed a mixer that I built last year. It has four stereo input pairs with a 7-band graphic EQ on each input [using National's LMC835, a digitally controlled EQ chip]. There's a massive crossfader/matrix with a total of eight channels out." The mixer is controlled by an RS-232 link to the master show computer. "I can upload data to the mixer," explains French. "Then I say, 'go cue 1,' and it will do the crossfades automatically. I'm probably going to move this mixer to MIDI [control], because I've run out of serial ports, and I can daisy-chain MIDI."

The same PC that controls the mixer also enables French to start and stop any disc player at any frame number. When playback starts, the computer reads these frame numbers off the disc. The frame count is used as the master sync source for automating the rest of the presentation. "Originally, we thought we could tell a laserdisc player to go and then just run a timer from the computer's real-time clock," French notes. "But it turned out that the computer real-time clock and video are on slightly different time bases [the difference between real 'wall clock' time and video drop-frame time]. So, we just started reading the laserdisc player directly. By transferring the frame data at 9600 baud, I can nail my cues to about a frame, or frame-and-a-half at the worst." At the end of each video segment, the system reverts to manual control until French starts the next segment.

"I've been using Sony videodisc players," he adds. "Right now we're using the 1650. We had the 2000s, which are good machines. But they have a little problem: When you tell it to seek



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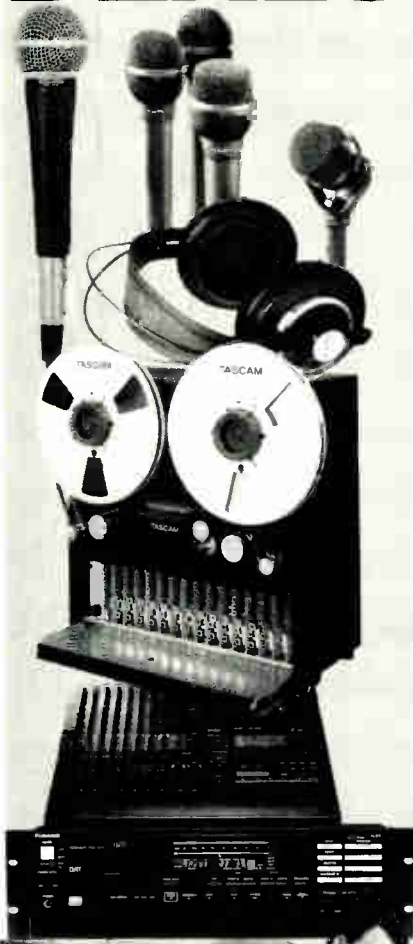
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a frame that it's already on, the player sits there for about 15 seconds with absolutely nothing happening, rather than coming back immediately with "Yeah, I'm here already, what's next?" The 1550/1600 Series gets rid of that problem. They're actually a cheaper [transport]—more of a home-entertainment grade than industrial grade, but their software behaves a lot better."

While slaved to the laserdisc playback, the central PC is busy controlling all the show's lighting, the above-mentioned matrix mixer, a video wall and, believe it or not, a MIDI-controlled Cadillac. "They have a car chassis where the wheels can automatically rotate, steering wheel can turn and shocks bounce," French explains. "I built a little microprocessor that will read the MIDI stream and use that as commands to operate the car's automation. You no longer need a steering wheel to drive, all you need is a keyboard!"

Although his gear uses a variety of control protocols, he's moving much of his development to MIDI. "What got me into MIDI to begin with," he continues, "was the Tom Petty 'Into The Great Wide Open' tour [see January 1992 *Mix*]. For that particular show I had to link some lighting control desks and a Varilite console together so [the operator] could hit one button and cause a lot of stuff to happen at once. All the desks had MIDI, although each one of them [had a different MIDI implementation]. I used an MPU-401 card and Cakewalk [a popular MIDI sequencer for the IBM PC] to capture [the MIDI output from each board while it was operated manually]. You should have seen the look of amazement on the Varilite guy's face when he saw ten seconds of button pushing turn into about a half-second."

French writes a significant amount of his own software to make everything fly. His latest version runs under the Microsoft

Windows environment on the PC. He notes Windows' built-in MIDI support as a plus, as well as the system's multitasking and interprogram-messaging abilities. This allows new control modules to be added and removed individually as needed, without having to rewrite the master control software. "And," French adds, "you can create really nice-looking displays to impress the customer, even if they don't do anything!"

Lest we forget the bread and butter of live sound, rest assured there are speakers and amplifiers here somewhere. "Speakers vary," says French. "We use fairly small Triad systems with a sub and two satellites." Loudspeakers are positioned so that several simultaneous audio presentations can take place in different parts of the display, or the entire system can be combined for a surround-sound effect.

"We're using Rane amps," he continues. (The MA-6, which contains six individual amp channels in a single package.) "Those amps turned out to be pretty bulletproof. Last year we were getting some pretty awful distortion, and it turned out that the people who wired the system had crossed a bunch of speakers, so I was getting hots feeding hots and all kinds of garbage. The Ranes lived through it, which was impressive."

Despite the large amount of machine control involved in French's productions, he doesn't see a totally automatic solution anytime soon: "One of the problems is performers who are not on their mark, or they're late, or they decide to change the set list, and so on. Things don't necessarily happen when and where they're supposed to, so you still need that live operator there to point it in the right direction." ■

*Mix sound reinforcement editor David (Rudy) Trubitt also writes a "Computer Musician" column for our sister publication, Electronic Musician.*

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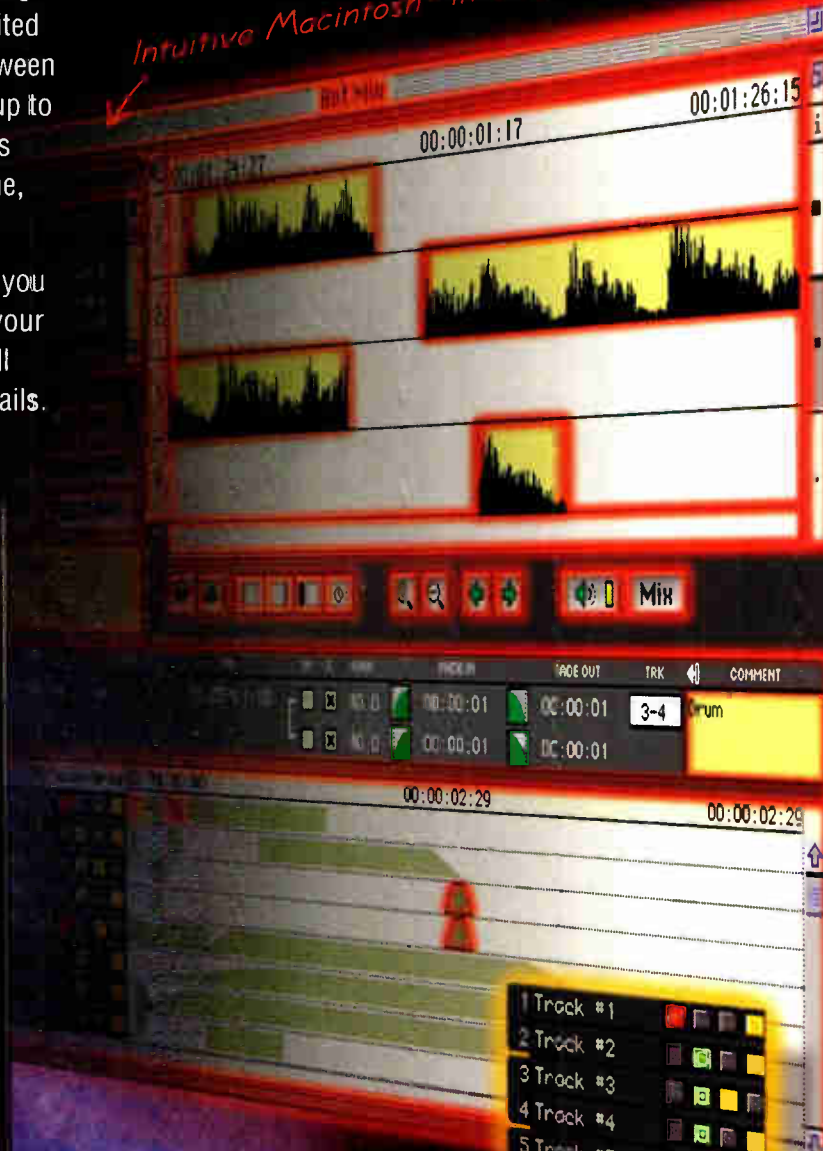
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World Radio History

by David (Rudy) Trubitt

# SOUND CHECK

## PM4000 REVISITED

Last month we noted the delivery of several Yamaha PM4000s to A-1 Audio (Los Angeles). I recently caught up with independent engineer Lucas Corrubia, who is currently out with an A-1 system on *The Music of Andrew Lloyd Webber*.

"It's been a two-PM3000 show for the last two years," Corrubia says. "We went to the 4000 because it's more cost-effective. [Currently] we have a PM4000 and a PM1800, but we're going to try to fit everything in the 4000. We're getting 12 stereo input modules." These modules take the place of effects returns and have all the functionality of a normal mono channel strip.

"[Because of] the way the music is arranged," Corrubia explains, "it's okay to double up two flutes, oboes or violins on one stereo input channel, as long as it's not the first and second chair on the same channel. It's an advantage to have both instruments on the same fader—I'm bringing up a section.

"I have big hands, and little faders worry me, but this setup is fine because the layout is great," Corrubia adds. "Sonically, the show sounds so much better. You can pick everything out because the EQ is much more precise. I'm pleasantly surprised."

The loudspeaker system for the show is a hybrid design by Martin Levan, sound designer for numerous Webber shows. It includes a Meyer system with an array of Tannoys around the proscenium. Stage monitors (eight Meyer UM-1s) are mixed from the house. The 37-piece orchestra is miked using a combination of Countryman 101 omnis on strings, Sennheiser MKH-40s on woodwinds and some AKG 414s thrown in for good meas-

ure. Twelve hand-held Sennheiser wireless mics are also used.

## PAVAROTTI CHOOSES C:MAX

One of Luciano Pavarotti's recent studio sessions piqued the tenor's curiosity regarding headphone-like monitoring systems for his live performances. Sound designer Alexander Yuill-Thornnton chose the recent Hartford, Conn., show for a test of C:MAX's wireless in-the-ear monitoring system. Larry Droppa, president of Circuits Maximus,

came to Hartford to set up the system. John Monitto of Pro Media (El Sobrante, Calif.), which provides sound for Pavarotti's North and South American dates, describes the results:

"It went well," says Monitto. "We did a rehearsal the day before the performance, where he tried the ear pieces on and felt that they were comfortable. At rehearsal on the day of the show, he wasn't getting enough level at first, but eventually we

—CONTINUED ON PAGE 132



**Mick Whelan at the board during last year's grand finale**

## LIVE SR WORKSHOP

Synergetic Audio Concepts and *Pro Sound News* will co-sponsor the 1993 Live Sound Reinforcement Workshop January 12-14 at Chapman University Campus in Orange, Calif. (preceding the Winter NAMM show). Registration fees for the workshop, which include materials and meals, are \$650 per person.

The theme of this, the fourth workshop in the series, will be "Mixing Art with Science." The instructional staff will include Albert Leccese from Audio Analysts, Mick Whelan of Electrotec, M.L. Prociase of Showco, and a yet-to-be-named engineer

from Maryland Sound, as well as Will Parry of Signal Perfection and David Scheirman of Concert Sound Consultants as program chair and workshop coordinator, respectively. The emphasis will be on concert sound as well as high-quality sound systems for theme parks, houses of worship and special events. Important safety topics like rigging and AC distro will be covered as well as emerging technologies such as in-the-ear monitoring and computer control of audio equipment.

Call (812) 995-8212 or fax (812) 995-2110 for information. ■

## Live Sounds



*Springsteen's vocal mic is an Audix capsule mounted on a Sony transmitter. Above: House mixer John Kerns and (right) monitor mixer Fred "Gumby" Jackson.*



# Bruce Springsteen

Performer

**BRUCE SPRINGSTEEN**

Venue

**THE WORLD MUSIC THEATER,  
TINLEY PARK, ILL.**

**SEPTEMBER 2 AND 3, 1992**

Sound Company

**AUDIO ANALYSTS**

House Mixer

**JOHN KERNS**

Monitor Mixer

**FRED (GUMBY) JACKSON**

Crew Chief

**MARIO LECCESE**

**by Nort Johnson**

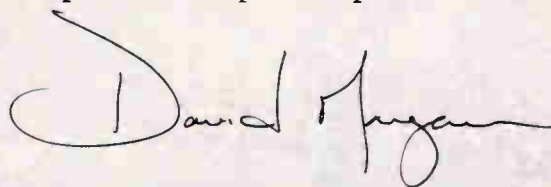
While cloudy skies loomed over the small Chicago suburb of Tinley Park, Bruce Springsteen's crew prepared for the first of two sold-out shows at The World Music Theater.

The World is a massive, state-of-the-art shed that saw its first concert season in the summer of 1990. It has the largest outdoor seating capacity under one roof (12,000), with a total capacity of 33,000. The World's enormous

steel roof makes this venue an acoustical challenge.

By 7 a.m. on the morning of the first show, stage hands and crew were busy replacing the venue's 90x68-foot stage with the tour's own bi-level platform. Springsteen's stage is equally impressive in size but is contoured at the two upstage corners, allowing for approximately 12 extra rows of seating wrapped around each side. Before the stage was half-con-

*"On Paul Simon's 'Born At The Right Time Tour,' every vocal microphone was a Beta 58. In addition, 34 of our 100-plus inputs were from percussion instruments. Many rehearsal hours were spent on microphone choice and placement. We found the Beta 57 to be a valuable tool—perfect for bongos, bata, wood blocks, cowbells, and temple blocks. It's a fast, accurate, wide dynamic range microphone with little low-end coloration, strong midrange, and well-controlled high frequency response. Challenged by a virtual forest of percussion gear in close proximity, the side rejection and isolation delivered by the supercardioid pattern proved real assets."*



*David Morgan, House Sound Engineer,  
Paul Simon's "Born At The Right Time Tour"*



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structed, the Audio Analysts sound crew had flown the 64 HD S-4 speaker enclosures they were to use for the next two days. Crew chief Mario Leccese oversaw the rigging of the system while monitor engineer Fred (Gumby) Jackson and FOH engineer John Kerns were busy at their respective stations.

Springsteen's monitor mix position was in a ground-level pit, squeezed between the audience and the stage. There was just enough room for Fred Jackson's AA/CADD SM-1M monitor console and a Gamble 36x16 custom desk. "I sit less than two feet away from one performer and less than four feet away from another," Jackson says. "The crowd is three feet behind me, and two monitors are directly in front of me. I also have my cue wedge behind me and a sidefill above my head. It's like trying to have a conversation in a crowded room. Somehow, you have to keep track of everything that's happening. I mix every night at about +5 over nominal, just to get over the top of the other information that's bouncing around the room. After three-and-a-half hours of all that, you can become pretty disoriented."

The need to keep clear sight lines precluded the use of monitors or sidefills onstage. "Instead, we developed a box that incorporates a compression 10- and 2-inch, which we blasted from the center, almost like an HD S-4," Jackson says. "When Bruce steps out of the center pocket, there is another set of monitors buried in the runway that comes around the front of the stage. There's also a set of long-throw sidefills in the air on the side of the stage. It's not a wash like what you'd do with normal sidefills and a bunch of wedges across the front. There are certain positions you wait for him to walk to, and then you hit him with it. You can't just sit back and watch—you have to punch up each mix. He can be unpredictable."

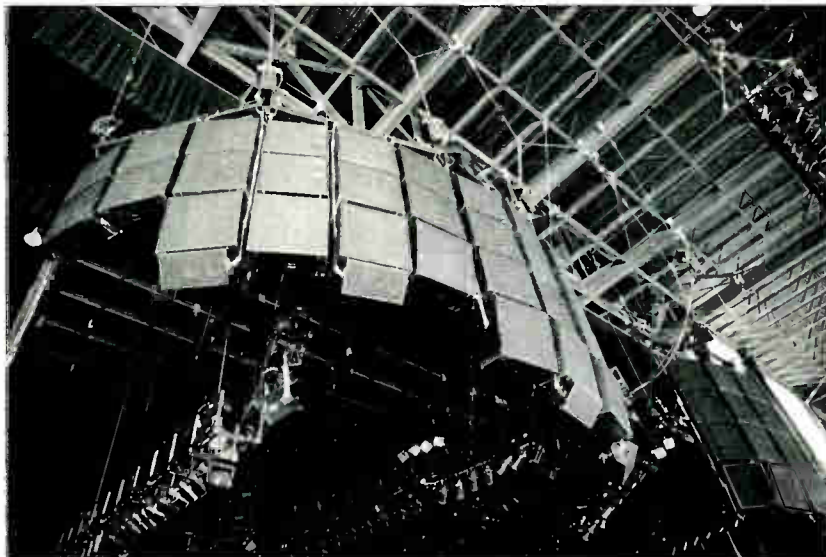


PHOTO: RUDY ARAS

The house mix position at The World is a 32x16-foot area centered 115 feet from the stage, just in front of the first-level pedestrian walkway. House engineer John Kerns used an AA/CADD SM-1M house board along with a Soundcraft 500. "The CADD console has a lot of inputs and great sound," Kerns says. "Once I started using it, I never wanted anything else. There's a lot of head room and flexibility. It's got 40 inputs, both with A and B mic inputs and a line input on each channel, eight stereo returns, eight auxiliary inputs, eight matrices, eight stereo group outs, three stereo mix outs, three mono mix outs, eight mono sends and four stereo sends."

Kerns also showed off three impressive drive racks. "I'm using a few TC Electronic 2290 delays," he notes. "One is just for effects, and the other is a vocal thickener. I also have an AMS reverb and AMS delay harmonizer, which are only for Bruce's vocals, and three Lexicon PCM70s for drum and instrument reverbs. All the background vocals get Eventide I-3000. I'm switching [presets via MIDI] on everything with an MX-8 MIDI patch bay and a little Roland controller. It's extremely easy—just punch in your program number. Some drum sounds come from two Wendel Jr.'s here [at the FOH] and a couple of Akai 1000s back-stage. They're occasionally used

**Audio Analyst's  
rig flying high  
at The World  
Music Theater**

for kick and snare, but not that often."

Besides the 64 flown HD S-4s and six HD S-4s per side onstage, there were what appeared to be two monitors hanging from each cluster, angled down at the audience. Kerns says that the motivation behind the position of AA's new nearfill cabinets is to provide clear sightlines. "With this design, the bottom cabinets hang down at a slight angle and cover the first ten or 15 rows," he says. "We also have one onstage for the folks in the middle. Those are the people who either paid the big money or slept in line all night. It's important for them to hear the house sound, not just the monitors. The speakers have two 12s and a horn inside and are tuned to 40 Hz. I don't try to get that much bottom out of them because there's a lot of bottom end thrown around, and you have the stage volume right there." The entire system was powered by 12 racks of Crown amps. Each rack held a mixture of Macro-Tech 2400s and Macro-Tech 1200s and was located at ground level, stage left and right.

Jackson noted that a new mic capsule on Springsteen's wireless helped with the monitors as well

—CONTINUED ON PAGE 133

—FROM PAGE 128, SOUND CHECK

got it to where he liked it, and we used the C:MAX for the show. I set up his monitor mix and then worked with John [Pellowe, who, along with James Locke from Decca Records, is responsible for overall sound]. Orchestra was added to his C:MAX monitor mix, which is never put into his wedge monitors. We also added a couple of condensers as audience mics, fed only to the C:MAX.

"Several of us wore systems to monitor what he was hearing," Monitto continues. "I found the ear pieces we had to be somewhat comfortable. If your ears aren't dry, they do tend to slip out a bit. But the system sounds great. Pavarotti usually needs four Meyer UM-1s. The new system made a dramatic difference [to the house sound] because the monitors were not on at all. He said he wants to continue using the system after the Hartford show—he was very happy."

#### BURNS AUDIO ON THE CAMPAIGN TRAIL

The 1992 political campaign found Burns Audio (Burbank, Calif.) providing sound services for both parties. First, the company provided sound for the Republican National Convention in

the Houston Astrodome. Bruce Burns described the project as "the biggest challenge of my career. The large dome surface presented us with quite a task: to ensure that the President sounded natural and intelligible throughout the arena, especially with the high ambient noise level of the crowd." Engineer Patrick Baltzell used a 56-channel Gamble board and a Crest-powered Apogee rig. Alexander Yuill-Thornton performed his Precision Room Equalization technique to minimize resonance in the highly reverberant space. Crown MPX multiplexers and an IQ software program were used to manage the 54 Crown triple-element microphones located throughout the seating area.

Their next political project was a Beverly Hills fundraiser featuring Barbra Streisand for the Clinton Gore ticket. The event was transmitted via satellite to locations around the country. In addition to providing sound reinforcement for the live event, Burns managed staging, video facilities, audio recording, communications and labor. Audio reinforcement and video projection at the three major downlinks in New York City, Atlantic City and Washington, D.C., were coordinated by Burns Audio's Alexandria, Va., office.

## NEWS FLASHES

The USITT Engineering Commission is in the process of revising and updating the 1980 standard for theatrical pin connectors. To participate, contact Jerry Gorrell at (602) 262-7364...**Maryland Sound Industries** (Baltimore) provided six Symetrix 571 SPL computers with slave units to the Smithsonian Institute in Washington, D.C. The units are used to control volume levels in a new exhibition, "American Encounters." Sensing microphones measure ambient levels, enabling the units to insure that narration tracks are neither lost beneath crowd noise nor overpowering under quieter conditions...**Clive Green & Co.** announced the supply of a 70-input Cadac J-Type console for the Chicago production of *Miss Saigon*. The console was supplied in an unusual configuration, with three frames of 25, 17 and 45 modules each, plus an additional pair of 8x2 submixers. Sound design for the show is by Andrew Bruce of **Autograph Sound** (London)...**Scharff Weisberg** supplied equipment for a taping of *Star Search* at Disney-MGM TV studios in Orlando, FL. Apogee AE-5 and AE-6 loudspeakers, QSC and Crest amps, Eventide and Aphex signal processing and a 28-input Soundcraft Venue console were used. Scharff Weisberg expects to be replacing the Venue with a Europa console shortly. The system provides sound for the show's large studio audience, as well as monitoring for the performers...**Carey Sound** (Greensboro, NC) recently installed Electro-Voice MT-4 speakers in two large live-music clubs on the East Coast. At the Kat's Cradle in Chapel Hill, NC, two blocks of MT-4s were used, with the high boxes flown and the low end onstage. The same configuration was installed at Magellans in Raleigh, NC. The club was known as Switch before being renovated and renamed...**Eighth Day Sound** (Cleveland, OH) was recently busy with Clinton bus tours. Cleveland Browns presea-

A trust fund was established for the children of Tasco president Terry Price, who passed away in an auto accident earlier this year. An open letter from the fund's trustees puts it best:

*Dear Friends,*

*On behalf of Gabby, Alex and Vanessa, we would like to express our gratitude for the extraordinary reaction from everyone in our business at the loss of our great friend Terry. The outpouring of love, support and prayers was overwhelming. Terry was a diamond, forged through hard work, polished by his unwavering determination, unique in his loyalties, brilliant, hardened by a life that we have all chosen for ourselves and have been lucky enough to endure and prosper. Inside every diamond there burns a heart quite brightly, and no fire burned greater than Terry's for his family.*

Contributions may be sent to:  
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son home games and tours with Johnny Mathis, Tom Jones, Kenny Loggins, Smokey Robinson and The Whispers/O'Jays. Also new with Eighth Day is a Yamaha D2040 digital crossover and PM4000 console, the first of several, according to the company. Several new trucks were also added to their inventory... Rat Sound Systems (Sun Valley, CA) is out with Sonic Youth. The Lollapalooza team of Dave Rat (house), Karrie Keyes (monitors) and Mark "Smitty" Smith as systems tech and production manager will cover the several-month outing, including a stop at Denver's Red Rocks. Equipment highlights for the tour include a Ramsa WR-S852, Soundcraft 500B (for opening acts), a Yamaha PM2800 monitor console and a 32-box, 30kW Crest-powered loudspeaker system... Visual Aids Electronics (Cincinnati, OH) recently installed nine Audio Logic SC-31 graphic EQs and six SC-610 mixers in the Grand Ballroom of the Crown Center Hyatt Regency hotel in downtown Kansas City. ■

—FROM PAGE 131, SPRINGSTEEN

as with the house. "We got a custom Audix OM 7 capsule and had them put it on a Sony transmitter. It's got a hypercardioid pattern, and rejection is incredible. It sounds like a wired microphone. It makes it a little bit easier for John and me with the amount of stage volume that's going on."

Springsteen's first night at The World went well. Thunderstorms were predicted all day, but luckily the skies didn't open up on the crowd. The lightning strikes seen on either side of the stage during "Thunder Road" were not produced by special effects, but by nature. Sound was good almost everywhere, except for the second- and third-floor sky boxes, where the sound swirled around due to the high ceiling (85 feet from floor to roof) and the lack of coverage upstairs.

The next day, Kerns talked about his first night under the

World's immense roof: "The bottom end will not go away. It just sort of rumbles. It's about six seconds out here at the mix position, somewhere between 80 and 100 cycles. And it's tough with these skyboxes here. It's tough to get even coverage on the top end. If we could put a lot more sound on the ground, I would have taken the whole rig up higher to cover that specifically. About halfway back, it starts to get a little shy. But I'll tell you, from what everyone on-

stage tells me, the stage sounds real nice. Nothing rumbles around onstage and it's real dead. It's very important to Bruce and everybody involved with this production that everyone in the audience gets the best sound possible, and I agree with that. After all, the audience are the people who pay the big bucks." ■

*Nort Johnson is a Chicago-based writer and veteran of the touring, club and festival scene.*

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## SOUND REINFORCEMENT NEW PRODUCTS


**COMMUNITY  
VBS412 SUB**

Community Light & Sound (Chester, PA) expanded its line of VBS subwoofers with the VBS412, an electronically controlled system loaded with four proprietary long-excursion, ferrofluid-cooled, cast-frame drivers. Its 30.5-inch-wide trapezoidal cabinet shares the same floor space as Community's three-way RS-880 system, and the VBS412 produces deep bass down to 35 Hz with a 2,000-watt program rating.

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**STEWART  
PA-1800 AMP**

Stewart Electronics (Rancho Cordova, CA) offers the PA-1800, a dual-monaural power amp in a 17-pound, two-rackspace package providing 650 watts/channel into 4 ohms or 1,800 watts bridged at 4 ohms. The PA-1800's true dual-mono design has two independent power supplies, dual-fan cooling, 1/4-inch XLR barrier-strip inputs, and a bandwidth said to be 3-180k Hz (+0/-3 dB).

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**SOUNDTECH  
SUBSAT 1**

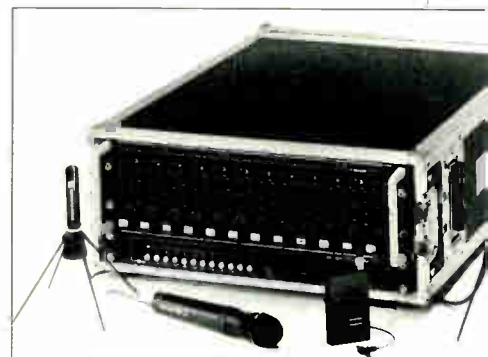
Designed as an economical way of adding a subwoofer to an existing sound reinforcement system—without the expense of adding an active crossover and power amplifier—is the SubSat 1 from SoundTech (Vernon Hills, IL). SubSat 1 is a passive 120Hz, 12dB octave crossover with stereo inputs and two subwoofer outputs. Both 0 and -3dB full-range outputs are provided, so users can attenuate the full-range speaker slightly to increase bass or match a less-efficient subwoofer.

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**APOGEE AE-3S2**

Offering acoustic qualities similar to the popular AE-5 is the AE-3S2, a compact, high-power, two-way speaker system from Apogee Sound (Petaluma, CA). The AE-3S2 features a 1-inch throat compression driver mounted on an alternate-coordinate, spheroid-ellipsoidal horn that is said to offer a high degree of freedom from feedback. The trapezoidal, flyable, 36-pound cabinet has Speakon connectors and houses a 10-inch cone driver. Frequency response is 70-18k Hz,  $\pm 3$  dB, with a maximum continuous SPL of 121 dB; a subwoofer is optional.

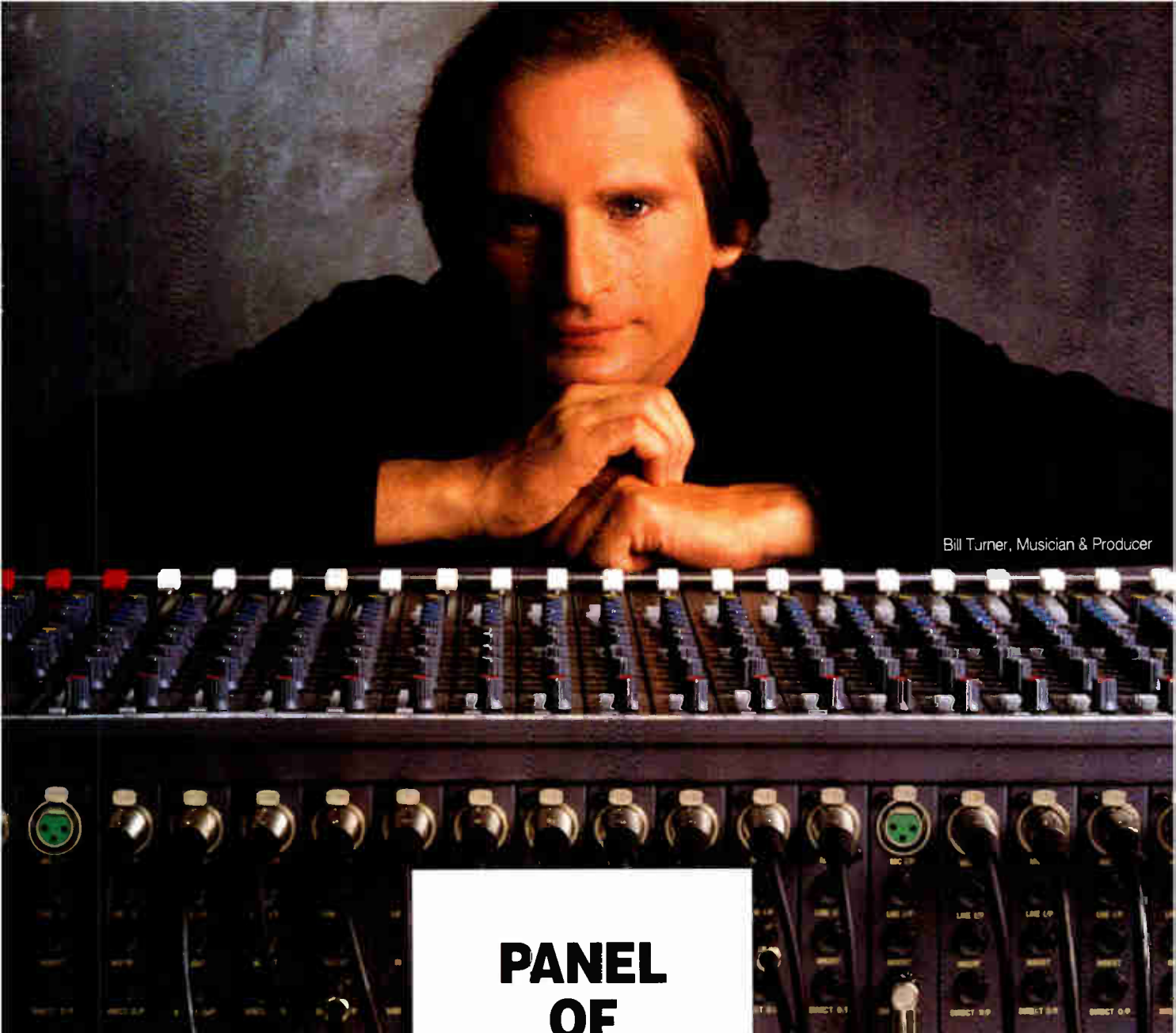
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**BEYER U700 UHF  
WIRELESS**

Beyer Dynamic (Farmingdale, NY) debuts the U700, a wireless system operating in the 470-980 MHz UHF band. The U700 accommodates up to 12 channels, and both body pack and handheld transmitters are available, with a choice of mic capsules. A series of ground plane antennas are offered, as is an LED monitoring field, which allows switchable status monitoring of any of the 12 channels.

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Bill Turner, Musician & Producer

## PANEL OF EXPERTS.

Bill Turner is an expert on professional sound studios as well as being a renowned session musician. Among his noteworthy accomplishments, he played lead guitar with Bill Haley, and most recently toured Europe with a revival of the original 1954 Comets band. He currently performs and records with his own band, Blue Smoke.

Bill is equally talented as a producer in his Brooklyn, New York, studio, Bill Turner Productions (BTP). "Being an independent producer, we often have to create the product on location and many times outdoors. This is the trickiest... anything can happen outdoors. We eliminate a lot of the 'gremlins' by using only the parts and connectors we feel are the best...and that

translates to Switchcraft. We never leave the studio without Switchcraft."

Switchcraft manufactures microphone connectors, plugs, adapters, cable assemblies, receptacles, patch cords, audio patch panels, and more. If you need something customized, we'll help you design and execute your concept. Wherever music is made, Switchcraft can supply the components and assemblies to make it sound better.

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## Swimming in Deep (Roger) Waters with Patrick Leonard

It will surprise no one to learn that Roger Waters' third post-Pink Floyd album (and first in five years), *Amused to Death*, is a conceptually challenging and sonically rich work. After all, this is the man who masterminded *Dark Side of the Moon*, *Wish You Were Here* and *The Wall*, three of pop music's most impressive marriages of high art and high concept. I found his dour final Pink Floyd album, *The Final Cut*, and his first two solo records, *The Pros and Cons of Hitchhiking* and *Radio KAOS*, unfocused and un-compelling, but his latest opus is definitely in the tradition of his finest work.

It's loaded with biting-cynical and funny observations about our civi-



PHOTO: RICHARD HAUGHTON

lization's (and species') continuing decline; with passionate volleys against the military mindset that controls world politics and the cultural vapidness that is engulfing Western culture via television; and, most of all, with haunting musical moments that will stay with listeners for years to come. Waters is not afraid to deal with the Big Is-

ues, and if he occasionally sounds strident or heavy-handed, it is only because he cares so much about what he's trying to say.

Waters is famous for being a perfectionist in the studio—someone who is not afraid to take *years* to make a record—and indeed that was the case with *Amused to*

—CONTINUED ON PAGE 139

## Brooks & Dunn's Boot Scootin' Remix

by Dan Daley

If Madonna's next incarnation (after *Erotica*, that is) includes a string tie and Tony Lama boots, you can attribute it to the impact of country music's first dance remix. The methods and techniques normally found on urban-format 12-inch club mixes were applied to Nashville duo Brooks & Dunn's "Boot Scootin' Boogie," your basic country-rock shuffle elevated to the status of cross-genre phe-

nomenon with four weeks on top of *Billboard's* Country Singles chart last summer.

The "Boot Scootin' Boogie" remix idea first came to Scott Hendricks nearly two years ago. Hendricks, producer/engineer of several traditional country acts, including Alan Jackson and Restless Heart, was out for a few road dates with Jackson at the time. At club venues, he noticed that decidedly non-country records from Michael Jackson and Madonna were being played to satisfy the club-goers' dance-

ing desires. He filed the images away, and earlier this year, when "Boot Scootin' Boogie" was decided upon for the Brooks & Dunn record he was about to embark upon, Hendricks went to friend and Nashville-based pop producer Keith Thomas and suggested they collaborate on a dance remix of the song. Thomas shared Hendricks' enthusiasm for the idea but his schedule wouldn't permit participation. Thomas did, however, recommend engineer/producer/remixer

—CONTINUED ON PAGE 140

## Miles' Swan Song: The Hip-Hop "Doo-Bop"

Less than a year after his unexpected death from pneumonia, Miles Davis hit the top of the jazz charts this past September with one of the most unusual records of his more than four-decade career—the jazz hip-hop album *Doo-Bop*, produced by Eazy Mo Bee and re-released posthumously in June.

### Miles Davis with Eazy Mo Bee

While the disc is not likely to be a favorite of the legions of purists who never made it past Miles' 1970 fusion *Bitches Brew*, those who have followed and enjoyed Miles' quests in recent years will no doubt be intrigued by this at times fascinating marriage of street rhythms and Miles' free blowing. Anyone who heard early '70s Miles masterpieces like *On the Corner* will quickly recognize that

—CONTINUED ON PAGE 141



PHOTO: MICHAEL BENABIB

## The Many Hats of T Bone Burnett

*The Criminal Under My Hat*, the latest in a long line of intelligent and tuneful albums by singer/songwriter/producer T Bone Burnett, has all the earmarks of the best folk music: melodies that are instantly memorable; spare instrumentation that embellishes rather than distracts from the tunes; lyrics that are direct without being simple-minded; and a social consciousness that is manifested through a combination of wry satire and neatly developed metaphors. It's T Bone's first album in four years (his last was the messy, disjointed and somewhat inaccessible *The Talking Animals*), and it represents something of a return to his roots.

"After we made *Spike* [Elvis Costello's acclaimed album, co-produced by T Bone], I was pretty ex-

hausted, so I went back to Texas and retired for three years," T Bone says. "I got back into writing and I didn't force myself. I had one idea in mind, which was to try to write a lot of melodies—I wanted to spend time with my kids and I wanted to write. I also spent a lot of time listening to

blues and country, and I think the honesty and directness I heard in that affected my writing. You know, Leadbelly was a really interesting writer because as soon as you heard his melodies, you knew them for the rest of your life. So that was what I tried to do with these songs."



PHOTO: STEVE NELSON

Co-producing with his longtime friend Bob Neuwirth (himself a fine songwriter), T Bone cut the songs in several different studios—Ocean Way, Kiva West and Sunset Sound Factory in L.A., and Sound Emporium and Music Row Audio in Nashville—with a number of top players, including guitarist Marc Ribot, bassist Jerry Scheff, drummer Jim Keltner, violinist Mark O'Conner and dobro master Jerry Douglas. The principal engineers on the project were Joe Schiff, Tchad Blake and John Hanlon. As an artist who has been producing others since the late-'60s (when he worked with such Texas acts as the Van Dykes, Delbert McClinton and the legendary Stardust Cowboy), T Bone naturally is quite comfortable in the studio, though he professes blissful ignorance of the highly technical end of recording.

—CONTINUED ON PAGE 141



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*Death*. Work began on the songs that would eventually make up the album more than three years ago, with Waters and some of his long-time bandmates, including guitarist Andy Fairweather Low, making demos and cutting tracks at a variety of studios—Angel Studios and Waters' own Billiard Room in London, and Compass Point in the Bahamas.

A few months into the project, Waters' representatives contacted producer/keyboardist Patrick Leonard about getting involved, but Leonard was busy with other work at the time and declined. Though often considered a "dance music" producer because of his early '80s successes, Leonard has solid progressive rock credentials. Aside from playing in prog rock bands when he was younger and being a lifelong Pink Floyd fan, he has worked on albums by Bryan Ferry and even the post-Waters Pink Floyd album, *Momentary Lapse of Reason*. In fact, working with Pink Floyd at the height of their enmity with Waters—it was certainly among the nastier public tiffs of recent years—is one reason Leonard steered clear of Waters at first.

"I'd heard stories about Roger from [Floyd guitarist] Dave Gilmour that made me think, 'No, I don't really want to get involved in this,'" Leonard remembers. "Then, quite a bit later—almost a year later—I got another call to see if I'd be interested again, and I ended up going to New York and meeting with Roger. He had just done *The Wall* in Berlin and I thought, 'This guy is amazing. How awful can he be?'"

"We had a nice meeting," he continues. "I listened to his demos, and I thought he was wonderful. We got along really well. We breached the Dave Gilmour issue briefly. He wanted to know how strong my alliance was, and I told him that aside from having a tremendous amount of respect for David as a musician and thinking he's a nice man, I have no alliance one way or the other. At the time it was pretty heated between them; now I know Roger has put it completely behind him. This album gives him the ability to do that."

"The original idea was that I would take these tapes and these concepts that Roger had and just finish them," Leonard explains. "We would put them together and it should take a

few months, and we'd mix it and that would be it. Of course, once we got started I realized that wasn't going to be the case. He had some 24-track masters, but none of those ended up being used, except for a couple of drum tracks and a few little guitar parts. The rest we re-did. We started from scratch and recut all the basic tracks so they had the right kind of unity. Some of the tunes also needed to be rearranged, so rather than cutting tape up and all that, we rearranged them as demos and then recut them."

Most of the basics were recorded at Olympic Studios in London with the rhythm section of bassist James Johnson and drummer Graham Broad, guitarist Low, and Leonard playing keyboards. "We had a couple of days of rehearsal before we got into it so we'd have a good sense of the dynamics of the music," Leonard says. Other instrumental parts—like Jeff Beck's incredible axe work, John Patitucci's bass on one song, the choirs, the Chinese music ensemble, the National Philharmonic—were added over the next year or so at such facilities as Abbey Road and CTS in London, and Evergreen, Devonshire, Ameraycun and Leonard's Johnny Yuma, all in Los Angeles. Waters' regular engineer, Nick Griffiths, supervised the actual recording; other engineers included Hayden Bendall, Jerry Jordan and Stephen McLaughlan.

When it came time to mix, James Guthrie, who had worked on *The Wall* with Waters, was brought in to provide a fresh perspective to the marathon project. "When you're mixing a record, you need someone who isn't going to do it the same way you've done it a hundred times already," Leonard explains. "You push the faders up, you pan this guitar left, this guitar right, you put this amount of reverb on this, you add the delay back to this thing, you put the snare drum about here, and you EQ in this bottom-end frequency. You get so used to doing it that way that when you go to mix you just do the same thing."

"The intention of this music was so clear that there was no danger that James [Guthrie] would miss it," Leonard continues. "He may pan it to the other side and he may EQ it a little differently and he may decide this needs a little chorusing or something. But he wasn't going to do anything

extreme. It was good to have an objective opinion, plus someone who had the fresh energy to bring to it."

The mix was done at Devonshire on the 70-channel Neve VR console, which was occasionally pushed beyond its limits, according to Leonard: "We had some 96-track mixes, with strings and choirs, all of which were real. You add that to four guitar players, multiple keyboard tracks and multiple percussion tracks, and pretty soon you're there."

Typical of Waters/Pink Floyd records, *Amused to Death* is littered with sound effects, ranging from explosions to jet fighters to telephones to chanting crowds. Some were created specifically for the project, others were from sound libraries; all were spatially enhanced using QSound technology. Leonard at first bristles when I ask how the eerie chanting effects were made, but then relents. "It's actually very simple," he says. "It's prerecorded crowds and then our own chanting crowd that we created through a series of voice timbres whispering and screaming, and different distances on the mic. Then you just use a Drawmer and noise gate them all together. Ultimately, though, we want you to think that's the real deal and these really are crowds chanting. You don't want people to know you've created it; it's like telling them how to do a magic trick."

Leonard says that the segues and sound effects (or "theater") were the last phase of the project, "and it got kind of brutal near the end, because the only way to know if it was correct was to sit down and listen from the top to the bottom and say, 'Well, that feels a little abrupt there; this one isn't quite breathing enough; the switch between side one and side two of the cassette isn't quite right.'" At more than 72 minutes of virtually continuous sound, that's a lot of listening.

In the end, Leonard worked on the album for 16 months, "which sounds like a long time, but actually isn't that long to be in a job. We tried to pace ourselves. Roger and I became very good friends and we became experts at diversionary tactics. We'd go off shooting or fishing when we needed to get out of there. We bought a pool table for the mix room in L.A., and Roger had a snooker table at his place in England."

Leonard believes that both the process and the final result made working on *Amused to Death* one of

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—FROM PAGE 139. WATERS & LEONARD

the highlights of his professional life. "It absolutely rises above any work I've done," he enthuses, "and I think it rises above most work that's ever been done, if I can be so bold.

"From a technical standpoint there probably wasn't anything that was really new for me," he continues. "But on a spiritual level and from a philosophical standpoint, I've never learned more in my life, because it's not that often that you get to work with someone who is truly a brilliant artist. I can't say enough about Roger and his vision and his persistence in the realization of that

vision. A lot of times, as musicians we say, 'Yeah, that's good enough. This is done.' But there's another level you can go to, and occasionally you'll stumble on it or you'll feel it and you'll say to yourself, 'This is the real shit. We're actually doing it now.' Then that feeling passes and you're back where you were. In this case, I think it was always pushed to the absolute maximum critical level. And what I learned was that it's possible to do that without the anxiety just about killing you, and it's possible to do it with nothing but fun and joy. That's something I'd never experienced before." ■

—FROM PAGE 136. BOOT SCOOTIN' REMIX

Brian Tankersley, late of Los Angeles and a recent Nashville arrival.

Tankersley's background in pop and rap allowed him to combine urban recording processes with the lyric-driven format of country. "I've done a lot of acoustic recording as well as dance remixes," Tankersley says. "And I do like the sense that country makes the song itself the focus of a record, not the sounds."

Tankersley dumped the track from its original 24-track analog format to a rack-mount Akai 12-track at his home and worked up a one-minute version as a sample. That was less to check the validity of the theory than to convince the powers that be at Arista Records, Brooks & Dunn's label, that country was ready for remix. "Half of the label people were skeptical and half were excited about the idea," recalls Hendricks, and that ratio remained even after the experimental version was heard. "They were concerned that there would be no place to sell it. The skepticism came from the fact that a remix had never really been done full-blown before with a country record. Up until then, country music's idea of a remix was to raise the kick and snare and loop the solo," a reference to extended versions of songs for video.

Finally convinced that it could at least function as a promotional product, Arista gave the go-ahead and Hendricks and Tankersley went into Javelina Recording in Nashville. Working on the studio's Calrec console, the pair spent the first day and a half working up the arrangement, Tankersley adding his touches di-

rectly from his sequencer, then mixing it in sections before editing them together onto a Studer 1/2-inch analog 2-track, extending the usual three-minute-plus country single format to more than six minutes.

Ultimately, Tankersley replaced all of the rhythm instruments, replacing the drums and bass after creating a tempo map on his Atari computer using C-Lab's Notator program. "The time code track from the multitrack was put there really for mix automation purposes," he explains. "It had no relation to the click track, so a tempo map had to be built. From there, I had to hand-pin the parts because the live drummer and the band push the tempo around as they play live. Not much, but compared to a drum machine, you have to do the replacements individually to lock them up perfectly." Tankersley used a dual-trace oscilloscope, triggering the sweep off a click and then comparing it visually on the CRT to the drum hits.

While Tankersley and Hendricks added sundry sampled sound effects hits, they purposely kept what Tankersley refers to as the "signature" elements of the track: the slide guitar, fiddle and electric rhythm guitar. A breakdown section was created that used nothing from the original recording.

"The methodology was urban, but the mentality was totally the opposite," says Tankersley. "The sounds were rock and country, not urban at all. If they were too uncountr'y, the idea wouldn't have flown."

Fly it did, to the tune of 200,000 remix units sold and a platinum



album. Since then, Tankersley has already done a similar remix of Mark Chesnutt's "Bubba Shot the Jukebox" with producers Mark Wright and Tony Brown. "I want to point out that all the country remixes have been done in conjunction with the original record producer," Tankersley says. "That's another way this differs from an urban mix in which the remixer is on his own. Working with the original producer keeps the original sensibilities and honesty intact, and that's critical in country."

Both Hendricks and Tankersley voice concern about what they suspect will be the inevitable imitations. But both feel that "Boot Scootin' Boogie" represents a true evolution in country music, not a novelty or a quick trend. "I don't know how far it'll go," says Hendricks. "But as long as it's done tastefully, not as a gimmick, and with respect for the song, then it's something that can move country music along." ■

—FROM PAGE 137, MILES' SWAN SONG

there is a definite link between that mesmerizing funk and contemporary hip-hop; in a sense, *Doo-Bop* was a natural for Miles. And, of course, Miles was well-known for exploiting young talent when he found it, always looking to ride the crest of the next wave of music.

Notwithstanding a pair of raps by Eazy that are little more than fawning pieces about Miles, there are several fine tracks on *Doo Bop*, all of them built around extensive samples, many of them from other people's records (and exhaustively credited on the liner notes). "Eazy is a great producer," comments engineer D'Anthony Johnson, who worked on most of the album's songs. "He really knows how to use the sounds he finds, and then I know how to enhance them. He'll program his machines [mainly an E-mu 1200 sampling drum machine and an Akai S950 sampler] at home, and then I dump it to 2-inch tape and take it from there—mix it down, add effects, maybe do some vocals. But that's *all* he uses; he creates his music from that—chords, bass lines."

For young Johnson, a former DJ and rapper who moved into engineering after studying at New York's Center for Media Arts and then working as an intern at Power Play Studios, working on *Doo-Bop* gave

him a chance to rub shoulders with one of the truly legendary figures of music, and he admits that he was slightly intimidated at first.

"Oh wow, it was *Miles!*" he says, still with awe in his voice. "I'd heard that he could be this tough guy, but then when I met him he was really nice. He came in here [NYC's Unique Recording, where Johnson frequently works] and he knew *exactly* what he wanted to do. He had heard cassettes from Mo Bee and he brought in his keyboard player, Deron [Johnson], and they went right to work, freestyle. He wasn't bossy at all. He was real free, hangin' out with the guys, trying to be young like us.

"I used a [Neumann] U-87 on Miles, with no effects; those went on in the mix, and I didn't use that much: a little [Lexicon] 224 or 480 small room patch on the trumpet, not real wet, just to give it a little depth; the [Roland] Dimension B as a chorus for bass lines. I used a little [Yamaha] SPX1000 Symphonic to give it a stereo image, a little airy feeling. And I used the [Eventide] H3000 for flanging."

Unfortunately, Miles and Eazy had not quite completed an album's worth of material when Davis died, so Eazy took the unusual step of creating new pieces for the album that combined unused, three-year-old trumpet tracks by Miles, with newly created settings. The best of these, "High Speed Chase," is among the best pieces on the album. "We sort of treated it like a remix," Johnson says. "We wiped off the other tracks and kept Miles' horn part, then added to it. In some places we had to sample some stuff to fit it in. I think Miles would have liked it.

"I'm real happy people are gettin' into this record," he concludes. "Miles Davis *is* hip-hop, and maybe this will get people who like hip-hop to check out his other stuff." ■

—FROM PAGE 137, T BONE BURNETT

"I know what I want to hear in my music and when I [produce] others," Burnett says. "I use everything and I know when it's working or not working, but I don't know what any of it's called or how any of it does what it does. I'm interested in *poetry*, and all of that [equipment] is *logical*. Chesterton said, 'Logic is the natural enemy of poetry. The poet

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wants to get his head into the heavens, and the logician wants to get the heavens into his head."

Still, even this poet is excited about one relatively recent tech invention: "I think samplers are the best thing to happen in years," he says. "People are able to make up entire sound worlds that never even existed before, that don't even have any specific musical references. Some of the stuff I'm hearing in rap and hip-hop is just fantastic. They do some wild things with samplers; everything is a sort of a 'you can't do that' kind of thing. I listen to black radio all the time because the production is so interesting and inspiring. Hip-hop is a real producer's medium, and I'm really interested in getting into that area a little bit. In fact, I was thinking of calling myself TB-1," he says with a laugh. Indeed, he's even written a hip-hop song called "Beauty" and given it to Madonna, with whom he has a long friendship.

Though he is increasingly using an Akai S1100 sampler in his own production work with others—usually to create loops that serve as temporary spines for some songs—T Bone says there is still no substitute for using real musicians, and he decries the overuse of computers in music. "It's good for things to speed up and slow down and be out of tune," he notes. "Besides being conceptually correct, it's also emotionally true. People even try to program flaws into the music, but it's not the same. Once you program a flaw it's no longer a flaw; it's a program."

It is not surprising that through the years this highly literate, yet down-to-earth, soul has gravitated toward artists possessed of a similar integrity and forthrightness: he's produced three Los Lobos records; Peter Case's excellent solo debut; *King of America* and *Spike* for Elvis Costello; and albums by Bruce Cockburn (1991's powerful *Nothing But a Burning Light*), The BoDeans, Marshall Crenshaw and Sam Phillips (T Bone's wife of several years). Quite a group. More recently, he worked with an Australian singer named Wendy Matthews and a Berkeley band called Counting Crows, whom he says "had the best tape of songs I've ever gotten as a producer." (Counting Crows' album should be out on Geffen in the next few months.)

"I'm attracted to good songs and good singers and I don't want to distract too much from that," T Bone says. "The way records used to be made is you'd hire an arranger, the first thing you'd write down was the melody line, and then everything else would be voiced around the melody. We started going backward with multitrack recording. We'd put down a rhythm track and a hundred overdubs, get two 24-tracks filled in

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medium."**

**—T Bone Burnett**

with music and then try to stick the vocal in the middle of all this sound. Jerry Wexler called it 'track-happy.' For me, it's gotta start with the song and the vocal performance."

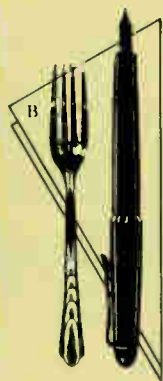
After making his own records for the first half of the '80s, then doing mainly production in the second half of that decade, T Bone is trying to wear both hats now and strike a balance between them. "You end up using a lot of your creativity working on other people's records," he says, "but I think I'm getting better at working at both and having one not detract from the other."

He readily acknowledges that he'll probably never be a chart-topper in either pursuit: "I couldn't tell you exactly what it is that makes most hit records successful. And I don't think I'm facile enough to sell out," he says with typical self-deprecating candor. "You have to be able to do something you don't mean, and I'm not good enough to do something I don't mean and have it sound like anything. The only reason what I do sounds like anything at all is because I mean it." ■

by Mr. Bonzai

# STEVE DOUGLAS

## SAX TO THE MAX



Steve Douglas has been a main man in music since the birth of rock in the '50s—and today he's still exploring the meaning of sax. In his long and winding career he's racked up solid credentials as sax and flute soloist, composer, producer, arranger and record company bigwig. He's worked with artists ranging from Elvis Presley to Bob Dylan and teamed up creatively with Phil Spector, Brian Wilson and Ry Cooder.

After catching a recent show at The Baked Potato in L.A., I can assure you that Douglas is definitely one of the coolest of cats. Along with his own band, he was joined by drum legend Hal Blaine for a set that spanned his recent Balinese-influenced tunes to "Harlem Nocturne," a pre-James Brown "Night Train" and a raucous-rockish medley of Wall of Sound-era sax excursions. The club got hot and sweaty. Blaine quipped, "Hey, would somebody throw another log on the air conditioner?"

As a teenager growing up in '50s L.A., Douglas backed artists such as Ritchie Valens, Don & Dewey and The Sharps (later The Rivingtons). Fresh out of Fairfax High, he joined Duane Eddy & The Rebels to cut sax on "Forty Miles of Bad Road," "Peter Gunn," "Yep!" and "Cannonball."

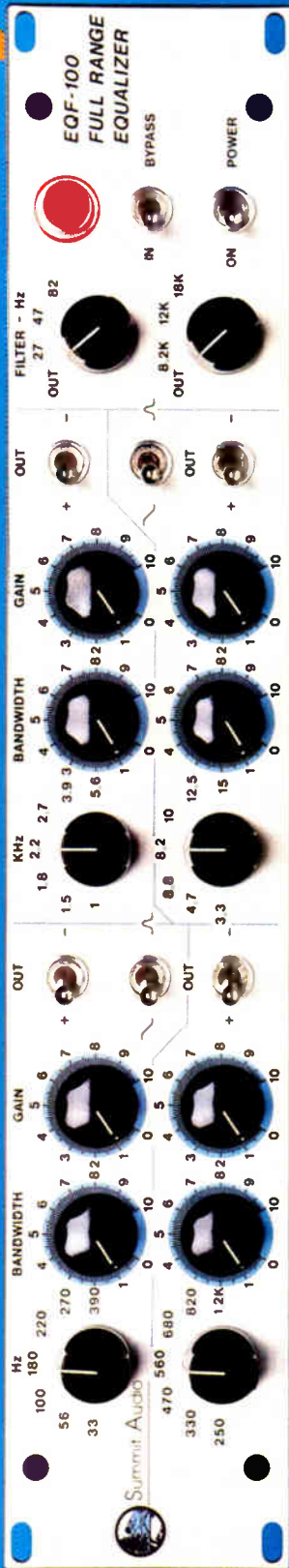
Word got around that Douglas was the sax for any session needing a horn of plenty. He was asked by Phil Spector to help put together a studio band, and The Wrecking Crew was born to run with such hits as "He's A Rebel," "Then He Kissed Me," "Be My Baby" and "(Today I Met) The Boy I'm Gonna Marry." Brian Wilson called on Douglas for Beach Boys hits from "Surfin' U.S.A."



to "Good Vibrations." Other artists Douglas has worked with include Jan & Dean, Dick Dale, The Ventures and Bob & Earl ("Harlem Shuffle").

With the King himself, Douglas was in the film band for *Girls Girls Girls* and recorded live on camera with Hal Blaine. In the studio with Elvis, they cut the double-sided hit "Viva Las Vegas"/"What'd I Say." Film work has continued through the years with *One Flew Over the Cuckoo's Nest*, *Fast Times at Ridge-*

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mont High, Top Gun, Gremlins and a string of critically acclaimed Ry Cooder-scored movies. He also played in Cooder's '80s band.

Douglas' latest album adventure is *Beyond Broadway*, a spicy blend of exotic instrumentation led by his unmistakable mastery of the saxophone.

**Bonzai:** Was it great to be playing with Hal Blaine again?

**Douglas:** Sure was, and the audiences were pretty enthusiastic. Our old Wrecking Crew member and owner of the club, Don Randi, asked us to come back anytime.

**Bonzai:** It's such a kick to hear

started. In fact, I quit being a musician a couple of times because I just never got off. People paid me a lot for what I did, but I was embarrassed by it all, to be quite honest. It wasn't until recently that I was able to listen back, like to some of my Duane Eddy albums, and say, "God, that's actually pretty good." But at the time, to my ear, it didn't sound good and it didn't feel good.

I was limited as a musician in those early days because it happened so quickly. I had a knack for playing a clever rock 'n' roll solo, and that took me a long, long way. But I didn't play flutes and other instruments, like I do now—I just wasn't a well-rounded musician. In just the last year, my playing has

**I had a knack  
for playing a clever  
rock 'n' roll solo, and that took me a  
long, long way. But I didn't play  
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way I play.**

those old riffs from the past. What was that Phil Spector showstopper?

**Douglas:** The sax solo from "Da Doo Ron Ron." It doesn't make sense to play the whole song, because it doesn't make a good instrumental. But the audience gets a taste, along with Hal's riffs from "Be My Baby" and all those hits we played on.

**Bonzai:** Do you think you're a better player now than back in the '60s?

**Douglas:** Oh, I know for a fact I am! I can't believe what has happened to my playing just in the past year. I feel like it's all come together. I've studied and observed talent in people—there are musicians who come to town at age 18 and they are full-blown monsters. Tom Scott was one; Plas Johnson was one. I don't think these people get any better—and that's not a put-down. They stay great, but here they are at 18 and they're monster players.

I was not like that. I couldn't stand the way I played when I first

gotten a lot more fluid, and now I like the way I play.

**Bonzai:** What is the true secret of the saxophone?

**Douglas:** Well, I got some really good training by playing along with old rhythm & blues records—trying to duplicate the nuances in the solos. I can name one record, "Honky Tonk" by Bill Dogget—Clifford Scott did the sax solos. If you could master everything he did, you'd be on your way. These are things you couldn't learn in school. I don't really know *how* I did it, but I know I wanted to imitate those great players. It stood me in good stead, and I have a video out now about how to play rock 'n' roll sax, with Hot Licks Productions, that sells pretty well each year. I talk about different embouchures and playing techniques.

**Bonzai:** What is the foreign touch in your new music?

**Douglas:** Well, I'm very attracted to Eastern music—Indian, Russian, Far

East. I found that I am able to do what I do, just play blues, around those backgrounds. On my new album, I brought in some Balinese music.

**Bonzai:** Let's leap back into your past again. Did you go to high school with Phil Spector?

**Douglas:** Yes, I was two years older than Phil. When I was in the 12th grade he was in the 10th grade.

**Bonzai:** Being a senior, did you look down on this lowly sophomore?

**Douglas:** No, I wasn't too involved with high school. I just wanted to get the hell out of there. I was as uninvolved with Fairfax High as Phil was. We were acquaintances and had a music and orchestra class together. I got to know him better after I graduated because I had a band and Phil was in it, and his sister was my manager. Phil did Lonnie Donegan songs, like "Rock Island Line."

It's interesting—back in those days one of the highest things you could aspire to was to get a band together and get on the Vegas-Reno-Tahoe circuit. Louis Prima and Keely Smith were there with some great acts, and that's where all the action was. Above that was superstardom, but this was where all the action was—in the lounges. Our hope was to get booked on that circuit. But Phil wasn't too involved with my band—he was always late and screwed up, and this and that.

**Bonzai:** What did he play?

**Douglas:** Guitar. He's a very fine guitar player, and a pretty good singer.

**Bonzai:** Later, he was the boss—was that cool?

**Douglas:** Oh yeah, sure. You see, Phil went back to New York and did all that work there. He would fly me in to play on his records. I never really thought about what a neat thing that was until recently. He could have called King Curtis, or any of those guys back East. He flew me to New York not because he was being a nice guy, but because he knew I could give him what he wanted.

So when he came back to Los Angeles, he called me to put a studio band together. I had been working with some fantastic musicians, like Hal Blaine, Leon Russell, Glen Campbell. I knew who to call, and this is the band that became known

as The Wall of Sound Band, or The Wrecking Crew. The first session we did was "He's A Rebel," and that went to Number One. Everybody started asking for the same crew. We worked with the Beach Boys, Jan & Dean—just about all the top bands.

**Bonzai:** And you had a band of your own called The Catalinas, with a record called "Bonzai Washout"?

**Douglas:** Oh, my god!

**Bonzai:** Was it a hit?

**Douglas:** No, not really, but I was working with Bobby Darin and he thought we should do a surfin'/hot rod record. It was one of a million we did like that. That one was actually one of the better ones, but there were a lot of crummy ones. [Laughs] I did so many of those records, and I didn't think a whole lot about the music. It was very boring to do it every day.

**Bonzai:** What about your historic work on "Peter Gunn" with Duane Eddy & the Rebels?

**Douglas:** Well, I'm proud of that one especially, because we were doing an album and I suggested we do "Peter Gunn." Duane said, "Well, gee, what am I gonna do?" I said, you just go: "Da, da-da, da da-da," and then I'll play. He begrudgingly did this and that record has been a hit twice. It did a lot of good things for his career and put some money in Henry Mancini's pocket, too. Great tune.


**Bonzai:** I bet most folks don't know that you produced some big records, "Theme From A Summer Place" for The Lettermen and "Danke Schoen" for Wayne Newton.

**Douglas:** Yes, at the time I was working for Bobby Darin and running his publishing company, TM Music. He had signed Wayne, and it was the Newton Brothers at the time. Then it was "Featuring Wayne Newton" and then it was just "Wayne Newton," in a matter of minutes, you know. When I went to work for Capitol Records, I was a staff producer and was assigned a bunch of artists. I inherited Glen Campbell, Jodie Miller, The Lettermen.

**Bonzai:** And then you bought a recording studio?

**Douglas:** Big mistake. I bought two, actually, and one worked out well. While I was head of A&R for Mercury Records on the West Coast, I

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# C O A S T

## L.A. GRAPEVINE

by Amy Ziffer

Producer/engineer Bruce Botnick's audio post-production studio, Digital Magnetics, was acquired recently by Pacific Ocean Post, a video post house in Santa Monica, and Botnick has become a partner in POP. The acquisition became official July 1, but Botnick said it had been in the works for years. "They excelled at video and we excelled at audio," he commented, "and the opportunity arose for us to pull it together, so we did." He observed that with digital being implemented so heavily in the video area, it seemed as though the two companies were moving along the same track and would benefit

—CONTINUED ON PAGE 148

## NASHVILLE SKYLINE

by Dan Daley

New Rooms, New Owners: Producer and Giant Records chief James Stroud and L.A.-based country music producer Richard Landis (Lorrie Morgan, Oak Ridge Boys) are jointly building a new studio in the UA Tower on Music Row. Loud Studios (a combination of Landis' and Stroud's names) is on the Tower's first floor, above three floors of parking garage, and it will have a single control room with four iso booths. The equipment, including an SSL console, is being brought in by Landis from Los Angeles. The design by Vincent Van Haaff is being implemented by local studio construction wiz Gary Backman.

Backman says that the office building location has its isolation problems, but they can be dealt with. "What I



**Stephanie Mills and producers Donald Lawrence (left) and Rodney Barber work at Reflection Sound (Charlotte, NC) with engineer Tracey Shroeder (background).**

have noticed in town lately is that people are moving away from the big-room concept, and they seem to want multiple spaces around a control room instead," he notes.

Producer Garth Fundis (Trisha Yearwood, Colin Raye, Keith Whitley) purchased Sound Emporium. According to studio manager Susan Dey, Fundis completed the purchase last June from original owner Roy Clark (yes, *that* Roy Clark), who's main business interest is his theater in Branson, Mo. The studio has been Fundis' base of operations for several years, beginning with his work with Don Williams.

Some physical and cosmetic changes are expected to go down this year, as well as some equipment updates, although they haven't yet been decided upon, according to

—CONTINUED ON PAGE 148



PHOTO: ED FREEMAN

**Saturn Sound (Burbank) with its 60-input Neve V3 console and dozens of keyboards and MIDI modules.**

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## SESSIONS & STUDIO NEWS

by Jeff Forlenza

### SOUTHERN CALIFORNIA

Recent sessions at North Hollywood's Devonshire Studios included Whitney Houston working with producer David Foster and engineers Mick Guzauski and Dave Reitzas on the soundtrack to the movie *Bodyguard*; Bel Biv DeVoe were in with engineer Warren Woods mixing their latest for MCA; and Motley Crüe tracked and overdubbed with engineer Bill Kennedy for Elektra Entertainment... At Hollywood Sound Recorders, producer Rick Rubin was in mixing *Digital Orgasm* for a Def American release with engineer Martin Schmelze; and Black Crowes producer George Drakoulias was working with Jesus and Mary Chain... Capitol Records artists School of Fish were at Scream Studios (Studio City) mixing their latest project with producer Matt Wallace and engineer Tony Phillips... Blue-eyed soulstress Taylor Dayne cut tracks with producer Humberto Gatica for an Arista Records release at Trax Recording in Hollywood... At Saturn Sound Studios in Burbank, producer Julian Raymond and engineer Jeff Lord-Alge were re-mixing Freddie Mercury tracks for Hollywood Records... At Clearlake Audio in North Hollywood, The Mystrals tracked and mixed their second album with producer Guy Marshall and engineers Brian Levi and Colin Mitchell...

### NORTHEAST

The Phil Woods Quintet worked with producer Bill Goodwin and engineer Kent Heckman at Red Rock Recording in Saylorsburg, PA... Imago recording artists What's Up? recorded basic tracks and overdubs at White Crow Audio in Burlington, VT, with producer Bernard Edwards and engineer Dave O'Donnel... Ruffhouse recording artist

Black Butterfly was at Studio 4 (Philadelphia) cutting tracks with producers Tony Dofat and DJ Clash for her upcoming debut; Craig Caruth and Manuel Lecuona worked the board... Top Choice Clique was at One World Recording (Boston) recording their debut for A&M Records. Nuno Bettencourt co-produced with bandmember MC Force, while Bob St. John engineered with Carl Nappa assisting... German vocalist Doro Pesch completed her latest album at Ocean Recording Studios in Ocean Gate, NJ...

### NORTHWEST

At Dance Home Sound in Emeryville, CA, Greg Douglass tracked and produced his new CD with special guests Peter Rowan, Nick Gravenites and Steve Douglass. Lisa Richmond engineered and co-produced the project...

### SOUTHEAST

MCA recording artist Stephanie Mills was at Reflection Sound Studios in Charlotte, NC, to cut basic tracks for two songs for an upcoming release. The songs were produced by Donald Lawrence and Rodney Barber.

—CONTINUED ON PAGE 148

## N.Y. METRO REPORT

by Dan Daley

New York City, for those of you who don't live here, is made up of five boroughs. For those of you who do live here, New York City is made up of five boroughs. It's necessary to remind residents of that fact every so often, myself included, since only one of the five—namely, Manhattan—usually gets the attention.

Queens is thought of as that place you pass through to get to the airports; Brooklyn and the Bronx are associated with deceased baseball teams (the Dodgers and the Yankees, respectively, although the Mets'

—CONTINUED ON PAGE 149

**L7's Suzi Gardner (left) and Frank Phobia sing background vocals for Anthrophobia's "Candy Coated Voodoo" at Sigma Sound Studios (Philadelphia) with producer David Ivory (right).**

PHOTO: VINCE KERSHNER



—FROM PAGE 116, L.A. GRAPEVINE

from a closer relationship.

Ten thousand square feet of space in an adjacent building was acquired for five new rooms that will be coming online in January if everything goes as scheduled. Major equipment for those rooms is still under review, but a Synclavier Post Pro and Sonic Solutions hard disk editing system are already in place.

Botnick brought many Digital Magnetics staff members with him, including senior mixer/editor Ted Hall, Sonic Solutions system operator Bruce Baliester (whose father owns Group IV) and technical director Tim McCollm (who was formerly with Soundworks West). Also joining the staff is Tim Claman, a former in-house Synclavier operator for NED.

In other staffing news, Jane Scobie has joined Stephen Bray's Saturn Sound as studio manager. Scobie was hired to help develop outside bookings for the two-year-old facility in Burbank, which only recently opened its doors to outside clients. Scobie is originally from England, and in her 18 years of experience she has worked in recording studio PR and management, and as a music consultant, coordinating the production of the ProSample sound library.

UCLA Extension will be welcoming the new year with a series of great courses on various aspects of audio production. "Post-production Sound for Producers, Directors and Editors" will be taught by Victoria Sampson, a motion picture sound editor whose credits include *Romancing the Stone*, *Prince of Tides* and *Return of the Jedi*. This class will define the sound editor's contribution to projects with a visual aspect and is primarily for film and video people wanting to have a better understanding of the audio end.

"Console Automation Systems" will be taught by Guy DeFazio, an independent recording engineer, journalist and technical consultant formerly with Lion Share Studios. Students will be introduced to the fundamental elements of console automation systems, and speakers from GML, SSL and Neve will discuss the specific features of their systems.

Third and last is "Staying in Sync: The Techniques and Methods for Putting Music, Audio, Film and Video Together," a class designed for those involved in audio, film and video work who want to understand the coordination of musicians, tape, MIDI sequencers and electronic musical instruments

at all stages of audio production.

Classes are generally one night a week, from 7-10 p.m. on the UCLA campus in Westwood. They range from six to 12 weeks in length. For registration information, call UCLA Extension, Department of Entertainment Studies and Performing Arts, at (310) 825-9064.

Follow-up to last month: The new Studio III at Record Plant will be outfitted with a 96-input Neve VRP Legend console with GML moving fader automation. George Augspurger has been contracted to design the main monitors for both rooms and work with studio bawtion in designing the live recording spaces.

According to the studio's press release, Ron Lagerlof, former VP of technical operations at Lucasfilm's Skywalker North facility (and more recently a consultant to Ground Control), is overseeing the installation of video layback and projection facilities in the two new rooms. Clearly, Record Plant intends to expand its client base in the film and video arena.

The International Teleproductions Society is having a Christmas luncheon, incorporating a bazaar and live auction with proceeds going to the ITS Christmas fund to benefit several Los Angeles charities. For more information, call the president of ITS at (818) 956-7912.

In closing, a reminder to everyone that the winter NAMM convention is scheduled for January 15-18 at the Anaheim Convention Center. For registration information, call NAMM at (619) 438-8001.

Send L.A. studio news to Amy Ziffer, c/o *Mix*, 1999 Avenue of the Stars, Suite 500, Century City, CA 90067; or call (310) 551-4035; fax (310) 556-3855. ■

—FROM PAGE 116, NASHVILLE SKYLINE

Dey. Sound Emporium will continue to rent time to outside clients.

Carl Tatz at Recording Arts has designed and developed a new product: Comp-Eze is a 10-channel, track-compilation device intended for real-time control of track comping. The system, which Tatz says uses the best op amps he could find, was inspired by a request from producer Emory Gordy, who wanted something for comping that was simpler to use than console automation. Since Tatz developed it, Comp-Eze has been used by most of the producers working in his studio, including Scott Hendricks and Tom

Schuyler. The two-piece, automating unit is divided between the main system at the patch bay and a remote unit with ten LED controls. Tatz is considering bringing the system to market next year.

Next installment: Demo Kings of Nashville. ■

—FROM PAGE 147, SESSIONS & STUDIO NEWS

Tracey Shroeder engineered the project with programming by Mike Lawler and David Harris...A&M rockers Extreme mixed their new album, *3 Sides To Every Story*, at New River Studios (Ft. Lauderdale, FL) with producer Nuno Bettencourt, and Bob St. John engineered with assistance from Jim Thomas...Atlanta rockers Insane Jane were at Ardent Studios in Memphis working with veteran producer Warren Bruleigh (Violent Femmes, Phranc, Throwing Muses) on a project for Sky Records...

#### NORTH CENTRAL

Aretha Franklin was at Studio A (Dearborn Heights, MI) cutting rhythm tracks for a song to appear in Spike Lee's *Malcolm X*. Arif Mardin produced the Qwest Records sessions with the help of engineers Michael O'Reilly, Randy Poole and assistant Ed Marx...

#### SOUTHWEST

Independent record label Code of The West recorded, mixed and digitally assembled a 17-song project entitled *Texas Gold* at Longhorn Sound Studio in Baird, TX...

#### STUDIO NEWS

New York-based rental company Steerpike, owned by Sting, purchased the first fully transportable 48-track digital studio. The Solid State Logic Portable Studio is a complete studio based around a 64-channel SL 4000 G Series console that breaks into three sections and folds up into flight cases. Other flight cases contain the patch bay, G Series computer, power supply, Sony 3348 digital multitrack and outboard equipment. All of the units are linked by multipin connectors for rapid assembly and packing. Sting is currently using the Portable Studio at his home in Wiltshire, England, to develop tracks for his follow-up album to *Soul Cages*...Formerly known as Charico Studios, Hurricane Pass Studios opened in Clearwater, FL. Roger K. Hughes, recently with Criteria Studios, is general manager and senior



engineer of the expanded three-room complex. The new studio phone number is (813) 784-5000...**Sound Arts Recording Studio** in Houston, TX, relocated to a new, enlarged facility in the Spring Memorial area. The new address is 8377 Westview Dr., Houston, TX 77055; (713) 464-4653.

Send nationwide sessions and studio news to sessions editor Jeff Forlenza, c/o *Mix*, 6400 Hollis St. #12, Emeryville, CA 94608. ■

—FROM PAGE 147, N.Y. METRO

performance this year puts Queens in the running, too); Staten Island is associated with a long-standing, but as of yet unrealized, desire to secede and become part of New Jersey (it's true). But there are studios there. They are not Power Station or Hit Factory, but from small things, baby, big things one day come (tip of the hat to Nick Lowe).

At Laughing Dog Productions on Staten Island, owner Bill Donnelly runs a Tascam MS-16 through an Aries 24-input console; Sound Tools handles the DAT editing. He has four self-designed iso rooms around a central control room where he records a combination of rap, rock and jingles, picking up overflow from Manhattan, Jersey and other areas. The location is sometimes a handicap, he acknowledges. "A lot of jingle singers and some rock bands don't want to travel from Manhattan." But that's countered by what he calls a much lower overhead and a more relaxed atmosphere. And better parking. "If I had the choice, I'd stay right where I am," he crows.

Grampa Studios in Brooklyn's Boerem Hill section is a 16-track all-Tascam operation run by Mick Cantarella, a.k.a. "Skip Rubber." He's there because that's where he grew up. "And it's where my friends are," he adds. "Some people have a Brooklynphobia, but there's also a lot of clients who come from pretty far away to use the studio. Being in Brooklyn isn't a big problem. I like it because it's mellower and slower-paced. Manhattan is always very intense and in-your-face."

Queens probably has the most ethnic diversity of all New York's boroughs, and that's a plus when it comes to food choices, explains Cary Dean Hart, manager of Power Play Studios in Long Island City. As large as most Manhattan facilities—with three rooms, four Sony APR 24-track decks, two SSL consoles and one MCI 636 deck—

Power Play has made its reputation as one of the city's first and better rap rooms. Rap still plays a big part of bookings, as do alternative rock and remixes.

As far as location goes, Hart feels L.I.C. is perfect, right next to the Midtown Tunnel and the 59th Street Bridge into Manhattan but with none of the overhead, crowding, parking problems and general weirdness of Manhattan. It's also close to the Kaufman and Silvercup film stages, closer to the airports than Midtown and has more opportunities for short-term apartment rentals for extended projects. Disadvantages are mostly perceptual. "People

don't think it's as convenient as Midtown," Hart comments. "But I wouldn't move from this location if I was given the opportunity."

Up in the Bronx, Nomad Studios recently reopened after undergoing a renovation. The 24-track Studer/Soundcraft studio covers a lot of musical bases, according to owner/manager Annette Rapp. She cites conveniences like better parking, which favor the Bronx.

Overall, the studios of the boroughs don't seem to be gripped by Manhattan-envy. Woody Allen might have a problem outside of Manhattan, but more than a few studios don't. ■



**Murray Allen (left) and Don Lucki Jr. at Chicago Recording Company mixing Lucki's *Emotional Sunglasses* for Chance Records.**

## SESSION SPOTLIGHT

Chance Records is a new label out of Chicago dedicated to capturing jazz and new age music with a focus on using the latest digital recording techniques and the talents of Chicago musicians. Don Lucki Jr. started the label with the intention of mixing live musicians along with sequenced (or virtual) tracks, and he now reports that noted engineer Murray Allen has agreed to engineer all future Chance projects.

The debut Chance release is *Emotional Sunglasses* from Lucki, which was recorded on Chicago Recording Company's MCI 500 48-

channel board in Studio 4. One of Allen's secrets for warming up the virtual tracks was to play them through Yamaha NS-10s into a closed room with a piano that had its cover open and pedals down to allow for sympathetic resonance. Then those ambient room vibrations were mixed back through the board along with the virtual tracks. The jazz/new age tracks were engineered live-to-DAT, with another DAT running as a safety. Assistant engineer for the sessions was John Armstrong.

Next up for Chance are The Rob Martucci Group and Wild Pitch, with two contemporary jazz releases due out by the end of the year. ■

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—FROM PAGE 145, STEVE DOUGLAS

was partners with independent producer Snuffy Garrett. It was tough to find a studio because the town was booming, so we bought this studio called Amigo. We got our acts in there to record and then I decided I wanted my own place, so Snuffy bought me out and I got this other place that later became Richard Perry's studio, Studio 55. It used to be called Nashville West, and was the original Decca Studios built around 1930. A wonderful room, but I lost my ass on that place.

**Bonzai:** It seems that these days a few folks are losing their butts in the studio business. Do you have any advice?

**Douglas:** I have no advice, really. I have a little home studio now like so many other people do these days. The quality of semipro goods has gotten so high that you can't tell the difference. The line has become blurred between professional gear and the semipro lines. There will always be a few recording studios, but there is so much you can do at home now, with so little outlay of money. It's a rough business, and you have to be flexible. If you can rent it out for rehearsals, do so. That's not much advice, but I just don't see how many people can make money in the studio business.

**Bonzai:** What are the essential qualities of a good engineer?

**Douglas:** As a producer, I like someone who can help me develop my ideas and is not closed off to trying new things. And I can't work with an engineer that won't let me touch a knob now and then. As a musician, I like somebody who knows microphones and doesn't have to hunt around to get a sound.

**Bonzai:** What type of mic do you jam into your saxophone onstage?

**Douglas:** That's an AKG wireless setup that is fairly new and really works well. I just started using a wireless over the last six months and it sure is fun. It gives me control over my volume. Pity the poor saxophone players, because we are always at the mercy of the house mixer. Now I feed them the sound I want and can crank it up if I want.

—CONTINUED ON PAGE 176

# TAPE AND DISC

## MASTERING, PRESSING, TAPE DUPLICATION AND COMPACT DISC FACILITIES

Information in the following directory section is based on listing applications mailed earlier this year and was supplied by those facilities listed. *Mix* claims no responsibility for the accuracy of this information. Personnel, equipment, locations and rates may change, so please verify critical information with the companies directly.



Tony Dawsey's room at Masterdisk Corporation (New York City) features a Neumann mastering console, a Sony DAE 3000 digital editor, KRK monitors and Hartley/Altec/Masterdisk three-way listening system. Tony Bongiovi and Doug Levine designed the studio with architect Tuller McNeallus. Recent mastering projects in the room include Kris Kross, DAS EFX, EPMD and Swing Out Sister. **Photo:** Tim Wilkes.

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#### Upcoming Directory Deadlines:

Northwest Studios: **December 8, 1992**

Video Production & Post-Production Facilities: **January 8, 1993**

Northeast Studios: **February 8, 1993**

*Mix* listings procedure: Every month, *Mix* mails listing applications to recording studios and/or other vital facilities and services for the recording, sound and video production industries. There is a nominal charge to list a Boldface Listing (name, address, contact and descriptive icons) and an Extended Listing (equipment and services and photo or logo). If you would like to be listed in a *Mix* Directory, write or call the *Mix* Directories Department, 6400 Hollis St., #12, Emeryville, CA 94608; toll free (800) 344-HIST (344-5478).

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- A02  8-16 Tracks
- A03  24 + Tracks
- A04  Digital Recording
- A05  Remote Truck
- A06  MIDI/Music Production

**SOUND REINFORCEMENT**

- B08  Sound Reinforcement

**VIDEO/FILM**

- C10  Production Company
- C11  Post-Production Company
- C12  Remote Truck
- C13  Multi-Image Production
- C14  Videotape Duplication

**EQUIPMENT MANUFACTURING**

- D17  Audio
- D18  Music
- D19  Video

**DUPLICATION/DISC MFG.**

- E20  CD Manufacturing
- E21  Tape Duplication
- E22  Mastering Only
- E23  Other (please specify)

**ACOUSTICS/DESIGN CONSULTANT**

- F26  Acoustics/Design Consultant

**SOUND/VIDEO CONTRACTOR**

- F27  Sound/Video Contractor

**BROADCAST PRODUCTION**

- G30  Radio Station
- G31  TV Station
- G32  Other (please specify)

**MEDIA**

- H35  Ad Agency/PR Firm
- H36  Magazines/Newspapers/Books

**RECORD COMPANY**

- J39  Record Company

**INDEPENDENTS**

- K42  Audio Producer
- K43  Audio Engineer/Technician
- K44  Video Producer/Director
- K45  Video Editor/Technician

**EDUCATIONAL/INSTITUTIONAL**

- L47  Corporate Facility
- L48  Music/Recording/School/Program
- L49  Trade Association
- L50  Government

**RETAIL/RENTAL/MFRS.REP**

- M51  Audio/Music
- M52  Video/Film
- M53  Rep/Sales

**MUSICIAN/ARTIST/COMPOSER**

- N55  Musician/Artist/Composer

**INDUSTRY-RELATED**

- N56  Artist Management/Booking
- N57  Music Publisher
- N58  Student
- N59  Other (please specify)

**3. Please check ONE category that best describes your JOB TITLE:**

- A.  Corporate Management- President, owner, other manager, etc.
- B.  Technical & Engineering- Engineer, editor, design engineer, etc.
- C.  Production & Direction- Producer, director, etc.
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- A02  8-16 Tracks
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5455 Buford Hwy., 8ld. A. Ste. 209 A; Atlanta, GA 30340; (404) 451-0532. Contact: Ross McCort.

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7021 Woodland Dr.; Springfield, VA 22151; (703) 642-9035; FAX: (703) 658-2070. Contact: David Glasser. **Equipment and Services:** Digital editing and CD mastering on a Sonic Solutions system. CD re-sets on a Sonic Solutions CD Printer. Meyer HD-1 monitoring. Signal processing from API, Lexicon, Apogee, Calrec, etc. Sony 1630, Sony APR-5003 (1/4" & 1/2"), Dolby SR/A, Sony PCM-601, Panasonic DATs, Sound Tools. Airshow is pleased to provide CD mastering services to Sugar Hill, Rounder, Positive Music, Folkways, and Rebel Records. Recent projects include Dead Milkmen (Hollywood), Basehead (Imago), Jerry Douglas, Red Clay Ramblers, Bill Kirchen, Mike Seeger, Michael Faith, Ralph Stanley, Doc Watson, Sweet Honey in the Rock, Ranch Romance, Tim O'Brien, Peter Rowan, Beausoleil (Rhino), Classic Jazz From Lincoln Center, USAF Airmen of Note. Full CD production services available. Please call David Glasser or Ann Blonston to discuss your mastering and editing requirements.

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1400 NW 65 Ave.; Plantation, FL 33313; (305) 587-6011; FAX: (305) 587-7039. Contact: Dick Smith, Barbara Smith.

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1857 Colonial Village Ln.; Lancaster, PA 17601; (717) 392-7840; (800) 525-6575; FAX: (717) 392-7897. Contact: Jim Boyer, VP. Marc Feingold, dir. of sales & mktg. **Equipment and Services:** Full-service CD manufacturing facility located in Lancaster, PA, specializing in production runs of 500 to 50,000 units. Helix is a self-contained, fully automated CO-replication plant. Complete premastering, packaging and printing services offered. Five-color, screen printing PictureDiscs™ and gold-tone metallization available.

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### AMERICAN MULTIMEDIA INC.



2609 Tucker St.; Burlington, NC 27215; (919) 229-5554; FAX: (919) 228-1409. Contact: Tim Mallard. **Equipment and Services:**

Mastering console: Neve 8108. Tape machines: Otari, Studer. Noise reduction: Dolby A, B, C, and SR, S Dolby. Monitor speakers: UREI, JBL, Meyer. Digital editing systems: Sony 1610 & 1630, JVC BP-90, Nakamichi, DMP-100, Sony 1630. Signal processing: dbx, Dolby A, B, C and SR capabilities. Aphex, Lexicon. Engineers: Richard Clark, Howard Hoyt. Method of duplication: D.A.A.D., bin-loop, digital bin. Duplicator: Otari, Ami-modified Electro Sound slaves, Gauss. Duplication speed: 64:1, 80:1. Capacity: 50 million annually. Tape Used: by customer request. Shell used: by customer request. Loading Equipment: 36 Concepts Design modifications. Packaging equipment/fulfillment services: Apex printing, Ilseman labelers, Scandia wrappers, Sentinel blistering, F-20, HS-3 and A-22 Shanklin, CST Pad printer and Kbar thermo-forming blister packaging. Compact disc: services and prices: 4-color process, 5-color booklet and inlay card printing. Other. Subsidiary Amergraphics specializes in audio cassette J-card and label printing. Full-service 4- and 5-color services for audio, video and CD. We are a fulfillment, distribution and contract packaging facility that offers 2 day service to 75% of the U.S. population. New facility opened September 1, 1992 with over 100,000 additional square feet.

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### ANALOGUE INDUSTRIES



217 S. Union St.; Burlington, VT 05401; (800) 777-1927; FAX: (802) 863-1234. Contact: Rick Dexter. **Equipment and Services:** Method of duplication: in-cassette. Duplicator: KABA 20 positions, Wollensak 16X. Duplication speed: real time, 2 times and 16 times. Capacity: 12,500 per week. Tape used: BASF. Shell used: Shape. Loading equipment: King. Packaging equipment/fulfillment services: Shrinkwrap. Other: on-cassette printing, insert design and printing, custom-length blank cassettes. Personalized service and fast turnaround for short or long runs. Very competitive for larger orders.

### ARCH AUDIO



PO Box 1011; Athens, GA 30603; (706) 543-6170; FAX: (706) 543-6170. Contact: James J. Quinn.

### AUDIO CRAFT



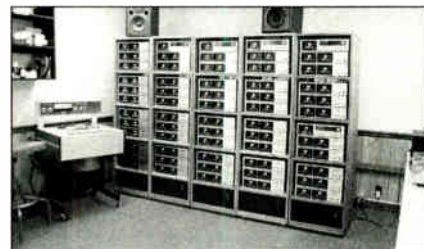
2701 E. Sunrise Blvd. #404; Ft. Lauderdale, FL 33304; (305) 563-0553; FAX: (305) 563-6084. Contact: Lonny Kelem, Cathy Cotter. **Equipment and Services:** Audio Craft is a full mastering and duplication facility specializing in superior real-time duplication using state-of-the-art Studer/Revox B215s cassette decks. We also offer

in-cassette high speed duplication on modified Telexes with duplication speed of 16:1. We accept any formatted master tape: DAT, 2-track 1/4", 2-track 1/2", 1/4-track or 1/2-track, VHS digital, VHS Hi-Fi or cassette. All cassettes are custom loaded and individually checked. We offer a complete professional package including printed cassettes, J-cards & shrinkwrap. Tape machines: Sony/MCI 2-track, Otari 2-track, Sony DAT 2500, Sony DAT 500ES and JVC 3700. Signal processing: Dolby A, dbx, Lexicon, UREI, Symetrix EXR. Monitor speakers: Electro-Voice Sentry 100A. Shells used: Magnetic Media, Lenco. Tape used: BASF Chrome & AGFA. Loading equipment: King/Concept Design. Other services: video duplication. Rates: on request. Chief Engineer: Bruce Marcho. Engineers: Mike Novack, Lonny Kelem, Paul Kurzweil.

### BIG OAK DUPLICATION



108 Midtown Ct., Ste. 206; Hendersonville, TN 37075; (615) 822-0088; FAX: (615) 264-1789. Contact: Tim Chesney. **Equipment and Services:** Magnafax 1/2" bin-loop duplicators, Concept Design CD-9000 loaders, Apex direct-to-shell printing. We specialize in short run orders offering 3-5 day turnaround time. No order too large or small!! Utilizing only the best in materials, such as BASF LHD, BASF Ferric Cobalt, the new BASF Cobalt Chrome tape and Lenco shells, our tapes are sonically as close to the master as you can get. Our in-house art dept. offers the very best in graphic design, artwork and layout. From inception, to final film, to printed finished product, we are a one stop facility for all your manufacturing and replication needs. We also offer real-time video duplication with minimums as low as 20 pieces, and some of the best prices in CD replication with minimums of only 500 pieces. Call (615) 822-0088 for samples and information.



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CASSETTE EXPRESS  
Nashville, TN

### CASSETTE EXPRESS



116 17th Ave. S.; Nashville, TN 37203; (615) 244-5667; FAX: (615) 242-2472. Contact: Dale Petersohn, Bob Hernandez. **Equipment and Services:** Mastering—mastering consoles: Sphere Eclipse C w/automation, Trident 75. Tape machines: Studer A-810, A-80 (1/4" or 1/2") and B-67. Sony PCM-2500 DAT, Panasonic SV-3500 DAT, Nakamichi F-1 w/VHS or Beta. Noise Reduction: Dolby SR/A, dbx. Other outboard equipment: Valley DSP de-esser/dbx comp/limiter, Teltronix, UREI and Summit Audio leveling amps, Aphex Type B Aural exciter, API parametric EQ (discrete), Sontec parametric EQ, Goldline RTA-30, Klark-Teknik DN360 graphic EQ, plus a host of peripheral equipment. Monitor amplifiers: McIntosh MC-250 & MC 2100, Yamaha P2050 and Studer A-68. Monitor speakers: Westlake TM1, Meyer HD-1, B&W DM100, EV Sentry and Yamaha NS-10M systems. Digital workstations: Synclavier, Macintosh II w/Performer software. Tape Duplication—method of duplication: In-cassette. Duplicator: 110 KABA duplicator slaves. Duplication speed: 1:1, 2:1. Capacity: 1 million annually. Tape Used: by customer request. Shell used: by customer request. Loading equipment: AEG Kronos 4. Other: other services include label printing, imprinting and inserts. CD processing and fulfillment services. Rates supplied upon request.



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- CD premastering/editing
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Cassette Productions Unlimited

CASSETTE PRODUCTIONS UNLIMITED  
Arden, NC

### CASSETTE PRODUCTIONS UNLIMITED

6 Commerce Way; Arden, NC 28704; (800) 545-3828. Contact: Jeff Baker, president. Equipment and Services: Mastering—tape machines: Studer, Otari, Sony PCM-2500, Panasonic SV-3700. Noise reduction: Dolby A, SR, B dbx, Dynaflex single-ended. Monitor speaker: JBL. Digital editing system: Digidesign So.Jnd Tools. Signal processing: dbx compressor, de-esser Klark-Teknik para EQ, Rane graphic EQ. Tape duplication—Method of duplication: bin-loop. Dupli-cator: Electro-Sound 8000. Duplicating speed: 64:1. Capacity: 100,000/day (C-40). Tape used: by customer request. Shell used: 5-screw, sonic, all colors. Loading equipment: King 790. Packaging equipment/fulfillment services: Proprietary Audio Book packager, all standard packaging and shrinkwrapping configurations. Rates: very competitive. Other: Audio producer(s), design, typesetting, printing, custom packaging, product assembly, video duplication, warehousing, fulfillment. A complete audio/video service. Established in 1978 with a reputation for on-time delivery of over 45 million cassettes.

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200 N. Edison; Tampa, FL 33606; (813) 254-6426; FAX: (813) 251-6286. Contact: Tim Crockett.

### CROWN MAGNETICS INC.

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### THE CUTTING EDGE

PO Box 217; Ferndale, NY 12734; (914) 292-5965; FAX: (914) 292-2313. Contact: Paul Gerry.

### BARRY DIAMENT AUDIO

2728 Henry Hudson Pkwy.; New York, NY 10463; (212) 543-2079. Contact: Barry Diament, Mary Antonelli, Allen Genauer. Equipment and Services: Mission: to improve the sound quality of music recordings. Add the knowledge of a musician to the skills and techniques acquired in over 20 years in audio. Add honesty, integrity and concern for your project. Only one company adds up... Barry Diament Audio BDA. Your sound alternative. BDA credits include: AC/DC, Arditti String Quartet, Anita Baker, Cars, Phil Collins, Jim Croce, Crosby, Stills & Nash, Cult, Danzig, Divinyls, Eagles, Enya, Kevin Eubanks, Steve Forbert, Genesis, Guns N' Roses, Ahmad Jamal, Kitaro, Eartha Kitt, Led Zeppelin, Alvin Lee, Bob Marley, Modern English, Anthony Newman, Stevie Nicks, Robert Palmer, Robert Plant, Linda Ronstadt, Simply Red, Subdudes, Tesla, Pete Townshend, U2, Yes, Warren Zevon.

### DIGITAL DOMAIN™

309 E. 90 St.; New York, NY 10128; (212) 369-2932; FAX: (212) 427-6892. Contact: Bob Katz. Equipment and Services: Mastering: Every piece of hardware and software at Digital Domain™ has been modified for improved sonics. Our console and custom 20-bit 128x

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### DISC MAKERS

1650 Broadway, Ste. 1010; New York, NY 10019; (212) 265-7505; FAX: (212) 262-0798. Contact: Howard Roseff.

### DISC MASTERING INC.

30 Music Square West; Nashville, TN 37066; (615) 254-8825; FAX: (615) 254-8826. Contact: Chad.

### DUPLICATION SPECIALISTS INC.

4584 Austin Blvd.; Island Park, NY 11558; (516) 432-7107; FAX: (516) 432-7091. Contact: David Schwartz, pres.; Randy Finnerty, gen. mgr.

SEE PAGE 153 FOR AN EXPLANATION OF THE STUDIO SERVICE ICONS. FOR MORE INFO ABOUT MIX LISTINGS SEE PAGE 151.



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75 Varick St.; New York, NY 10013; (212) 226-4401; FAX: (212) 966-0456. Contact: Jeremy Guttenberg, Jim Shelton. Equipment and Services: Full service mastering (using Neve DTC), CD manufacturing, cassette duplicator and LP manufacturer. CD services include: CD premastering, replication, packaging, graphic design and printing. Tape duplication is bin-loop system using the Lyrec Duplicator. Tape used in manufacturing is BASF, Agfa or Sunkyong. Loading equipment is Aeg Tachos-90. Cassette insert printing and design also available. Record manufacturing process uses Toolex-Alfa and Hamilton fully-automatic presses with capacity of 3 million per year. For complete information write, call or fax for a brochure. Other services offered include CD, cassette and LP jacket printing and design.



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(813) 572-6214. Contact: Joseph A. DeMaso, national sales mgr. Equipment and Services: Eva-Tone is a major independent cassette duplicator, printer and packaging service. Duplication is by state-of-the-art Duplitrronics digital bins thru Gauss 2400 slaves. This is a full service facility with automated packaging for all retail music styles, and specially packaging for audio book children's book/cassette products in-house. Eva-Tone has in-plant process color printing for inserts and diecut packaging and has equipment for clear plastic RF sealed packaging and sonic welding. Eva-Tone automatically inserts cassettes into envelopes and has complete lettershop services for direct mailers. Eva-Tone is the largest manufacturer of Soundsheets which are phonograph recordings pressed in thin flexible vinyl, and offers both CD and VHS video duplication and packaging for retail sale and direct marketing applications.



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215 W. 91st St.; New York, NY 10024; (212) 877-0973; FAX: (212) 877-8305. Contact: Allan Tucker.

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1697 Broadway #1404; New York, NY 10019; (212) 582-5473; FAX: (212) 245-2309. Contact: Jimmy Lee (studio mgr.), Carol Steele (operations mgr.). Equipment and Services: Frankford/Wayne Mastering Labs, Inc. is fully equipped with state-of-the-art equipment for mastering to CD, vinyl or cassette from any analog or digital source while providing prompt, friendly and professional service and quality. We have five multi-purpose mastering suites that feature superb equipment including Sony DAE-3000 editors; Harmonia-Mundi, Sony, Sontec, Massenburg, ITI, UREI and Valley signal processing; JBL, Quedest, Yamaha and B&W monitoring system; digital PCM-1630 and DAT recorders by Sony and Panasonic; all Dolby, dbx and Burwen noise reduction; Yamaha PDS one-up CD recording system; three SAL-74B mastering lathes by Neumann with CompuDisks. Owner/chief engineer Tom Steele and engineers Carlton Batts, Michael Sarsfield, Rick Essig and Greg Vaughn are available to provide creative guidance and technical expertise in a friendly and comfortable environment. With credits too numerous to mention, hundreds of gold and platinum records attest to Frankford/Wayne's commitment to the recording industry for over 27 years.

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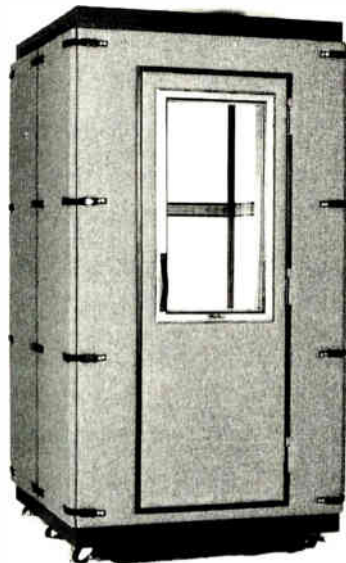
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FULLERSOUND INC.  
 Miami, FL

### FULLERSOUND INC.



1755 NE 149th St., Miami, FL 33181; (305) 945-6697; FAX: (305) 949-4864. Contact: Margie Curry/Michael Fuller. Equipment and Services: Consoles: Neve DTC, Cybersonics custom MC2003E. Tape machines: Sony 1630/DMR-4000, PCM-2500 DATS, PCM-601, Mitsubishi X-80. Noise reductions: Dolby SR, A, dbx. Speakers: UREI 813A, Yamaha NS-1000. CD recording: Gotham/Yamaha PDS-CDR90. Lathes: Scully LS-76, Ortofon DSS-821. Signal processing: Neve DTC, Sontec MES-430B-DRC-400, Ortofon CPS-741, STL-852. Digital editing: Sonic Solutions available on request. Cassette duplication: 10 Denon DRM-710. Engineers: Michael Fuller, Rod Fuller. Rate card available on request. Comments: Michael Fuller has been serving the recording industry for 17 years and opened Fullersound in 1986. Through the years Michael has achieved numerous gold and platinum awards. Nominated twice for the Mix TEC awards. Fullersound has always maintained the highest possible level of mastering and state-of-the-art technology. We at Fullersound pride ourselves on our personal commitment to our clients and high quality of workmanship.

### HUMMINGBIRD RECORDINGS



210 Ring Ave. NE #101; Palm Bay, FL 32905; (407) 676-9722; FAX: (407) 676-9002. Contact: John Foley.

### IAN COMMUNICATIONS GROUP INC.



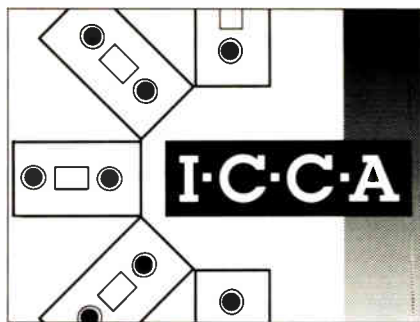
13 Ray Ave., Burlington, MA 01803; (617) 229-7500; FAX: (617) 229-5777. Contact: Richard B. Berberian. Equipment and Services: IAN Communication Group Inc. is the largest audio/video tape duplicator in New England. In-house operations include cassette and open reel audio duplication; video duplication in any quantity and international standard, and complete facilities for commercial printing of labels, J-cards, VHS sleeves and manuals; packaging, warehousing and fulfillment. Mastering: Otari MTR-101LX, Ampex ATR-102, Sony 1630, DAT, Dolby SR, Dolby B, Dolby HX-Pro. Audio duplication: Otari DP-7000 and DP-85 systems with Dolby HX-Pro. Electrosonic 6000 systems. Loading: AVA-2001 and Concept Design CD-9000. Video duplication: 1", Beta-SP, 3/4" U-matic, VHS, S-VHS, 8MM and Hi-8 in NTSC/PAL/SECAM standards. Four-field broadcast standards conversion. Packaging: Roldex direct imprint Ilseman boxer/inserters, Scandia overwrap. Printing: Heidelberg GTD, ATF, FUJI offset. AGFA process camera. Compugraphic MCS typesetting. Full bindery and shrink wrap.

### ICCA INC.



429 Briabend Dr., Charlotte, NC 28209; (704) 523-7219; FAX: (704) 529-5277. Contact: John Firestone. Equipment and Services: ICCA is dedicated to manufacturing our industry's highest quality cassettes at competitive prices. Utilizing 9 bin masters with 65 slaves, 36 loaders and 3 print-packaging lines our monthly produc-

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ICCA INC.  
 Charlotte, NC

tion capacity is 2.5 million cassettes. ICCA's graphic services division offers graphic design, typesetting, layout, film separation, custom package design and printing. The ICCA team knows how important the sound and image of your product is to you and your marketing effort. Call us for a brochure or pricing on your current project.



INDEPENDENT MUSIC PRODUCERS SYNDICATE  
 Peterborough, NH

### IMPS MUSIC



70 Rt. 202 N., Peterborough, NH 03458; (800) 677-8838; FAX: (603) 924-8613. Contact: Donna Dirusso. Equipment and Services: Free national advertising on every new release manufactured by IMPS CD manufacturing. The Independent Music Producers Syndicate (IMPS) offers the backing of its marketing and distribution organizations to promote your new title—after you have paid incredibly low prices for the highest quality CDs and cassettes. 1,000 CDs for as little as \$2.20 per unit... and with that, your album will be advertised to consumers and retailers nationwide. Also, one track from your album can appear on an IMPS New Release Sampler that is sent out to thousands of music buyers. For immediate information and services, call Donna at (800) 677-8838. IMPS Manufacturing.

### INNOVATIVE DEVELOPMENT TECHNOLOGY



8049 Monetary Dr., Ste. C-7; Riviera Beach, FL 33404; (407) 844-2111; FAX: (407) 844-9610. Contact: George Mattie, corporate mgr.



KLARITY KASSETTE INC.  
 Waterville, ME

### KLARITY KASSETTE INC.



One Post Office Square; Main St.; Waterville, ME 04901; (800) 458-6405; FAX: (207) 873-3911. Contact: Michael Pepin. Equipment and Services: Klarity Cassette has the facilities and expertise to create a superior product. This level of quality can be achieved only when each component is prepared without compromise. That's why the people at Klarity have adopted a "no-compromise" approach to every facet of their operation. From the guy who needs just 50 demo tapes to the corporation who needs 100,000 tapes, the

friendly sales representatives at Klarity treat each and every job as if it were their very own. Klarity Cassette... "The Ultimate Response." CD Replication: services include master set-up and conversion, glass mastering and plating, typesetting for label & booklet, color seps, in-house graphic design, and full packaging. High speed duplication: all high-speed duplication is performed on the incredible ElectroSound 4800/9000 system, hands down the best in the industry. When you need it "yesterday," Klarity's Express packages offer the fastest turnaround in the industry at pricing you can afford. Real-time cassette duplication: manufactured for the perfectionist on our exclusive Studer-Revox system. Call for our free literature or sampler products.

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21 Brewster St.; Staten Island, NY 10304; (800) 955-4DOG. Contact: Bill Donnelly.

### MAGNETIC TECHNOLOGY



816 18th Ave. S.; Nashville, TN 37203; (615) 254-7001; FAX: (615) 254-4685. Contact: Mack Evans, Maurine Evans.

### MASTER CUTTING ROOM INC.



250 W. 49th St., 3rd fl.; New York, NY 10019; (212) 765-8496; FAX: (212) 765-8630. Contact: Joe Brescio.

### MASTERDISK CORP.



545 W. 45th St.; New York, NY 10036; (212) 541-5022; FAX: (212) 265-5645. Contact: Linda Duffany. **Equipment and Services:** Disc mastering/CD premastering/editing/sonic restoration. Mastering console: analog—custom Neumann, digital—Neve DTC, Sonic Solutions, Harmonia Mundi. Tape machines: Ampex ATR, custom Studer with Cello class-A amps, Sony 1630, Mitsubishi X-80 & -86, Sony 7050 & various DAT. Noise reduction: Dolby SR, Sonic System No-Noise. Monitor speakers: Duntec Sovereign 2001, Cello Performance. Amps: Altec, Hartley, NS-10M, KRK, AR-18. Digital editing systems: (2) Sonic System editor 8-track software & No-Noise, (3) DAE-3000, DAT editor. Cutting lathes: Neumann direct-metal mastering (DMM), VMS-70. Signal processing: Sonic System No-Noise, all Harmonia Mundi Modules, Wadia Converter, Pymgy. Engineers: Howie Weinberg, Tony Dawsey, Greg Fulginiti, Scott Hull, Andy Van Dette. Rate card available.



MASTERFONICS INC.  
Nashville, TN

### MASTERFONICS INC.



28 Music Square E.; Nashville, TN 37203; (615) 327-4533; FAX: (615) 242-0101. Contact: Traci Samczyk. **Equipment and Services:** Masterfonics is Nashville's only facility with tracking, mixing, mastering and duplication under one roof. Two Tom Hidley designed mastering suites feature Neumann consoles; Hidley/Kinoshita 28Hz monitors; power amps by JDF/FM Acoustics; digital EQ and dynamics by JVC/Sony; analog processing by Sontec/Base; AD/DA conversion by Apogee/Wadia; DAT, JVC DAS and CD-R. Mastering room 1, staffed by Glenn Meadows, offers hard-disk editing by Turtle Beach; Harmonia-Mundi digital de-essing; Cedar audio restoration processing for noise, click and crackle removal. Mastering room 2, staffed by Benny Quinn, has digital editing by JVC; Studer analog tape machine; Dolby/dbx noise reduction; and Neumann vinyl mastering. A JVC digital editing suite and copy room are staffed by Milan Bogdan and David Boyer, offering format and sample rate conversions from all stereo digital formats, reference CDs, DAT and cassette copies, Wadia Fiber-optic digital distribution. Complete CD, cassette, and vinyl manufacturing services. Including packaging, artwork and printing; contact Jim Loyd.

### MASTERMIX



1808 Division St.; Nashville, TN 37203; (615) 321-5970; FAX: (615) 321-0764. Contact: Kathi Dement. **Equipment and Services:** This year MasterMix celebrates its tenth anniversary with a completely redesigned acoustic environment and a doubling of master-

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# MASTERMIX

MASTERMIX  
Nashville, TN

ing facilities. We continue our tradition of offering complete editing and mastering services for all audio formats including CD reference discs. We continue to provide the latest in hard disk editors, digital signal processing and classic analog devices to ensure the maximum in creative control without compromising sonic integrity. Call Kathi for prices and equipment specifics. Acoustic design: Neil Muncy Associates and Russ Berger Design Group. Monitors: Claude Fortier and E.M. Long. Tape machines: Studer with Cello playback electronics, Sony 1630 and 3402, DAT, dolby SR. Signal processing: Sontec, API, NTP, Harmonia Mundi Acoustics, Wadia, Apogee. Editing: Sonic Solutions, Audio File. Engineers: Hank Williams, Ken Love, Ronnie Thomas.



MASTERWORK RECORDING INC.  
Philadelphia, PA

### MASTERWORK RECORDING INC.



1020 N. Delaware Ave.; Philadelphia, PA 19125; (215) 423-1022; FAX: (215) 423-6020. Contact: Albert Oon, Peter Humphreys. **Equipment and Services:** Our staff has been servicing the mastering needs of both major and independent labels since 1972. Over the years we have expanded our services to include the complete manufacturing of compact discs, cassettes (high-speed and real-time) and records while maintaining the quality, attention and services already established in mastering. Credits: Grover Washington Jr., Chuck Mangione, Levert, The Cutaways, The O'Jays, E.U., Lou Rawls, Phyllis Hyman, Miles Jaye, Third World, Michael Fair, Mastermind, Patti LaBelle, Lorenzo, Dexter Wansel, Michael Pedicin Jr., Almighty Shuhorn and many others. Equipment available includes MCI/Sony digital (PCM-1630/DMR-4000 and PCM-2500 R-DAT); dbx, Oolby A, Dolby SR noise reduction; JBL, Tannoy, Yamaha monitor speakers; Digidesign SoundTools digital editing system; Scully with Sontec "CompuDisk"/Westrex-Ransteele driver cutting system; Sontec, UREI, Soundcraftsmen signal processing; Klark-Teknik digital delay; Orban, Sontec/Valley People limiters/compressor. Engineers: Nim Sarikananda, Peter Humphreys, David Humphreys. Please call to discuss your project.

### MASTERWORKS



5 Grand St.; Reading, MA 01867; (617) 547-7973. Contact: Jonathan A. Wyner.

### MIAMI TAPE INC.



8180 NW 103 St.; Hialeah Gardens, FL 33016; (305) 558-9211; FAX: (305) 825-9873. Contact: Carlos Garcia Jr.

### MIRROR IMAGE SOUND & RECORDING



619 S. Main St.; Gainesville, FL 32601; (904) 376-8742. Contact: Ray Valla.

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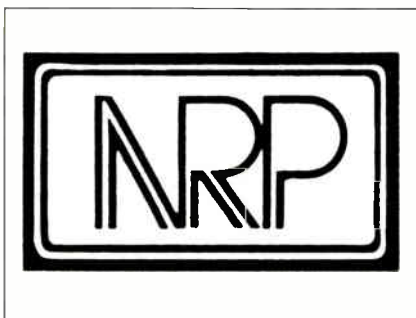


1201-J W. Pratt St., Baltimore, MD 21223; (800) 229-0355; (410) 752-0355; FAX: (410) 752-3311. Contact: Tim Evers, director of duplication services.

**MULTITAPE INC.**



1630 Euclid St. NW, Ste. 131; Washington, DC 20009; (202) 332-1522; FAX: (202) 462-4163. Contact: Bruce F. Moyser.



NASHVILLE RECORD PRODUCTIONS INC.  
Nashville, TN

**NASHVILLE RECORD PRODUCTIONS INC.**



469 Chestnut St.; Nashville, TN 37203; (615) 259-4200; FAX: (615) 244-3734. Contact: John Eberle, studio manager; George Ingram, president. Equipment and Services: Our three mastering suites offer complete mastering services for compact disc, cassettes and records. MCI and Studer tape machines; dbx Type I, Dolby A and Dolby SR noise reduction. Sphere and Neve consoles with Sontec parametric, Sphere graphic and Neve EQ. Neve and Valley 610 compressors. Yamaha NS-10M and EV custom monitors with Bryston power amps. Sony PCM-2500 R-DATS. Sony F-1, Sony PCM-1610 and 1630 processors; DMR 2000 and DMR 4000 Digital master recorders. DTA 2000 Digital tape analyzer. Digital signal processing: Lexicon 300 systems. Digital editing: CompuSonics hard disk system. Neumann VMS70 lathe with SAL 74 system and Zuma computer; and Scully/Capps lathe with Westrex cutting system. Complete compact disc replication service, including master preparation from your Digital or Analog mixes, Insert printing, Disc replication and packaging. Premium quality real-time cassette duplication with "on shell imprinting." Custom production of 45s and LPs; particularly 12" Maxi singles. Recent projects included: Clinton Gregory, The Geezinslaw Bros., Osbourne Bros., Alison Krauss. 2 Unlimited, Apotheosis, The 360's and Tennessee Performing Arts Center.

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First State Production Center; 1500 First State Blvd.; Wilmington, DE 19804-3596; (302) 999-1110; FAX: (302) 999-1656. Contact: Ed Kennedy, pres./gen. mgr.

**NATIONAL TAPE CORPORATION**



1110-48th Ave. N.; Nashville, TN 37209; (615) 383-7881; FAX: (615) 383-1768. Contact: Tom Beld, VP sales. Equipment and Services: Mastering console: Sony MXP-2000. Tape machines: Studer, Sony DMX-2000/1630. Sony R-DAT 2500. Noise reduction: dbx Type I, Dolby A, SR, B. Monitor speakers: Tannoy 10. Signal processing: TC Electronic, UREI, Valley People, BBE. Engineers: David Wirth, Bobby Newton, Bill Anderson, Eric Lancaster, Orville Holcomb, David Howard (chief engineer). Tape duplication: Method of duplication: bin-loop. Duplicator: Electro Sound 8000. Duplicating speed: 64:1. Capacity: 100,000/day. Tape used: Sunkyong, BASF. Loading equipment: King/Concept Design. Packaging equipment/fulfillment services: Scandia.

**NEW YORK AUDIO PRODUCTIONS**



140 W. 22nd St.; New York, NY 10011; (212) 243-6826; FAX: (212) 243-7210. Contact: Amanda A. Smith.

**L. NIX & CO. INC.**



2000 Madison Ave.; Memphis, TN 38104; (901) 725-0855; FAX: (901) 725-7011. Contact: Larry Nix.



NORTHEASTERN DIGITAL RECORDING  
Southborough, MA

**NORTHEASTERN DIGITAL RECORDING**



2 Hidden Meadow Ln.; Southborough, MA 01772; (508) 481-9322; FAX: (508) 624-6437. Contact: Anne Shepard, studio manager. Equipment and Services: Northeastern Digital Recording specializes in CD premastering and digital editing using the Sonic Solutions Sonic System and the Sony PCM-1630, including transfers from a wide variety of digital and analog formats. Write-once recordable compact discs and CD-ROMs, as well as CD replication services are also available. Our composer's suite offers digital editing and sequencing with Soundtools, and MIDI recording and mixing with DECK. Credits: The Beach Boys, David Bowie, Frank Zappa, Bob Marley, Arlo Guthrie, Buddy Guy, Alison Krauss, Big Star, Richard Thompson, Nils Lotgren, Paul Winter, Richie Havens, Rykodisc, Hannibal, Rounder, Heartbeat, Alligator, Omega/Vanguard Classics, East Side Digital, Musical Heritage Society, New World, Newport Classic, Northeastern, Biograph, Atlantic, Chrysalis, CRI, SBK, EMI, A&M, RCA. Please call for rates and information.

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3400 Pendleton Dr.; Wheaton, MD 20902; (202) 319-5588; FAX: (202) 319-4490. Contact: Bill Burns, Alan Wonneberger.

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1100 State St.; Camden, NJ 08105; (609) 963-3000; FAX: (609) 963-3854. Equipment and Services: Mastering: Otari w/HX Pro. Digital editing systems: Digidesign Sound Tools. Tape duplication: Electro-Sound 64:1. Loading equipment: Concept Design modified Kings. Printing: Apex CA-80, commercial print shop. Other duplication: video and floppy disk. Other: serving the music and spoken word industries since 1948. Recorded Publication Laboratories in-house services, including digital recording, editing and mastering, duplication, graphic arts and package design, printing, fulfillment and mailing service, offer the flexibility to produce a complete project at one location.

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147 Mill Ridge Rd.; Lynchburg, VA 24502; (804) 582-6139; FAX: (804) 582-6144. Contact: Corinne Barbara. Equipment and Services:

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49 E. 52nd St.; New York, NY 10022; (212) 445-2958; FAX: (212) 755-8311. Contact: Risa Kantor, Tim Geelan, Rob Grabowski. Equipment and Services: Compact disc mastering is our specialty. Our consoles include SSL G series, Sony 3056 with API EQ and Neve DTCs. We also have a Cedar digital audio restoration system as well as Sonic Solutions hard disk editing and CD maker. Additionally, we offer 48-track digital mixing and editing and real-time advance cassette duplication. Our credits include: Michael Bolton, Firehouse, Celine Dion, Killer Dwarfs, The Doan, Public Enemy, Wynton Marsalis, Peabo Bryson, Total Look & Style, The Allman Brothers, Midnight Oil, Branford Marsalis, Harry Connick Jr., George Michael, Mercury Rev, Des' Ree, Kirk Whalum, The Will Rogers Follies, Donovan, Earth, Wind & Fire and The Legacy Mastersound Series. For more information call Risa Kantor, acct. service mgr.; Tim Geelan, Rob Grabowski.

## SOUND-ARTS CO. INC.



5 Cindy Lane; Ocean, NJ 07712; (908) 493-8666; FAX: (908) 493-0667. Contact: Ethel Davidson, account executive. Equipment and Services: Sound-Arts is an advanced full-service, state-of-the-art audio duplication and packaging facility offering top quality craftsmanship at competitive prices. Cassette packages include printing of J-cards using customer-provided camera-ready art, mastering, duplication and packaging using top-quality equipment. Cassette duplication is done by bin-loop at 64:1, using Otari DP-7300, DP-80 with 26 slave units. We use Sunkyong tape and have the availability of shells (C-O's) from a variety of manufacturers. Loading equipment includes King 790 loaders. Packaging is provided using Heino Ilseemann KZM3, CM-1 packagers. Production capacity is 1.5 million cassettes per year. Both ferric and chrome blank cassette are available in standard and custom lengths. Sound-Art also provides excellent quality COs at competitive prices. CD packages include tray-cards and booklets from customer's camera-ready art, pre-mastering and glass mastering service, replication and packaging. For further information call: (800) 862-TAPE (8273) or fax: (908) 493-0667.

## soundmirror



SOUNDMIRROR INC.  
Boston, MA

## SOUNDMIRROR INC.



76 Green St.; Boston, MA 02130; (617) 522-1412; FAX: (617) 524-8377. Contact: Nancy Grossman/John Newton. Equipment and Services: Soundmirror is New England's most complete CD mastering facility, offering fully digital mastering by experienced engineers at attractive rates. Our two studios provide complete digital mastering from all tape formats, including direct-from-DAT mastering centered on a customized Sony DAT mastering system. We also offer disk-based 2 to 24-track mixing and editing utilizing either a Lexicon Opus or Sonic Solutions, and our Sony DAE-3000 editing system is available for all 2- to 24-track post-production needs. A fully isolated machine room common to both studios allows complete flexibility to suit the needs of each project. The studios are equipped with Apogee AD and DA converters, Lexicon 480 and 300 signal processors and B&W 801M loudspeakers. Complete CD production services are also available. We take great pride in providing excellent service with fast turnaround and can work within any budget. Clients include Polygram, Elektra, EMI, Rounder, Northeastern and Critique.

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119 Ramona Ct.; New Rochelle, NY 10804; (914) 576-2624; FAX: (914) 725-8911. Contact: Harry Klane.

## STERLING SOUND

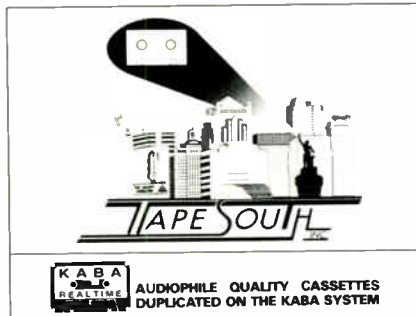


1790 Broadway; New York, NY 10019; (212) 757-8519; FAX: (212) 757-4607. Contact: Larry Lachmann, studio manager. Equipment and Services: As they have for nearly 25 years, Sterling Sound displays the versatility and consistency in excellence, as is evident in the following mixed bag of musical styles. Guns N' Roses, Eric Clapton, Metallica, Madonna, Chaka Khan, Bon Jovi, AC/DC, Pat Metheny, Heavy D and the Boyz, Peter Cetera, Roxette, Miles Davis, Izzy Stradlin, Sophie B. Hawkins, Kitaro and Joe Public. It is a full digital and analog state-of-the-art facility.

## STUDIOD MAGNETICS INC.



12 Long Island Ave.; Holtsville, NY 11742; (516) 289-3400; FAX: (516) 289-1604. Contact: Douglas Young, Craig Balaban.



TAPE SOUTH INC.  
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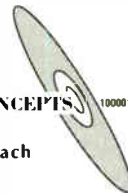
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### CREATIVE SOUND PRODUCTIONS INC.



8383 Commerce Park Dr. #604; Houston, TX 77036; (713) 777-9975; (800) 451-7034; FAX: (713) 774-3419. Contact: Edward B. Smith, pres.; Michele Busse, dir. of duplication. Equipment and Services: Creative Sound is a quality oriented full-service cassette

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### THE LITTLE WAREHOUSE INC.



5505 Valley Belt Rd., Ste. F, Independence, OH 44131; (800) 445-8273; (216) 398-0022; FAX: (216) 398-9980. Contact: Joe Kauffman. Equipment and Services: Method of duplication: in-cassette and bin-loop. Duplicator: Telex 6120XLP, Telex CD series, Marantz PMD500 system, Magnafax LBC-82-QT, Magnafax LBC-88TT, Magnafax TM81-FT. Tape used: BASF 619, 479, chrome and magmedia.

Video: BASF, Maxell, Ampex and 3M. Shell used: Magnetic Media 5-screw C-O. Shape C-O's, HG-1 and SI V-O's. Loading equipment: King 790s and King 2500s. Packaging equipment: Conflex sealer and Weldotron shrink-tunnel. Apex Z100 overwrap system. Rates: quote on request. Other: in-house typesetting and printing of labels and inserts. Custom.

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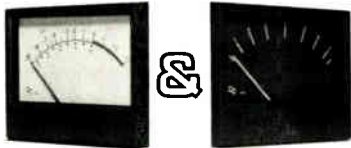
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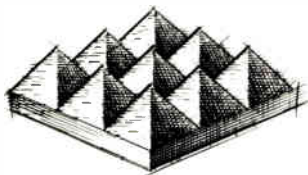
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### TM CENTURY



14444 Beltwood Parkway; Dallas, TX 75244; (800) 937-2100; FAX: (800) 448-0000. Contact: Gary Hollis. **Equipment and Services:** Mastering console: Sony MXP-2000, Yamaha DMP70. Tape machines: Sony PCM-3202 DASH, (2) PCM-1630 DRM 4000. (3) Sony 2500 Pro DAT, Sony 501. Noise reduction: Dolby A, Dolby SR, dbx. Monitor speakers: JBLs 4410, Yamaha NS-10M. Digital editing systems: (3) Sonic Solutions, Sony CD1-OFF (WORM) system. Signal processing: Yamaha DMP7D. Engineers: Larry King, Angie Junes, Page Nurice, Cheryl Bales, Bill Hudson. Rates: digital studio: \$150/hour. No-Noise processing \$100 per finished minute. Other: complete CD packages available, also custom CD1-off service, digital sound effects library, in-house MIDI production studio, short-run and large-quantity CD projects accepted.

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Indianapolis, IN

### WORLD MEDIA GROUP



8472 Brookville Rd., Indianapolis, IN 46239; (317) 353-1113; FAX: (317) 353-0750. Contact: Andrew Symons, Jeff Mellentime, Curt Albright. **Equipment and Services:** Mastering room equipment includes: Studer A-80 1/2" with HX Pro, Otari MTR 12 1/4" half track machine, Tascam 122 MkII, Sony DTR 700 DAT machines, Sony 601 processor for F1 transfers with VHS and Beta compatibility, Dolby A, B, C, SR, dbx Type 1 noise reduction all available. Studio monitors are UREI 809s driven by a Carver PM175. Signal processing includes: Klark-Teknik DN410 parametric EQ, Drawmer M-500 programmable dynamics processor, BBE 442 processor, (2) dbx 263X de-essers, Audio control RTA and Tascam 401 CD player. Duplication equipment includes: (1) Gauss 1200 master with 7 slaves, (1) Lyrec P4400 master with 4 slaves; the Gauss system is 64:1 with a 3 3/4 running master and the Lyrec is 64:1 with 7 1/2 ips and 80:1 with 3 3/4 ips. We use BASF "Chrome +" and Sunkyong chrome and ferric tape. Our loading equipment includes (9) concepts Design modified 775s and (2) modified 790s. We use an Apex CA-30 printer, and Apex 2-90 inserter, Q & M folder, and a Scandia 607 shrinkwrapper for our cassette packaging department. We offer complete CD packages including premastering, processing, graphic film work and printing, CD reference discs are available as well as video duplication and record manufacturing. WMG can also provide graphic, custom filmwork, printing, warehouse order fulfillment, mail fulfillment, special assemblies poster, and mailers.

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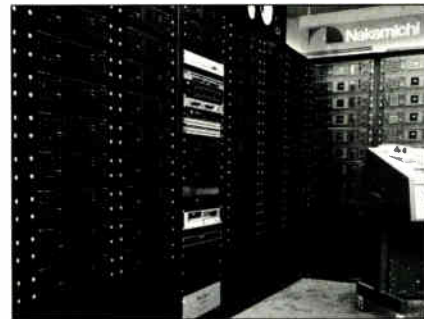


1416 N. La Brea Ave.; Hollywood, CA 90028; (213) 856-2775; FAX: (213) 856-2675. Contact: Sandi Johnson. **Equipment and Services:** Mastering engineers: Arnie Acosta, Dave Collins, Ken Perry, Stewart Whitmore, Alan Yoshida.

### A&M POST-PRODUCTION



1416 N. La Brea Ave.; Hollywood, CA 90028; (213) 856-2797; FAX: (213) 856-2712. Contact: Bill Lazerus.



AAPEX TAPE DUPLICATION  
San Rafael, CA

### AAPEX TAPE DUPLICATION



28 Paul Dr., Ste. E; San Rafael, CA 94903; (415) 492-1300; (800) 323-2279 outside CA; FAX: (707) 585-1330. Contact: Sherry Jones. **Equipment and Services:** Duplication system: 103 Nakamichi MR-2B real-time cassette slaves 1:1 speed. Mastering tape machines: Technics S-3500 R-DAT, Otari MTR-12 2-track open reel (7.5, 15, 30 ips), Sony PCM-501 ES Beta or VHS digital. Outboard: Aphex Aural Exciter, Aphex Compellor, Yamaha 1/3-octave graphic equalizers. Monitors: JBL. Amplifiers: Yamaha. Noise reduction: Dolby A, SR, B (in-cassette). Mission statement: Apex tape duplication strives to bring its customers the highest quality cassette duplication possible by utilizing only Nakamichi machines and real-time methods to elim-



inate bin-loop generation loss and fidelity compromises. We invite you to experience "Apex Ultimate Fidelity" with your next master. Full packaging services are available including shrink wrap, labels, J-cards and on cassette printing. Full mixing and mastering services are available at our 24-track studio, The Banquet Sound Studios.

### AAZTEC RECORDING AND TAPE DUBING



1110 E. Missouri Ave., Ste. 400; Phoenix, AZ 85014; (602) 279-0808; FAX: (602) 277-6552. Contact: Marc Bennett.

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**ABBEY TAPE DUPLICATORS INC.**  
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### ABBEY TAPE DUPLICATORS INC.



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1311 W. Magnolia Blvd.; Burbank, CA 91506; (818) 846-2679; FAX: (818) 846-3527. Contact: Rae DiLeo. Equipment and Services: Real-time and high-speed cassette duplication. Laser-printed labels and J-cards. Shell imprinting. DAT editing and sequencing. DAT/DAT copies. D/A and A/D 24-track transfers.



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### AT&T RECORDING/DUPLICATING



501 N. Larchmont Blvd.; Los Angeles, CA 90004-1305; (213) 466-9000; FAX: (213) 467-6615. Contact: Kathy Van Booven. Equipment and Services: Mastering console: Ramsa. Tape machines: Studer 1/4", Otari 1/2" 8-track, Scully 1/2" 4-track, Sony DAT 2500,

Panasonic DAT 3500. Noise reduction: dbx, Dolby. Rates: \$80/hour + material. Tape duplication—Method of duplication: in-cassette and bin-loop. Duplicator: (94) KABA real-time decks, (10) Nakamichi real-time, high speed out-of-cassette duplication; 16x speed. Duplicating speed: real time, 2:1, 16:1. Tape used: Agfa 649, 647, 949, 947 for cassette, Agfa 468 for masters. Shell used: Shape Mark 10, Magnetic Media. Loading Equipment: King. Rates: Competitive rates. Call for quotation. Other: Label printing, packaging, shrinkwrapping.

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12426 1/2 Ventura Blvd.; Studio City, CA 91604; (818) 762-ACDC; FAX: (818) 508-8077. Contact: Steve Katz, Steve Mitchell.



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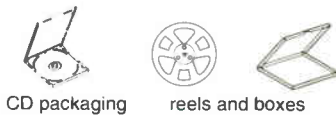
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FOR MORE INFORMATION ABOUT MIX LISTINGS SEE PAGE 151.

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10th & Parker Streets; Berkeley, CA 94710; (510) 549-2500. Contact: George Horn. Equipment and Services: Mastering—mastering consoles; Sony SDP-1000 digital console. Tape machines: Sony 1630, Mitsubishi X-86C, Studer A80. Noise reduction: all types. Monitor speakers: Hidley. Digital editing system: Mitsubishi. Cutting lathes: Neumann. Signal processing: Sony digital. Engineers: George Horn, Phil DeLancia. Rates: call for rates.

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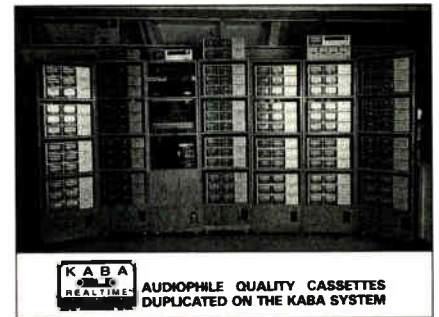


PO Box 764; Bonita, CA 91908; (619) 267-0307; FAX: (619) 267-0307. Contact: Merrie Holyfield, Dan Marshall. Equipment and Services: Digital mastering console: Sonic Solutions/Sonic System, Macintosh IIcx, 1.8 gigabyte hard drive, Sony CDW-900E recordable CD writer, Panasonic 3700 and Sony DATs, KRK monitors, Bedini Spatial Environment processing (B.A.S.E.); real time cassette duplication on the KABA system using BASF chrome, Lenco shells; typesetting, 4-color printing (J-cards, CD brochures), on shell imprinting, fabrication and overwrap. CD services: analog-to-digital conversion, digital editing, generation of premaster CD (tapeless). Typical cost for 1,000 CD's with full-color brochures, remastering, glass master, in jewel box—\$2,800. Engineers: Dave Merullo, Don Marshall, Karl Fitch. Production manager: Merrie Holyfield

**JACKSON SOUND PRODUCTIONS LTD.**



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STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION

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8. Full Name and Complete Mailing Address of Publisher: MBS, S.P., A/S/A Act 12 Publishing, 6400 Hollis Street, Suite 12, Emeryville, CA 94608

9. Full Name and Complete Mailing Address of Editor: Bill Peterson, 6400 Hollis Street, Suite 12, Emeryville, CA 94608

10. Title and Complete Mailing Address of Principal Owner: David M. S. Swartz, 64 C Hollis Street, Suite 12, Emeryville, CA 94608

11. Title and Complete Mailing Address of Business Manager: Bill Peterson, 6400 Hollis Street, Suite 12, Emeryville, CA 94608

12. Title and Complete Mailing Address of Circulation Director: Bill Peterson, 6400 Hollis Street, Suite 12, Emeryville, CA 94608

13. Title and Complete Mailing Address of Advertising Manager: Bill Peterson, 6400 Hollis Street, Suite 12, Emeryville, CA 94608

14. Title and Complete Mailing Address of Business Development Manager: Bill Peterson, 6400 Hollis Street, Suite 12, Emeryville, CA 94608

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160. Title and Complete Mailing Address of Assistant Treasurer: Bill Peterson, 6400 Hollis Street, Suite 12, Emeryville, CA 94608

161. Title and Complete Mailing Address of Assistant Controller: Bill Peterson, 6400 Hollis

## LOCATION RECORDING SERVICE INC.



2201 W. Burbank Blvd.; Burbank, CA 91506; (213) 849-1321. Contact: Shari Fraiberg, general manager. Equipment and Services: Mastering—mastering console: (2) Neumann SP79, Neumann MT66. Tape machine: (4) Studer A80 MkII 1/4" and 1/2", (3) Studer B67, (4) Nakamichi MR-1, Sony PCM-1630, (2) DMR 4000. Noise reduction: Dolby SR, A, dbx Type I. Monitor speakers: UREI B11-A, Studer A68 amps. Cutting lathes: (3) VMS-70 with SAL-74 amps, SX74 heads. Signal processing: Sontec Mes 430, EMT 240 plates, Yamaha REV5, UREI 1178 limiters. Engineers: Bruce Kennedy, Kevin Gray. Rates: \$95/hour analog, \$150/hour digital. 12-inch LP \$105/side, 1630 CD submaster \$400. CD clones \$180. Other: complete printing services, record labels, jackets, CD inserts and tray cards, cassette J-cards, commercial printing, complete record production.

## MARTIN AUDIO GROUP



1200 Westlake Ave. N., Ste. 414; Seattle, WA 98109; (206) 784-0139; FAX: (206) 782-9044. Contact: Ian Sanders, Jack Kruse, Scott Olsen.

## MASTER TRACK PRODUCTIONS



1524 W. Winton Ave.; Hayward, CA 94545; (510) 782-0877; FAX: (510) 782-6280. Contact: Sandi Larson.

## THE MASTERING LAB



6033 Hollywood Blvd.; Hollywood, CA 90028; (213) 466-8589; FAX: (213) 465-7570. Contact: Docken Polk.

## MAXI CASSETTE PRODUCTIONS INC.



1440 E. Arrow Hwy., Unit L; Irwindale, CA 91706; (800) 344-6294; FAX: (818) 357-1666. Contact: Michael Aris.

## MELODY PRODUCTIONS



7712 23rd Ave. NW; Seattle, WA 98117; (206) 783-8694; FAX: (206) 791-1765. Contact: James A. Bostad Sr., CEO. Equipment and Services: Method of duplication: in-cassette, reel-to-reel, and DAT. Duplicator: Nakamichi MR-2B, Otari 4050 cassette-to-cassette and 1/4", 7.5 or 15 ips to cassette. Duplication speed: 1:1 and 8:1. Capacity: 480/day real-time and 1,750/day high-speed. Tape used: full line BASF products (LNS, LHD, Chrome Plus, Super Chrome and COFFE tape). Shell used: Shape Mk-10, Michele, Lenco, Magnetic Media and MPC. Loading equipment: Exclusively King 790's. Packaging equipment/fulfillment services: Seal-A-Thon. Rates: Call for rates. Other: Full audio services, from mixing to mastering in our 8-track studio to custom loading of cassettes, to duplication and pad printing, J-card and shrinkwrapping. We are the Pacific Northwest's exclusive custom blank loader of cassettes which are manufactured for real-time in cassette duplication. We stock many custom manufactured transparent cassettes and clear C-O's with colored components. Included in our production studio is a video editing suite with effects and duplication from 8mm, 1/2" or 3/4". Credits: soundtracks and endless cassettes for international exhibits and museums. New for '92—full line of BASF studio products.



MUSIC ANNEX DUPLICATION  
Fremont, CA

## MUSIC ANNEX DUPLICATION



42650 Christy St.; Fremont, CA 94538; (800) 869-0715 outside CA; (510) 226-0800. Contact: Steve Urquhart or Kathy Fry. Equipment and Services: What makes Music Annex Duplication unique is our ability to deliver the highest quality cassettes and compact discs at competitive prices. We have the latest equipment and an experienced staff to ensure your satisfaction. From 1 CD or cassette up to 1 million, Music Annex offers you the quality and service that labels like Windham Hill, IRS Records and JVC Jazz count on. Make sure your product looks and sounds the best that it can. Choose Music Annex Duplication. Call 1-800-869-0715 (outside CA) or (510) 226-0800 (in CA) for a free sample and our duplication information pack.

# MUSICON

## RECORDING & DUPLICATING



MUSICON RECORDING AND DUPLICATING  
Wilsonville, OR

## MUSICON RECORDING AND DUPLICATING



27501 SW 95th Ave.; Wilsonville, OR 97070; (503) 682-8668; FAX: (503) 682-3043. Contact: Steve Ziegler. Equipment and Services: We prepare your master in our fully automated recording studio using the finest equipment from Studer, GML, Summit and Otari. Our duplicating plant features a 12-slave Versadyne bin-loop duplicating system, 6 King 790 loaders, multi-color on-cassette imprinting, and automated inserting, boxing and cellowrapping. Our facility is unique: we offer state-of-the-art recording and large-scale duplication and packaging under one roof. We have a monthly capacity of over 1 million tapes but we treat every job, big or small, like it's the only one that matters. Our prices are competitive and we offer the finest in quality and service. Our clients are as diverse as Jenny Craig International, Harvest House Publishing, Tony Robbins and Portland Trail Blazers. We would like to count you among them. Please give us a call.

## NORTHWESTERN INC.



15938 SW 72nd Ave.; Portland, OR 97224; (800) 547-2252; FAX: (503) 624-2185. Contact: Ken Thompson, Jeanne Alldredge, Kathy Lawrence. Equipment and Services: Bin-loop duplication with 6-slave Versadyne 1500 system. Real-time duplication with KABA system on TDK Cobalt tape. Complete compact disc services. Quality mastering with Digidesign Pro Tools, in-house in our fully equipped recording studio. Large voice talent pool. In-house on-cassette imprinting, shrinkwrap, packaging and fulfillment services. We ship anywhere in the world. From your master or script to retail ready packaged product, we are experts at delivering the finest quality, on time, with the best service in the business. Of course our pricing is always competitive. Please call us for quick quotes or more information. Be sure to ask for a free catalog or sample tape.

2323 Corinth Ave. Los Angeles, CA 90064



OCEANVIEW  
DIGITAL MASTERING

OCEANVIEW DIGITAL MASTERING  
West Los Angeles, CA

## OCEANVIEW DIGITAL MASTERING



2323 Corinth Ave.; West Los Angeles, CA 90064; (310) 444-9904; FAX: (310) 478-0659. Contact: Sandy Siegel, Joe Gastwirt, Cal Roberts. Equipment and Services: Custom analog and digital mastering, editing and No-Noise services featuring the Sonic Solutions System. Mastering console: Neumann SP79. Tape machines: custom Ampex ATR-104, Sony 1630, various DAT machines. Analog-to-digital conversion: Custom Ultra analog 20 bit converter. Digital-to-analog conversion: Theta Generation III and Apogee. Noise reduction: Dolby, dbx, and No-Noise System. Monitor speakers: custom ATC/Hartley, Tannoy SGM-10B with Mastering Lab crossover. Sony/Start Labs CD Writer. Signal processing: Sontec, Neumann, NTP, etc. Engineers: Joe Gastwirt, John Modell and Jeffrey Norman. Rate card upon request.

Mix Bookshelf Catalog

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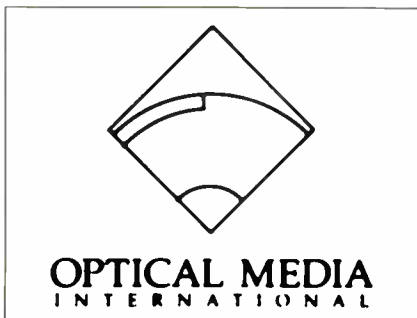
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Mastering, Pressing, Tape Duplication and Compact Disc Facilities



OPTICAL MEDIA INTERNATIONAL  
Los Gatos, CA

### OPTICAL MEDIA INTERNATIONAL

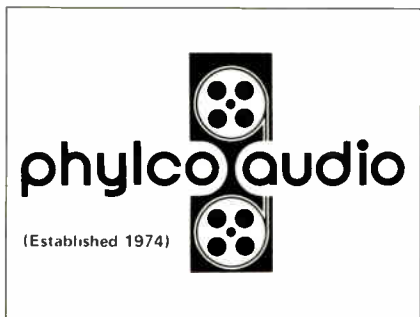


180 Knowles Dr., Los Gatos, CA 95030; (408) 376-3511; FAX: (408) 376-3511. Contact: Sylvester Pesek. **Equipment and Services:** Mastering—Mastering consoles: Topix CD Audio, CD-ROM pre-mastering workstation. Tape machines: Sony DMR-4000, PCM-1630, Fostex D-201 DAT. Noise reduction: Sonic Solutions, Sound Tools. Digital editing systems: Topix workstation, Sonic Solutions, Sound Tools. Signal processing: Sony DFX-2400. Rates: call for quote. Compact disc—services, prices: CD-Audio, CD-ROM and mixed mode CD preparation, tape premaster and encoding, Yamaha. Sony reference disc systems. CD pressing in any quantity—24-karat gold compact discs. Other: complete services for all CD formats: CD-Audio, CD-ROM, CD-ROMXA, CD-I, including program design, graphics, packaging and fulfillment. Call for price quote.

### TOM PARHAM AUDIO PRODUCTIONS



1140 S. Cypress #D; La Habra, CA 90631; (714) 871-1395; FAX: (714) 871-1395. Contact: Tom Parham.



PHYLCO AUDIO/VIDEO DUPLICATION SERVICE  
Gold Hill, OR

### PHYLCO AUDIO/VIDEO DUPLICATION SERV.



11693 Old Stage Rd., Gold Hill, OR 97525; (800) 348-6194; FAX: (503) 855-7581. Contact: Robert Deates, Gail Husa, Ken Husa. **Equipment and Services:** Our tape duplication is done at a speed of 32:1 on stereo bin-loop system. We use BASF tape and Michelex and MPS shells. All our cassettes are loaded on King 790s. We offer full-service packaging, imprinting, J- and O-card printing, custom packages, plastic wrap. Our rates are very competitive, call for quote and free brochure. Our duplication service is used by large nationwide corporations as well as the small just getting started groups. We are a family owned and operated company and furnish personalized service to all our clients. Call us, we know you'll be glad you did.

### PLU AUDIO SERVICES



Pacific Lutheran University; Tacoma, WA 98447; (206) 535-7268; FAX: (206) 535-7799. Contact: Bob Holden.

### PRECISION REAL-TIME DUPLICATION



7763 Barque Pl.; Tucson, AZ 85741; (602) 744-2451; FAX: (602) 744-3552. Contact: Ted Novak.

### QUADIM CORPORATION



31542 Rustic Oak Dr.; Westlake Village, CA 91361; (818) 706-8843; FAX: (818) 706-8426. Contact: Guy Costa.



RAINBO RECORDS AND CASSETTES  
Santa Monica, CA

### RAINBO RECORDS AND CASSETTES



1738 Berkeley St.; Santa Monica, CA 90404; (310) 829-3476; FAX: (310) 828-8765. Contact: Jack G. Brown, Steven E. Sheldon. **Equipment and Services:** Tape duplication—method of duplication: bin-loop. Duplicating speed: 64:1. Capacity: 50,000 per 24-hour day. Tape used: BASF chrome and normal, Sunkyong chrome and normal. Shell used: Michelex, Lenco. Loading equipment: King 790. Packaging equipment/fulfillment services: Scandia. Compact disc—services, prices: CD replication, packaging, blister-pak multiples. Record manufacturing—pressing: 26 Lened Automatic, labels, jackets, sleeves—prg. drop shipping. Capacity: 50,000-12", 18,000-7". Vinyl used: Keycor KC 588. Rates: send for brochure or phone. Other: Layout and design department and typesetting at \$50 per hour. Complete CD service, minimum 500 per order, quick turn-around. In-house services. Special prices on combined orders. Large package department specializing in multiple units. Serving the music industry for over 50 years.

### RAINBOW CASSETTE STUDIO



PO Box 472; Taos, NM 87571; (800) 748-1540. Contact: Judy Lujan.

### BILL RASE PRODUCTIONS INC.



955 Venture Ct.; Sacramento, CA 95825; (916) 929-9181; FAX: (916) 929-4751.

### RECORDED MEDIA SERVICES



98-027 Hekaha St., Unit #44; Aiea, HI 96701; (808) 487-0110; FAX: (808) 487-3731. Contact: Mike Wilcox.

### REELTIME TAPE DUPLICATION



125 Altana St.; San Rafael, CA 94901; (415) 459-7180; FAX: (415) 459-7180. Contact: Tony Johnson.

### RICHARDSON TAPE & SOUND



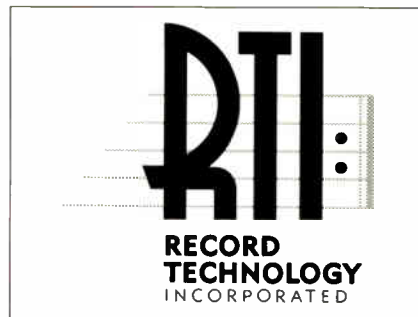
HC71, Box 231; Mountain View, AR 72560; (501) 269-3908; FAX: (501) 269-3908. Contact: Aubrey Richardson, Kelvin Richardson. **Equipment and Services:** We do real-time duplication only. This gives you the best quality you can get on an audio cassette. Copies are made direct from your reel-to-reel, cassette, or R-DAT tape. We use over 100 Nakamichi cassette tape decks with BASF music quality or chrome tape for duplication. This ensures that you get absolutely the best quality from your master. Other services offered: digital mastering from R-DAT to R-DAT (Sony and Panasonic), custom loaded blank cassette in-house with King & Superscope tape loaders. Real-time (1 7/8 ips speed) duplication frequency responsive from 20 to 20kHz. Signal processing (DOD, UREI, dbx, Aphex, BBE). Direct to shell-imprinting with foil (gold, silver and other colors). Complete packaging and shrink wrapping. Small orders on short demo tapes at reasonable prices and quick turn-around.

### ROCKET LAB



51 Federal St.; San Francisco, CA 94107; (415) 495-2297; FAX: (415) 495-2684. Contact: Kay Arbuckle/Nancy Baysinger. **Equipment and Services:** Mastering—mastering console: JVC, Sonic So-

lutions. Tape machines: Ampex ATR-104, Studer 820, Sony 2700, Panasonic SV-3700, Sonic Solutions CD Printer. Noise reduction: Dolby SR, A, dbx. Monitor speakers: Meyer Sound Labs HD-1, Veldyne ULD 18". Digital editing system: Sonic Solution, Studer Dyaxis. Cutting lathes: Scully/Westrex/E.A.R. Signal processing: Massenburg, EAR, Sonic Solutions, Studer Dyaxis, NTP, Sontec, Dynacord DRP20. Engineers: Paul Stubblebine, Ken Lee, Marc Senasac. Compact disc services, prices: call for quotes. Other: CD reference discs available. Complete digital editing including audio-for-video.



RTI-RECORD TECHNOLOGY INC.  
Camarillo, CA

### RTI-RECORD TECHNOLOGY INC.



486 Dawson Dr.; Camarillo, CA 93012-8090; (805) 484-2747; FAX: (805) 987-0508. Contact: Linda Pierce Ferguson, Reid MacInnis, Don MacInnis, Bill Baue. **Equipment and Services:** Mastering—mastering console: Amek. Tape machines: Otari, Studer, Sony, Panasonic, Nakamichi. Noise reduction: Dolby, dbx. Monitor speakers: JBL. Engineers: Mark Hashimoto, Sean Waldron. Rate: Please call for brochure and information package. Tape duplication—method of duplication: bin-loop, duplicating speed: 64:1. Tape used: BASF, Sunkyong. Shell used: Lenco. Loading equipment: King. Packaging equipment/fulfillment services: Shanklin. Rates: Please call or write for brochure and information package. Compact disc—services, prices: RTI offers complete CD production services. Minimum order quantity: 500. Please call or write for brochure and information. Record manufacturing—presses: SMT. Vinyl used: Keycor. Other: Now in its 20th year of operation, RTI specializes in providing top-quality goods and complete, reliable services to independent labels of all sizes and genres. Please call or write for brochure and information package.

### STARSHINE AUDIO ENTERPRISES



932 Nord Ave.; Chico, CA 95926; (916) 345-3027. Contact: Hugh Santos, John Peters.

### SULLIVAN RECORDING



1390 Frank Hill Rd.; Ashland, OR 97520; (503) 482-8181. Contact: Frank Sullivan.

### TAPE SPECIALTY INC.



13411 Saticoy St.; N. Hollywood, CA 91605; (818) 786-6111; FAX: (818) 904-0267. Contact: Customer services.



TOWER MASTERING  
Hollywood, CA

### TOWER MASTERING



The Capitol Tower, 1750 N. Vine St.; Hollywood, CA 90028; (213) 871-5003; FAX: (213) 871-5008. Contact: Pete Papageorges, mgr. **Equipment and Services:** Mastering—mastering console: Neve, Sony, Studer, Muse. Tape machines: Studer, Sony 1630, Mitsubishi X-86 HS, Ampex ATR-100. Noise reduction: Dolby A/SR. Monitor speaker: JBL custom, TAD custom. Digital editing systems: Sonic Solutions, Sony DAE-3000. Cutting lathes: Neumann SAL 74B with

Zuma computer. Signal processing: Harmonia Mundi, Sontec EQ, NTP EQ, Sonic Solutions. Engineers: Wally Traugott, Ron McMaster, Larry Walsh, Kevin Reeves, Rob Norberg. Rates: Call for pricing and information. Other: At the Tower Mastering facilities in Hollywood we will provide CD premastering, EQ and PQ encoding, CD reference discs, DCC premastering, cassette mastering for duplications, reference/master lacquers, cassette copies, DAT copies. Credits: Quincy Jones, Indigo Girls, Megadeth, Ugly Kid Joe, Bonnie Raitt, Red Hot Chili Peppers, Les Paul "Box Set", Hammer, Mellow Man Ace, "Gershwin in Hollywood," Soul Asylum, Crowded House, Aretha Franklin and many more.

### TRIAD STUDIOS



4572 150th Ave. NE; Redmond, WA 98052; (206) 881-9322; FAX: (206) 881-3645. Contact: Chris Middaugh.

### OUTSIDE U.S.

#### ANALOGUE INDUSTRIES



211 St-Antoine Street West, Ste. 100; Montreal, QC H2Z 1H4; (514) 878-TAPE (8273); FAX: (514) 878-3693. Contact: Rick Dexter.

#### AUDIOBEC RECORDING

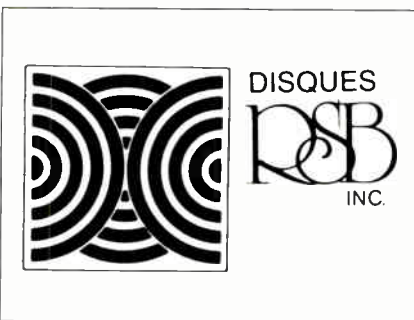


600 Port Royal W.; Montreal, QC H3L 2C5; (514) 384-6667; FAX: (514) 388-1488. Contact: Mike Tubie.

#### DISC MAKERS



Senda de la Posada N-6; Quintas del Rio; Bayamon, PR 00961; (809) 740-0010; FAX: (809) 785-5554. Contact: David Rodriguez.



DISQUES RSB INC.  
St. Laurent, QC

#### DISQUES RSB INC.



8420 Cote De Liesse; St. Laurent, QC H4T 1G7; (800) 361-8153; FAX: (514) 342-0401. Contact: Richard Belanger, Pierina Nero.

#### THE LACQUER CHANNEL INC.

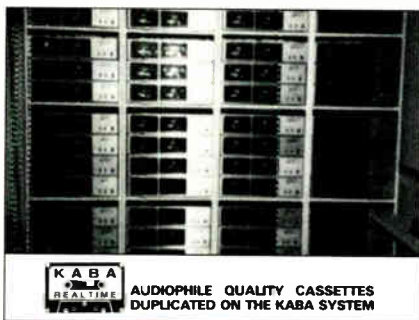


MUSIC INDUSTRY SERVICE CORP.; 297 Les Mill Rd.; Toronto, ON M3B 2V1; (416) 444-6778; FAX: (416) 444-0251. Contact: Doug Moncrieff, George Graves, Bob Trowell. Equipment and Services: Mastering—mastering consoles: Sony SDP-1000 digital transfer console, modified Neve analog console. Tape machines: Studer A80 1/2" and 1/4", Otari 1/2", Studer Revox cassette deck. Noise reductions: Dolby A, SR, B, dbx type I. Monitor speakers: SOTA CF-750 in two acoustically matched sets. Digital editing systems: (3) Sony PCM-1630, (5) BVU-820, (1) DMR-4000, (3) PCM-2500, DAL-1000 limiter, Sony DAE-3000 editor, DFX-2400, LHH-1050 PQ editor. Cutting lathes: Neumann VMS 70 with Zuma audio. Signal processing: Pultec EQ, UREI LA-4 limiter, BBE-202R. Engineers: George Graves, Allan Moy, Kathy Birkett. Rates: \$140 (Canadian funds) per hour, base rate. Call for full quotation on requirements. Tape duplication—method of duplication: SAM. Packaging equipment/fulfillment serv-

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Montreal, QC

#### LES INDUSTRIES MAGRA LTEE



55 Ave. du Mont Royal W., Ste. 802; Montreal, QC H2T 2S6; (514) 286-2472; FAX: (514) 286-0341. Contact: Mario Paquet, president. Equipment and Services: Mastering—mastering console: Chilton QM-. Tape machines: Studer A807-2/2, Studer A807 4/4, (2) Revox. Noise reduction: Dohly B. Monitor speakers: JBL 4312. Signal processing: Klark-Teknik EQ, Symetrix noise reduction. Engineer: Pauline Roy. Rates: on request. Tape duplication—method of duplication: in-cassette and bin-loop. Duplicator: (102) KABA slaves, bin-loop. Duplicating speed: KABA 1-1 and 1-2, AEC Lyre 1-40 and 1 80. Capacity: 1,200,000. Tape used: Ampex, Sanyo, Agfa. Shell used: Magnetic Media, Shape Mark IV, Michelex. Loading equipment: (3) AEG Korps 4, (2) Electro Sound. Packaging equipment/fulfillment services: Shrink and print on cassette with Roldex. Rates: on request. Other: KABA, demo, new age on CrO2, cassette album kits, 48-hour service. Bin-loop, low minimum and choice of colors for printing. DAT-to-DAT copy, reel-to-reel copy. Free demo sample on cassette and studio accessories available. Distributor of Ampex and 3M products.

#### MEDIA HOUSE PRODUCTIONS INC.



1174 Winnipeg St.; Regina, SK S4R 1J6; (306) 359-0977; FAX: (306) 569-2240. Contact: Joan Dolter.



MUSICLANE  
Markham, ON

#### MUSICLANE



110 Konrad Cres. Unit 6; Markham, ON L3R 9X2; (416) 479-7560; FAX: (416) 477-0075. Contact: Ted Carsorn. Equipment and Services: Mastering: complete compact disc and cassette mastering to PCM-1630. Digital Domain EQ, compress on/expansion, level adjustments, etc., available with snapshot automation at real-time. Digital editing: non-destructive digital editing with user created fades, crossfades, segment editing and much more using the Sonic System. For rates and more information call Ted at (416) 479-7560.

#### PRECISION SOUND CORP.



3117 Norland Ave.; Burnaby, BC V5B 3A9; (604) 299-4141; FAX: (604) 299-4146. Contact: Sonja Forseth, Dan Howton.

#### SONRISE AUDIO DUPLICATION



#7 128040 Bathgate Wy.; Richmond, BC V6V 1Z4; (604) 278-1544; FAX: (604) 270-2745. Contact: Lorne Klassen.

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January 1993

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Sound for *Beauty and the  
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# MIX

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# MIX READER SERVICE

For more information about products & services in MIX:

**1.** See the opposite page for a listing of Reader Service numbers for advertisers in this issue.

**2.** Circle the Reader Service numbers that correspond to each advertisement or editorial item in which you are interested. (Maximum of 20 numbers.)

**3.** Complete all information on the card below. Please check ONE answer for each question unless otherwise indicated.

**4.** Mail card postage-free!

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P.O. Box 5069, Pittsfield, MA 01203-9856

Issue: *Mix*, December 1992 / Card Expires: April 1, 1993

Name \_\_\_\_\_ Title \_\_\_\_\_  
 Company \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_  
 State \_\_\_\_\_ Zip \_\_\_\_\_  
 Phone (\_\_\_\_) \_\_\_\_\_

- 1) Your company's primary business activity (check ONE):
  - 01.  Recording studio (including remote trucks)
  - 02.  Independent audio recording or production
  - 03.  Sound reinforcement
  - 04.  Video/film production
  - 05.  Video/film post-production
  - 06.  Broadcast/radio/television
  - 07.  Record company
  - 08.  Record/tape/CD mastering/manufacturing
  - 09.  Equipment manufacturing (incl. rep. firm)
  - 10.  Equipment retail/rental
  - 11.  Contractor/installer
  - 12.  Facility design/acoustics
  - 13.  Educational
  - 14.  Institutional/other (please specify)
- 2) Your job title or position (check ONE):
  - 15.  Management—President, owner, other manager
  - 16.  Technical & Engineering—Engineer, editor, design engineer, etc.
  - 17.  Production & Direction—Producer, director, etc.
  - 18.  Sales & Administration—Sales rep, account executive, etc.
  - 19.  Artist/Performer—Recording artist, musician, composer, other creative
  - 20.  Other (please specify)
- 3) Your role in purchasing equipment, supplies and services (check ONE):
  - 21.  Recommend the purchasing of a product or service
  - 22.  Specify makes, models or services to be purchased
23.  Make the final decision or give approval for purchase
24.  Have no involvement in purchasing decisions
- 4) Your company's annual budget for equipment, supplies and services:
  - 25.  Less than \$50,000
  - 26.  \$50,000 to \$149,999
  - 27.  \$150,000 to \$249,999
  - 28.  \$250,000 to \$499,999
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  - 30.  Immediate purchase
  - 31.  Files/future purchases
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006	031	056	081	106	131	156	181	206	231
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008	033	058	083	108	133	158	183	208	233
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011	036	061	086	111	136	161	186	211	236
012	037	062	087	112	137	162	187	212	237
013	038	063	088	113	138	163	188	213	238
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016	041	066	091	116	141	166	191	216	241
017	042	067	092	117	142	167	192	217	242
018	043	068	093	118	143	168	193	218	243
019	044	069	094	119	144	169	194	219	244
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023	048	073	098	123	148	173	198	223	248
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P.O. Box 5069, Pittsfield, MA 01203-9856

Issue: *Mix*, December 1992 / Card Expires: April 1, 1993

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  - 01.  Recording studio (including remote trucks)
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  - 04.  Video/film production
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  - 07.  Record company
  - 08.  Record/tape/CD mastering/manufacturing
  - 09.  Equipment manufacturing (incl. rep. firm)
  - 10.  Equipment retail/rental
  - 11.  Contractor/installer
  - 12.  Facility design/acoustics
  - 13.  Educational
  - 14.  Institutional/other (please specify)
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  - 17.  Production & Direction—Producer, director, etc.
  - 18.  Sales & Administration—Sales rep, account executive, etc.
  - 19.  Artist/Performer—Recording artist, musician, composer, other creative
  - 20.  Other (please specify)
- 3) Your role in purchasing equipment, supplies and services (check ONE):
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025	050	075	100	125	150	175	200	225	250

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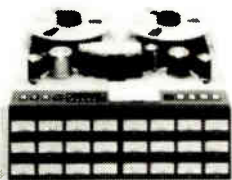
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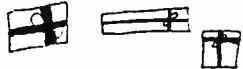
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—FROM PAGE 150. STEVE DOUGLAS

Also, it's great being free to not have to stand in front of the microphone—I can go off and interact with the other musicians.

**Bonzai:** Is there anyone in the world that you would like to meet?

**Douglas:** Fats Domino. I've never worked with him and I just love his music.

**Bonzai:** Can you remember your most ridiculous experience in a recording studio?

**Douglas:** I can't tell you who I was working with, but we were all pretty loaded on acid in a pitch black room trying to make music and that was very bizarre. I'm sorry I can't elaborate.

**Bonzai:** Who is the most amazing artist you've worked with—someone who touched you, and blew you away?

**Douglas:** Bob Dylan. I am a big fan of something that most people might not even like in him, or acknowledge, but he's an amazing guitar player. He is the only guy I know who can play sloppy and out

of tune, and have it be so charming that you can't *stand* it. Like these out-of-tune reggae bands that have the groove, the beat and the feel. Having toured with Bob, I saw amazing nights. Not every night, but maybe one out of five he'd play harmonica, play guitar and sing and be just amazing, a wizard on these things, taken to a whole other level. His singing can be pretty amazing when he's not doing that out-of-tune shit, you know? His depth as a writer is unchallenged. I think he makes dreadful records, his weakest area, but he never ceased to amaze me and the other members of the band.

Brian Wilson was another amazing guy I worked with. I worked on the *Pet Sounds* album. It was so hip, so interesting and so challenging musically. To watch him break new ground, and be so musically mature without really knowing what he was doing. He would hear things in his head and work toward getting it out. I saw him challenged many times by musicians: "Brian, that's not going to work, it doesn't sound right." He'd just say, "Do it." And later on he

would overdub something and it would all come together.

Spector is another one—maybe the greatest record producer who ever lived. The thing that was great about those days and watching these people work was, first of all, we knew we were making hit records. It made the sessions particularly exciting and rewarding when we were working with Phil or Brian, because we knew we were making hit records. They just had an edge over everything else.

**Bonzai:** As an artist, would you consider yourself a late bloomer?

**Douglas:** I'm definitely a late bloomer—I feel that my writing has never been better. It's hard, because my history doesn't always work in my favor. If I make a jazz album, I won't be accepted by the jazz crowd. They don't give a shit about Brian Wilson or Phil Spector. I was never really accepted by the academic circles—I'm just a rock 'n' roll punk who got lucky. ■

*Roving editor Mr. Bonzai does not play sax, although he knows how to chicken squawk and flutter tongue.*

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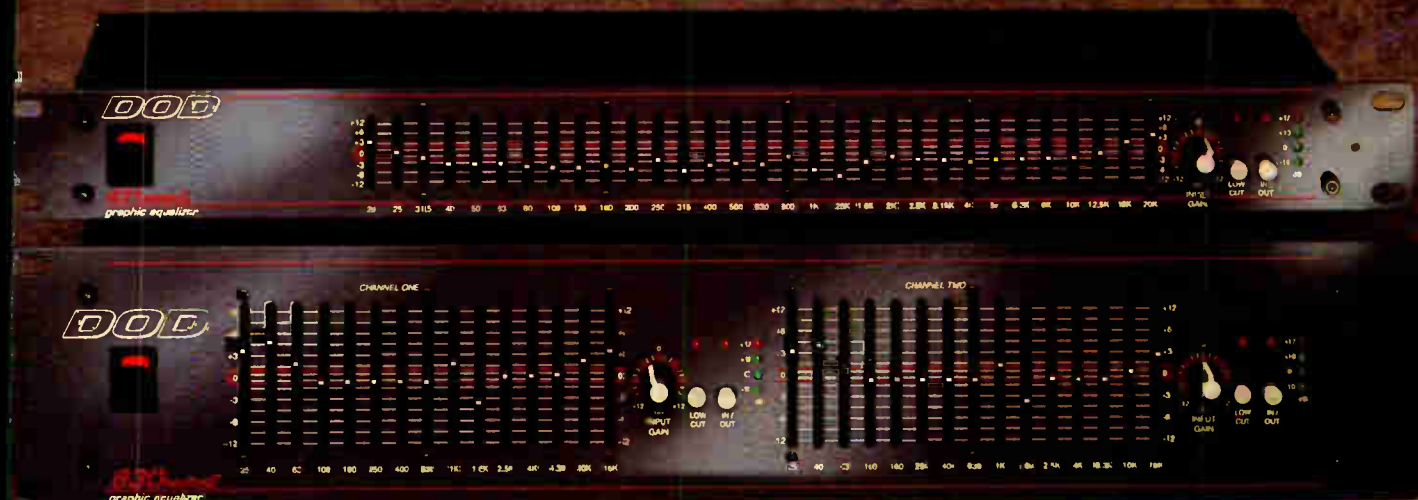
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