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MIX

George Massenburg on Recording, Automation and Console Design

Studio Monitors: The Next Generation

THE RECORDING INDUSTRY MAGAZINE

Class of '89

13 of America's Sexiest New Rooms Pose for *Mix* Readers

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Directory of Studio Designers and Suppliers

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MIX

AUGUST 1989 THE RECORDING INDUSTRY MAGAZINE VOL. 13, NO. 8

ACOUSTIC SPACES PAGE 28

DR. JOHN PAGE 65

STUDIO MONITORS PAGE 75

COMPUTERS FOR MUSIC PAGE 125

Starting this month: *John Woram's Basics* Technical insights for the beginner, drawn from John's latest book, *Sound Recording Handbook*.

Founded 1977 by
David M. Schwartz and Penny Riker Jacob

Cover: The "big" room at Howard Schwartz Recording in Manhattan is home to an SSL 6000 G Series, Sony PCM-3348 48-track digital and Studer A820 analog. Designed by John Storyk ten years ago, the 26 x 22 control room handles audio post for film, commercials and TV shows. **Photo:** Robert Wolsch. **Inset:** Gene Duncan

DEPARTMENTS

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BPA

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FROM THE EDITOR

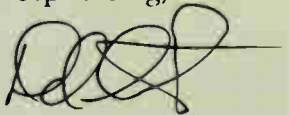
It goes without saying, if you happen to be a studio owner, that riding a vicious spiral of spending is a requirement for staying in business. Unfortunately, as too many have found out the hard way, more investment does not necessarily translate into the ability to pass along higher rates. It may only allow a studio to stay competitive. Whereas a studio with a $100,000 investment in 1969 might have been able to charge $125 an hour for its services, to charge the same $125/hour in 1989 might require a $1 million bankroll.

Capital-intensive is the way of life for a studio owner. And equipment is only part of the outlay. The demands of digital recording have created ever more stringent needs for optimized studio acoustics and ergonomics. Construction and acoustical materials that allow for +90dB dynamic range recording environs have forced many to cut back to their structural skeletons and beef up their invisible components, with no hope of recovering those direct costs in rate adjustments.

The previous assertion is obviously rhetorical, in that studio operators are a unique breed who have found their way into this business less from a desire to find wealth than a compulsion to pursue their passion. Nonetheless, this pursuit is costly, and to stay in the game requires an absolute commitment to professional business operations. There is no longer a dime to waste in running a studio. Quality needn't be sacrificed for economics; however, budgeting, projecting, developing profit centers, creative financing and well-honed judgment have never been more important to the fortunes of a studio owner.

This month we look at topics relating to studio design and acoustics, and talk to some of the people who are designing and investing in the studio technology of today and tomorrow. Our hats go off to these bold entrepreneurs who are risking their fortunes to keep our industry at the forefront of technology. More power to you!

Keep reading,



David Schwartz
Editor-in-Chief

With nine work stations o we'd like to introduce

Forgive us if we sound a little pompous. It's just we find ourselves in a curious position. Over the past several years, everyone and their brother has introduced a so-called "work station." When, to our way of thinking, they really aren't work stations at all.

To us, a work station should have the most sophisticated sequencer available. And in fact, our new W-30 does. It features 16 tracks, microscope editing, full compatibility with both Roland MicroComposers and Directors "S" Sequencing software, to say nothing of the friendliest user interface there is.

To us, a work station should also be designed around a sampler rather than a synthesizer. What this does, more than anything else, is make the system remarkably versatile. It's a whole lot easier to make a sampler sound like a synthesizer than the reverse. And speaking of sounds, those from the W-30 can be processed through either eight polyphonic outputs or a mix output.

Because the W-30 uses the same disks as the S-50 and S-550, you won't need to build a sound library. It already exists.

To us, a work station should possess an excellent memory. Which is why we've equipped the W-30 with a one mega-

n the market, the first.

byte, user-accessible memory (ROM). And because it comes with the most frequently-used sounds, you won't need to load in a sound disk to begin working.

The sampler section's 512k (RAM) memory is no less impressive. It's actually equal to that of a Roland S-330, and can be used for creating new sounds, or for playback, or for manipulating any of the S-Series disks. As a result, you'll not only be in a position to work with the sounds that are currently hot, you'll be in just as good a position to capture the sounds that will become hot.

Nor does its versatility end here, because the Roland W-30 not only puts

If you squint you can probably make out the fact that the new Roland W-30 has eight polyphonic individual outputs which allow any sound to be routed individually to a mixer.

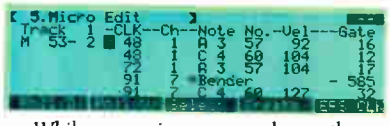
a 3.5" floppy disk drive at your disposal, it also gives you the ability to access additional data by using either a CD-ROM or a hard disk connected to an optional SCSI interface.

Of course, a work station should be able to express itself too. Which is why we've made our 61-note keyboard sensitive to both velocity and after-touch.

And it should be easy to use. Hence, the W-30 uses a large, state-of-the-art 240 x 60 dot LCD display that's capable of providing more useful information at one time than ever before.

But before we go, let us take this moment to pose a hypothetical question. Let's just say that all of the other so-called work stations found a way to include these very same features. They'd be better, of course, but still not comparable to the remarkable new W-30. Because they'd still be missing the most persuasive and motivating feature of all.

Our state-of-the-art 240 x 60 dot LCD display lets you view all the parameters while editing.



While sequencing you can change the length or dynamic value of any note simply by using microscope editing.

The Roland logo.

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CURRENT

GLW ACQUIRES HARRISON

GLW Enterprises, Inc., a group of Nashville-based investors, recently acquired the assets of Harrison Systems and has stepped up production of the Harrison line of consoles from its Nashville manufacturing facility.

Sales and marketing activity began immediately with the purchase of a Harrison Series Ten console by Eastside Sound in New York City. That was followed by the delivery of an SR-490, the company's new audio console for film scoring and re-recording, to Tecnison S.A. of Madrid, Spain.

Lou Holtzman and R.J. Cicero, speaking for Eastside Sound, said, "The Series Ten with Mac IIX automation is the console that will take us into the '90s. We looked at every music recording console available in the market, and the Series Ten far outdistanced the competition."

After installation this month, Eastside Sound will be conducting workshops and seminars on the Series Ten. The first is scheduled for September 9 to 12.

For more information, contact GLW at (615) 331-8800 or FAX (615) 331-8883.

CD-ROM SEMINAR AND EXPO

Meridian Data, Inc., and Philips and Du Pont Optical, in conjunction with Microsoft Corporation and Hewlett-Packard Company, will present the final two segments of their second annual CD-ROM Developers Seminar Series: October 16 in Chicago and November 16 in Dallas. To register, contact Meridian Data at (408) 476-5858 or FAX (408) 476-8908.

CD-ROM Expo '89, sponsored by *Infoworld*, *Federal Computer Week* and LINK Resources Corp., will take place in Washington, DC, October 3-4. Interested parties contact Jeff Arcuri at (617) 329-8334.

QUAD EIGHT PURCHASES QUAD EIGHT

Quad Eight Electronics, Inc., a relatively new California corporation, has purchased the assets, goodwill, engineering and manufacturing facilities of the Quad Eight audio mixing console from Quad Eight/Westrex, also know as the Mitsubishi Pro Audio Group.

The new company will continue to manufacture the Westar console (under the Virtuoso name) and the FilmStar film re-recording console. All warranty and nonwarranty service obligations of previously purchased consoles manufactured by Quad Eight/Westrex will be assumed by Quad Eight Electronics.

The new management team at Quad Eight Electronics includes Bill Windsor, president; Chuck Kelley, director of operations; and Bob Windsor, chief financial officer.

Console customers with service requests are asked to contact Quad Eight Electronics directly at: 225 Parkside Dr., San Fernando, CA 91340; tel. (818) 898-2341, FAX (818) 365-8310.

SIGMA SOUND SOLD

M & M Syndications, Inc., of Voorhees, N.J., has purchased the assets of Sigma Sound's New York City studios.

Michelle Pruyn, president of M&M Syndications, says things are going well in the first month, with old clients returning and new ones coming in to take a look. M & M also owns Edit Masters, a New Jersey video production company, and was looking to diversify into recording, according to Pruyn.

"We're looking to upgrade Studio 5 and add some capabilities," Pruyn says of future plans, which include the addition of D2 and 1-inch video machines. Gary Robbins is now serving as general manager, and Kieran Connelly is assistant studio manager.

Sigma founder Joe Tarsia and partner Pete Pelullo say they will now concentrate on their Philadelphia studios, and on establishing a new company, Sigma Alpha Entertainment Group, Ltd. The company's record label, Alpha International Record Co., will be distributed in North America by CEMA. "We had a very good run in New York," Tarsia says, "but it is now time to move on to bigger and better things."

SPARS TO HOST WORKSTATION CONFERENCE

The Society of Professional Audio Recording Services will host a technical conference on audio workstations in Chicago on the weekend of September 23-24. Murray Allen, president of Universal Recording, will chair the events.

Participating manufacturers will include AMS, DAR, Lexicon, New England Digital, SSL and Wave-Frame. Discussions are planned on "Audio Workstations—The Audio Solution for Video Post-Production" and "All Right, We've Seen It—How Do We Pay for It?"

For further information and reservations, contact Shirley Kaye, SPARS executive director, at (407) 641-6648.

MIX ADDS TO SALES TEAM

Sue Horwitz and Michele Kanatous have joined the *Mix* magazine sales team. Horwitz, formerly of Wave-Frame, is now the Southern California/Southwest advertising manager operating out of L.A. She can be reached at (818) 709-4662. Kanatous comes from *Post* magazine and is now the Eastern advertising manager out of *Mix*'s new Manhattan offices. She can be reached at (212) 545-5166. A hearty welcome. ■

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

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

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

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

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

And if you think digital machines have a corner on high performance transports, think again! The MTR-100's new transport incorporates reel motors that approach one horsepower—you'll get fast wind speeds of up to 474 inches per second! Of course, the transport is pinchrollerless to give you the legendary tape handling ballistics of our MTR-90.

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

Reel motors that approach one horsepower are driven by pulse width modulation amplifiers to tape speeds up to 474 ips.

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

So there you have it. With these powerful benefits available in analog, does it make sense to go digital? Sure, for some applications. But analyze your needs carefully before you buy. For many applications, a hot analog tape machine like the MTR-100 is the right choice.

And because we can see both sides of the question, put us to work. We have information that can help you make the right decision. Call Otari at (415) 341-5900 for the *"Technology You Can Trust"*.

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by Jim Yellowhawk

Due to the overwhelming number of inquiries, Sisapa Record Co. is proud to announce the release of the original art reproduction of Jim Yellowhawk's "Medicine Man".

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To assure equal distribution of low and high numbered prints, we will hold every third print for our foreign buyers.

We at Sisapa are thrilled at the massive requests we have received to release "Medicine Man" prints. We hope you will be equally thrilled to be the proud owner of your first Yellowhawk.

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President

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INDUSTRY NOTES

The Oscar-winning audio team for *Bird*, **Willie Burton, Les H. Fresholtz, Dick Alexander** and **Vern Poore**, accepted 3M's Lyra Award in Toluca Lake, CA. Also honored were the sound crews for *Die Hard, Gorillas in the Mist, Mississippi Burning* and *Who Framed Roger Rabbit?*...**Al Zang** has joined **Sennheiser Electric** of Old Lyme, CT, as manager for professional products, concentrating on dealer and end-user support...**Altec Lansing** has named **Patrick Flannery** district sales manager for the Midwest territory, operating out of the Oklahoma City offices...Moving up at **TimeLine**, New York City, are **Mitchell Chaplauske**, now production manager, and **William Ruggeri**, now purchasing manager...The popularity of the BOSS™/2 has led **Alpha Audio** to hire **Eric Heiberg** as a hardware and software designer. His first project was a retrofit time code reader module for ¾-inch video machines...Looking ahead to 1992, **Citronic** of Melksham, Wiltshire, UK, is introducing a safety standard spec to be adopted by manufacturers of pro audio equipment in the European economic community. Certificates of safety will be expected to accompany all distributed product ...**Solidstate Controls, Inc.** (SCI) of Columbus, OH, has acquired all power protection products carrying the DataShield name from **Pentron Corporation**. The DataShield products include online, uninterruptible power supplies, standby power supplies and power surge protectors...Up in Buchanan, MI, **Electro-Voice** has appointed **John Murray** as marketing development manager for pro sound reinforcement; also, **Claude Kleiman** has been named market development manager for wireless mics...**Greencorp Magnetics**, Australia's leading tape manufacturer, is entering the U.S. market with three lines of high-speed blank cassettes: a premium chromium dioxide, a super gamma ferric and a quality gamma ferric...**Spatial Sound Inc.** of Mill Valley, CA, has appointed **Dave Yancey** as national sales manager...Fifteen student composers recently received the **BMI Student Composer Awards** recognizing superior creative talent. More than 400 entries were submitted for the 37th annual awards, co-sponsored by BMI and the BMI Foundation...**Mort Feld**, 62, retired from his position as general manager of San Francisco-based **McCune Audio/Visual/Video** after 47 years of service; he will remain on call as a consultant...**Rob Peck** has been appointed marketing manager of **Martin Audio Ltd.**, London; also **Lynn Chappell** has been promoted to sales manager...The new international sales manager for **Soundtracs plc**, **Colin Lane-Rowley**, will support established markets in Europe and the Far East, and be looking for new outlets for the Surrey, UK-based manufacturer ...**R. Richard** Dyer has been elected chairman of the board of directors for **Pierce-Phelps, Inc.**, the audio-video supplier and teleconferencing installer from Philly; **Brian G. Pierce** has been named VP of planning and development...**C-SPAN**, the cable TV public affairs network based in Washington, DC, has converted its entire operation to **Panasonic's** ½-inch MII videotape format...**John W. "Jack" Murphy** has been promoted to VP and general manager, Eastern operations, at **Apple Computer**...**New England Digital**, meanwhile, has appointed **Ronald G. Knaggs** as VP of finance and chief financial officer...**Integrated Audio Sales** has opened doors in Hollywood. New address: 1556 N. La Brea, Hollywood, CA 90028...*The Home Studio Helper*, a catalog of products and services to help equip and control a home recording studio, is now available from **Hummingbird Recordings** of Palm Bay, FL...**Audio Processing Technology**, an SSL company, has appointed **Charlie Day** as product manager for the apt-X 100 digital audio compression system. Day is the former managing director of **Fairlight (UK)** ...A new high-level technical support group has formed in Hollywood. It's named **Hydra Tech** and combines the talents of **Mitch Marcoulier, Ron Ballard** and **Tim Myer**. ■

SESSIONS
AND STUDIO NEWS

NORTHWEST

Producer **Michael Molenda** completed the final mixes for the **Friends of Sarah Conner** cassette single for Sound & Vision Records at **Sound & Vision Studios** in San Francisco... Ex-Tower of Power vocalist **Lenny Williams** was at **Studio D Recording** in Sausalito, CA, working on an album project. **Alan Glass** and **Joel Jaffe** co-produced for Crush Records, with Jaffe engineering and "**Watts**" **Vereecke** assisting ... **Turtle Mobile Recording** (Bellevue, WA) recently recorded **The Pat Travers Band** live at The Commodore in Vancouver, BC. Engineering was **Larry Anschell**, assisted by **Dave Trgovcic**... **Joe Satriani** was at **Hyde Street Studios** in San Francisco working on his upcoming album. He co-produced with help from engineer **John Cuniberti**. **Matt Kelley** assisted... In Burnaby, BC, local rockers **Young Gun** recently released their first record, *Bite the Bullet*. Recorded at **Inside Trak Studios**, the six-song EP was engineered and mixed by **Lisa Barton** and produced by **Larry Gillstrom**... At **Ironwood Studio** in Seattle, engineer **Paul Scoles** was busy working with folk writer/musician **Geof Morgan** of Flying Fish Records... Recent sessions at **Starlight Sound** in Richmond, CA, included the **Denny Zeitlin Trio** recording their second album for Windham Hill Jazz. **Denny Zeitlin** produced with **Bill Thompson** engineering...

SOUTHERN CAL

Epic artists **Stevie Ray Vaughan** and **Double Trouble** were at **Soundcastle** in Los Angeles working on overdubs and mixing with producer **Jim Gaines**. **Dave McNair** engineered and **Bob Lacivita** assisted... **Pete Townshend** re-recorded Arthur Brown's version of "Fire" for a new rock opera. **Paul Erikson** engineered the sessions at **41B Recording Studios** in Westlake Village... **Jan Berry** of Jan and Dean was working on his new solo album at **Entourage Studios** in North Hollywood. **Mark Wolfson** engineered... Producer **Jay King** was at **Paramount Recording Studios** in Hollywood cutting new tracks for **Club Nouveau**... Trumpeter and bandleader **Maynard Ferguson** headed into **Sound Design** studios in Santa Barbara to cut a 48-track big band album. **Dom Camardella**, the studio's in-house producer and engineer, was at the helm... **Warren Zevon** was at **Red Zone Studios** in Burbank completing his album for Virgin Records, produced by Zevon, **Duncan Aldrich** and **Andy Slater**... With the recent demise of *Moonlighting*, **Bruce Willis** has been spending his time at **Hollywood Sound Recorders** working on his second LP for Motown/MCA. Due for a Christmas release, the blues/rock album features a host of guest stars, with **Robert Kraft** producing, **Dave McNair** at the board and **Martin Schmelzle** assisting... The Pisces production team of **Jarrett, Scotti** and **Goldblack** were busy at **WEC Recording Studios** in Universal City working on new releases by several Bouvier/CBS Records and Credence Records artists, as well as a soundtrack for *Over the Rainbow*, due out in December. Jarrett ran the board, assisted by **Darryl Coit** and **Ronnie Cea**... **Melanie** was busy at **Fidelity Studios** in Studio City finishing her latest U.S. release. Produced by **Artie Ripp** and **Peter Scheckeryk**, the album was engineered by **Cliff Zellman** and assistants **Steve Zipper, Dave Lopez** and **Joe Romersa**... **Dan Bates** and **Bob Esty** were at **Sound Image Studio** in North Hollywood producing and engineering a project for **Chain Reaction**... **Smokey Robinson** was at **Elumba Recorders** in L.A. working on his latest LP. **Howard King, Fritz Cadet** and **Rhett Lawrence** produced. **Larry Fergusson, Donnell Sullivan** and **John Gass** engineered... The **Black Velvet Band** from Ireland was at **Sunset Sound Factory** in Hollywood finishing up their Elektra Records release. **Pete Anderson** produced, **Scott McPherson** engineered and **Scott Woodman** assisted... **Melissa Etheridge** was recently at **Devonshire Studios** in North Hollywood doing overdubs for her upcoming record on Island Records. **Niko Bolas** and **Kevin McCormick** produced the session, with Bolas engineering and **Larry Goodwin** assisting... **Westlake Audio** in Los Angeles hosted **Weird Al Yankovic**, tracking new material for Scotti Brothers with producer **Rick Derringer**, engineers **Tony Papa** and **Darryl Dobson**, and assistants **Ric Butz** and **Bill Malina**... At **Summa Music Group** (West Hollywood), **Belinda Carlisle** recorded vocals and overdubs for her new LP. The project was produced by **Rick Nowells**, with **Lori Fumar** assisting engineer **Steve Marcantonio**... **Bobby Brown** was at **Larrabee Sound** in West Hollywood working on "We're Back," the theme song for *Ghostbusters II* for Columbia Pictures. **Keith Cohen** mixed the tune ... At **Artisan Sound Recorders** in Hollywood, engineer **Greg Fulginiti** mastered LPs for **T'Pau** with producer **Keith Olsen**, **Silent Rage** with producer **Gene Simmons** and **Blue Murder** with producer **Bob Rock** ... At **Aire L.A. Studios** in Glendale, **Jasmine Guy** was in recording vocals and tracking for her upcoming Warner Bros. album. **Rex Salas** produced, with **David Koenig** and **Rob Seifert** engineering... **Billy Idol** was in at **Take One Recording** in Burbank working on his latest for Chrysalis Records, with **Keith Forsey** producing, **Dave Concourse** behind the board and **Steve Montgomery** assisting... At **The Enterprise** in Burbank, **Princess Stephanie** was in tracking vocals and keyboards for her upcoming CBS debut. **Ron Bloom** and **David Kahne** produced the project, with Kahne engineering and **Christopher Danley** assisting... **Paula Abdul** was at **Skip Saylor Recording** in L.A. working with producers **Oliver Lieber** and **Randy Peterson**. **Peter Arata** engineered and **Joe Shay** assisted... **Poco** was at **Lion Share Recording Studios** in Los Angeles recording overdubs and mixing their latest for RCA Records, with **David Cole** producing and engineer-

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ing and **Laura Livingston** assisting...At **Dodge City Sound** in Burbank, Metal Blade artists **Alex Masi** and **Lizzy Borden** were recording, with **Alex Woltman** engineering and co-producing both projects and **Elliot Solomon** sharing duties for Lizzy Borden...

SOUTHWEST

Arlyn Studios in Austin reports that **Chris Thomas** was in finishing up his album for Hightone before leaving on a European tour. **Bruce Bromberg** produced the project...**Ricky Lynn** (formerly of Head East) recorded his first country album at **Crystal Clear Sound** in Dallas, with **Keith Rust** handling engineering duties and Lynn and **Donny Heil** producing. Also at CCS, Capitol Records artist **Tim Finn** showcased his new release for local radio stations, with Rust behind the board recording live to R-DAT...

SOUTHEAST

At **Midiland Recording Studios** in Coral Gables, FL, **Lou Rawls Jr.** was in cutting tracks for his upcoming LP with producer **Eric Foster White** and engineer **Will Tartak**...Atlanta's **Mastersound Studios** recently played host to Earth, Wind and Fire drummer **Sonny Emery**. Emery mixed a 12-inch single for his upcoming solo release on Landslide Records. The cut, "Serious," was engineered by **Ron Cristopher**...**Soundworks Recording Studio**, a new recording facility in Macon, GA, recently had Taj/Motown artist **AC Black** in working on two tunes. **David Norman** ran the console...Epic/Sony artists **Bo Gumbos** from Tokyo completed tracks for their debut album at **Ultrasonic Studios** in New Orleans. **Scott Goudeau** engineered the project, which featured guest appearances by **Bo Diddley** and **Cyril Neville**...The **McCarters** were at **Treasure Isle** in Nashville recording overdubs for their latest Warner Bros. release. **Paul Worley** and **Ed Seay** produced, with Seay handling engineering duties...**The Drama Club** was at **Cheshire Sound Studios** in Atlanta completing work on a new album for PolyGram. **Keni Burke** produced the project...**K.T. Oslin** was at the **Music Mill** in Nashville recording overdubs and mixing a program for Westwood One. **Joe Scaife** and **George Clinton** engineered the sessions...A&M artist **John Hiatt** was at **Sound Emporium** in Nashville self-producing tracks for his latest release, with **Rick Wills** engineering...Producer **Timmy Tappan** and engineer **Bob Tassi** were at **Soundshop Recording Studios** in Nashville working on a commercial for Kentucky Fried Chicken. The spot features the song "Wild Thing"...

NORTHEAST

At **Prime Cuts** in New York, **Tony Humpries** was in editing **Fun Boy Three**'s "Faith, Hope and Charity" for Chrysalis, and **David Connelly** edited **Eddie Murphy**'s new song, "Put Your Mouth on Me"...Recording and motion picture artist **Ruben Blades** was in **Sound Ideas Studios**, NYC, working on his new Elektra release with **Jon Fausty** engineering and **Mike Ifversen** assisting...At **Baby Monster** in NY, **Jane Gillman** was in recording her album for Green Linnet Records. **Steve Burgh** produced and engineered...Also at Baby Monster, **Elliot Sharp** was in recording and producing **Bachir Attar**, "The Master Musician of Jajouka," for release on Zora Records... **New Romance Crew** was at **EARS** in East Orange, NJ, mixing their Virgin Records LP with producer **Mtume**. **Craig White** engineered and **Danny Salt** assisted... **Charlie Karp and the Name Droppers** were recently in session at **Northlake Sound** (N. White Plains, NY) recording their second album for Grudge/BMG. Karp produced and **Ed Solan** engineered... Vocalist **Janet Dailey** led her metal group, **Pleasure Bombs**, through a smokin' series of sessions at **Sear Sound** in Manhattan. **Walter Sear** engineered the 24-track demo...At **JSL** in Oyster Bay, NY, **Lori Logan** was in recording an original song, "Impress Me." The full-blown MIDI production made full use of the studio's new Mac SE and *Performer* software...Newly signed Motown act **LX** spent two days recording vocals at **Ciani/Musica Studios** in NYC. **Janese Super** produced and **James LaCroix** engineered, assisted by **Guy Lento** and **Ivan Katz**...In Jersey City, NJ, **Ben E. King** was at **Quantum Sound Studios** tracking basics, with **Bert D'Coteaux** producing for Atlantic Records. **Bill Klatt**, **Mark Pawlowski** and **Doc Dougherty** were at the console, with **Steve Sisco**, **Darryl Kelly** and **David Carpenter** assisting...**David Strathairn** was at **New York Audio Productions** recording the narration for a Random House Audio Book, **Jefferson Parker**'s *Little Saigon*. **Paul Barboza** engineered the session and **Robert Kessler** produced...**Billy Squier** completed his sixth album for Capitol Records at **Power Station Studios** in New York City...Brazilian jazz artist **Toninho Horta** was at **Studio 900** in NYC cutting tracks for his latest LP on Verve/Forecast Records. Guest artists included **Pat Metheny**, **Randy Brecker** and **Nana Consuelos**. Studio owner **Tony Battaglia** engineered, with **Julio Pena** assisting...Island Records artist **Miles Jaye** recorded and mixed his self-produced second LP at **Kajem Victory West** in Gladwyne, PA, with **Mitch Goldfarb** engineering. Additional engineering by **Joe Alexander**, with **Brooke Hendricks**, **Brian Stover**, **Joe Stout** and **Jon Smeltz** assisting...Engineer **Barry Diament** of **Barry Diament Audio** (Riverdale, NY) has been busy mastering CDs for **Tony Banks** on Virgin and **The Questionaires** on EMI... Motown recording artists **The Boys** were at **Balance Sound Studios** in Bethesda, MD, recording audio for an anti-smoking music video and public service film. **Sharon Flynn** and **Jim Hristakos** produced, with **Jeff Severson** engineering and **Tom Deakin** assisting...Also at Balance Sound, New York rocker **Holly Beth Vincent** was in to help her pal **Laura Shawen** finish up an independent EP. Deakin and **Gregg Powers** shared production and engineering chores...**Prince Paul** was at **Calliope Productions** in Manhattan remixing "Good Thing" for IRS Records artists **Fine Young Cannibals**, with **Mike Teelucksingh** at the board...**Brent Musberger**, CBS-TV's "Mr. Sports," was at **Blank Productions** in Stamford, CT, doing State Farm Insurance commercials...**Hip Pocket Recording Studios** in Manhattan reports that **Gordon Grody** was in producing tracks for his upcoming album on SBK Records. **Butch Jones** was at the board, with **Pat Sweeting** assisting...**Bunny Wailer** was at Long Island City's **Power Play Studios** recording vocals and percussion for his new Solomonic Productions record. Engineers **Bryan Martin** and **Rob Sutton** were assisted by **Anton Pukshansky**, who also played guitar on several tracks...

NORTH CENTRAL

Brian Leftwich was in at **Alpha Music Productions** in Lenexa, KS, mixing a new album for the Tortuga label. Basic tracks were recorded at **Raguse Studios** in Tulsa, OK...At **the Disc Ltd.** in East Detroit, **Larry Hatcher** was in recording the **Temptations** for Motown Records. Also, **Valdez Brently** produced **Bridgette Grace** for Atlantic...**The Ellington Dynasty** completed their direct-to-2-track jazz album at **ARS Recording Studio** in Alsip, IL. Sessions were engineered and produced by **Jim Brown** and **Gary Cobb**...Pulling double duty as engineer and co-producer, **Danny Leake** completed a debut album for EMI/SBK Records artist **Darryl Tookes** at **Universal Recording** in Chicago... Grandstand Records recording artist **Sandra Feva** was at **Studio A** in Dearborn

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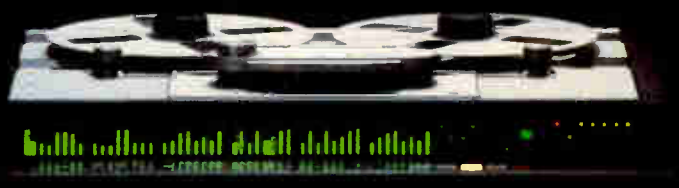

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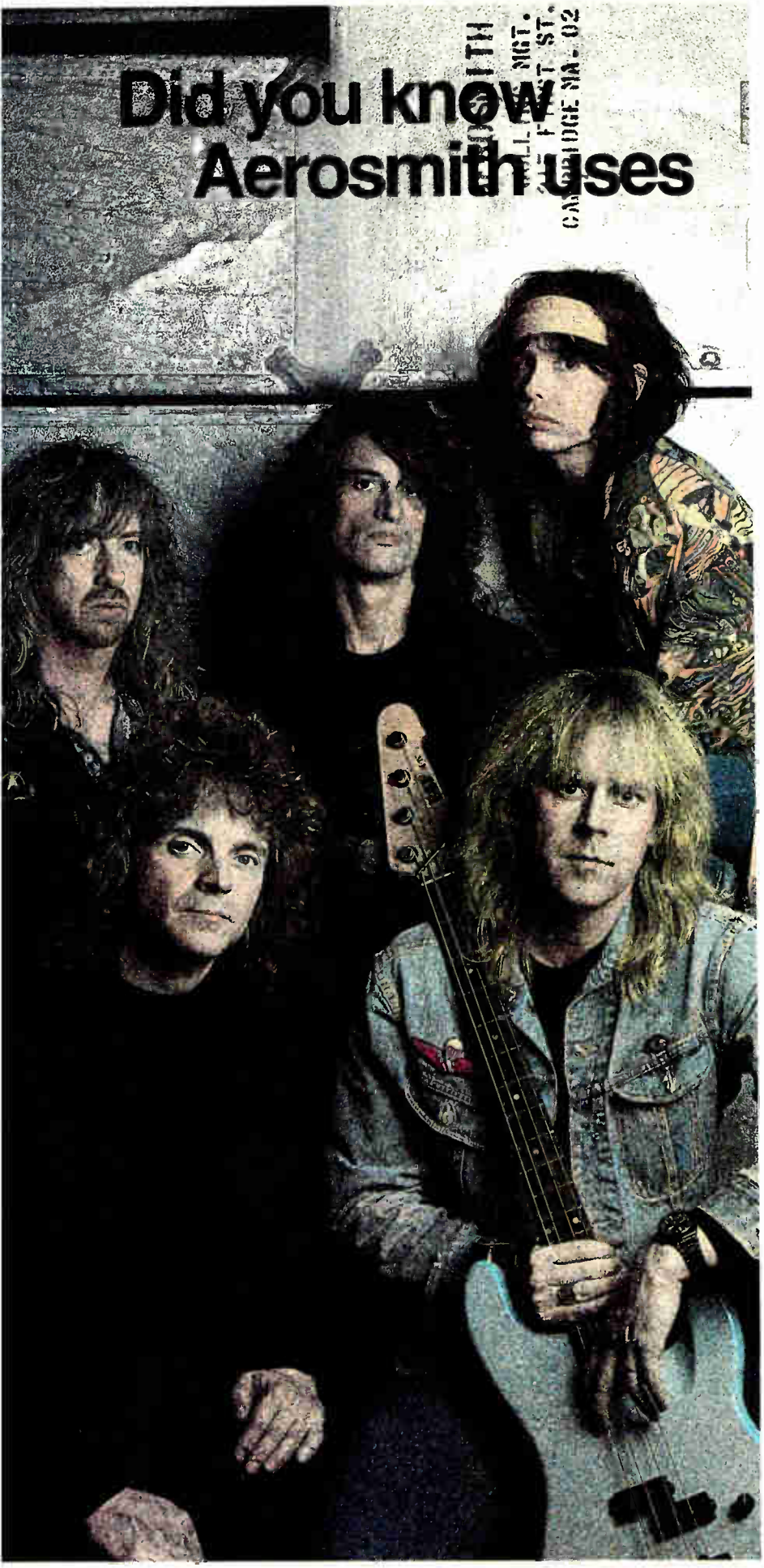
PROFESSIONAL AUDIO

—CONTINUED FROM PREVIOUS PAGE

Heights, MI, recording vocals for her first album, with producer **Gene Dunlap**, engineer **Greg Ward** and assistant **Randy Poole**. . . **Arthur Ray** recently completed a demo tape at **Black House Studio** in Ferndale, MI. Ray and studio owner **Mark Boker** produced the project. . .

STUDIO NEWS

Richard Rose of **Hot House Professional Audio**, NYC, designed and installed facilities at **Cotton Hill Recording** in Albany, NY. The 15,000-cubic foot, 11-sided control room was built around Tannoy's FSM-U monitors, and incorporates Perreaux 8000 and 6000 amps and Kimber Kable. . . The initial phase of a major renovation of **Buena Vista Sound**, Disney's full-service audio post-production center in Burbank, CA, has been completed. The facelift included wall-to-wall renovation of the studio's two dubbing theaters and machine rooms, consolidation of the transfer department and the rebuilding of the facility's engineering laboratory. Future plans call for a state-of-the-art dubbing stage and reconstructed ADR/Foley stages. . . **Tiki Recording Studios** in Glen Cove, NY, announced installation of an Adams Smith Zeta-3. The synchronizer will allow SMPTE synchronization between the facility's ¾-inch video machines and its 24-track and 2-track audio machines. . . **Alaska Video Publishing** in Anchorage purchased a Soundcraft 200B/VE console to be used for video post production and editing purposes. . . **Disc Mastering Inc.**, a Nashville-based mastering house, has added a Sony DAE 3000 audio editor to enhance its compact disc, cassette and vinyl mastering capabilities. . . **The Plant Studios** in Sausalito, CA, announced the opening of its Synclavier studio complete with an 8-channel Direct-to-Disk™ system. . . **Iris Sound** in Royersford, PA, received the Philadelphia Music Foundation's award for Recording Studio of the Year. . . **Omega Recording Studios** in Rockville, MD, installed a Solid State Logic 4048E Console with Total Recall and Primary Studio Computer. . . **Hyde Street Studios** in San Francisco recently acquired a Studer A800 MkIII 24-track recorder and 24 channels of Dolby SR. . . New equipment at **Blank Productions** in Stamford, CT, includes Sony video lockup, a PHMS earphone system (with a separate mix for each listener) and a 16-track Roland console. . . **Calliope Productions** in the Big Apple announced installation of a Sound Workshop 50-channel automated console, ½-inch mixing deck and video lockup. ■



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	ARTIST	ALBUM	PRODUCED ON SSL
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2	Soundtrack	Dirty Dancing	✓
3	Def Leppard	Hysteria	✓
4	INXS	Kick	✓
5	Michael Jackson	Bad	✓
6	Guns 'N' Roses	Appetite For Destruction	
7	Debbie Gibson	Out Of The Blue	✓
8	Richard Marx	Richard Marx	✓
9	Tiffany	Tiffany	
10	Aerosmith	Permanent Vacation	✓
11	Terence Trent D'Arby	Introducing The Hardline	✓
12	Whitney Houston	Whitney	✓
13	Gloria Estefan	Let It Loose	✓
14	John Cougar Mellencamp	The Lonesome Jubilee	✓
15	Rick Astley	Whenever You Need Somebody	
16	Bruce Springsteen	Tunnel Of Love	✓
17	Belinda Carlisle	Heaven On Earth	✓
18	Soundtrack	More Dirty Dancing	✓
19	Whitesnake	Whitesnake	✓
20	Robert Plant	Now And Zen	✓
21	Tracy Chapman	Tracy Chapman	✓
22	Keith Sweet	Make It Last Forever	
23	Poison	Open Up And Say . . . Ahh!	
24	Sting	Nothing Like The Sun	✓
25	Pink Floyd	A Momentary Lapse Of Reason	✓

1988 chart data supplied by Billboard/Music & Media. Albums indicated were wholly or partly produced using SSL consoles.

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by Ken C. Pohlmann

BEYOND SIXTEEN BITS

Back in the old days, the design of the input and output stages of a digital audio system was pretty straightforward: a brickwall analog filter and 16-bit A/D at the front end, and a 16-bit D/A converter and brickwall filter at the back end. Works great, particularly in theory. However, in practice a number of problems appear, including phase distortion and converter nonlinearity. The irony is that it is these analog parts that cause the greatest headaches (and bad press) for a digital audio system.

Today, as was wholly in evidence at the AES 7th International Conference, digital audio is rapidly emerging from its Neanderthal age. Nowhere is this more true than in the input and output stages of digital audio systems. Sixteen bits and brickwall filters are strictly passe, and methods employing oversampling, 18 bits, 20 bits, decimation, pulse density modulation, pulse width modulation and sigma delta are increasingly *de rigueur*.

The primary sonic limitation in a PCM reproduction system using linear 18-bit converters is the quality of the equipment used to make the master recording itself.

The choice of 16-bit words for CD, DAT and many signal processors was determined primarily by the availability of linear, 16-bit D/A converters. However, new conversion methods offer a chance to improve conversion quality. While no D/A technology can yield more than 16 bits of fidelity from a 16-bit medium, new conversion methods can provide better conversion. When correctly done, alternative conversion can improve the amplitude resolution of the player by ensuring an accurate conversion of the media's 16-bit signal, yielding faithful reproduction of the recorded signal. Similarly, better A/D conversion improves the fidelity of the encoded signal. It might be said that, in practice, linear 16-bit D/A conversion is insufficient for 16-bit storage or processing.

The reason for this lies in flaws inherent in D/A converters. Except in theory, 16-bit converters cannot fully decode a 16-bit signal without a degree of error. It is the aim of alternative conversion methods to improve conversion performance relative to 16-bit conversion. In short, to realize the full potential of audio fidelity for the end user, the signal digitization and processing steps must have a greater dynamic range than the audio signal itself.

One solution to the limitations of 16-bit conversion is a D/A converter with more bits' worth of conversion. An 18-bit D/A has 262,144 levels, exactly four times as many output levels as a 16-bit converter. Any nonlinearity is correspondingly smaller, and increasing the quantization word length at the conversion stage results in an increase in S/N ratio. Simultaneously, any quantization artifacts are diminished.

The intent of 18-bit D/A conversion technology is similar to that of oversampling: while the sampling rate is increased, the method doesn't create new information; it merely attempts to make better use of existing information. Not coincidentally, it is over-

sampling that makes 18-bit conversion of 16-bit data possible. It solves the obvious dilemma of coming up with 18 bits when the output from the media is only 16. When a 44.1kHz, 16-bit signal is oversampled, both the sampling frequency and number of bits are increased, the former because of oversampling and the latter because of the multiplication that must take place. For example, the output of an oversampling filter may be 176.4 kHz and 28 bits. Normally, only the 16 most significant bits are used for conversion through a 16-bit D/A converter, and the rest are discarded or used for noise shaping. An 18-bit architecture uses 18 of the bits from the output of an oversampling circuit, instead of 16. When proper oversampling techniques are used, those two extra bits do indeed convey useful amplitude information at levels below the most significant 16 bits.

The use of these two extra bits requires either an 18-bit D/A converter or a switched 16-bit converter. In the latter design, the 18 parallel bits from the oversampling filter's output are wired through switches to the inputs of a 16-bit D/A converter. When all 16 bits are used to convey a signal (as is the case with a high-amplitude signal), the upper 16 bits are applied to the 16-bit converter. However, when the two upper bits from the oversampling filter are not being used to convey a signal (a lower-amplitude signal) the 18 bits are shifted downward, the unused bits are ignored and the 16 lower bits are used instead. This adaptive scheme makes sense because in music recording the two upper bits are rarely used, and then often for a brief period of time. Through bit shifting, a 16-bit converter can handle an 18-bit input.

Since we have shifted the word by two bits, the signal's amplitude changes. In the binary system, a shift of one place (one bit) results in a doubling of value. A shift of two places quadruples the value. So when the lower bits are shifted up, the amplitude is four times too large, and therefore the output must be attenuated by one-fourth. An analog gain block downstream from the D/A handles this chore.

This adaptive 18-bit conversion technique may be considered a noise reduction scheme, because the signal is expanded at the D/A converter. The benefits result from the fact that the residual noise of the converter, as well as its conversion nonlinearities, will be proportionally reduced. Looked at another way, a four-times (12 dB) higher analog output has been achieved without increasing the D/A's residual noise and conversion error. When the gain is reduced by one-fourth to bring things back to normal, the noise and conversion errors are reduced by one-fourth. There is an increase in S/N of 12 dB and distortion reduction by one-fourth, both equivalent to using an 18-bit converter.

Of course, as with any clever scheme, there is a price to be paid for the benefit accrued. Specifically, it is not possible to receive all the benefits of 18-bit conversion with a 16-bit converter. When the bits are shifted, it is difficult to immediately and simultaneously shift the gain of the analog output to compensate. Furthermore, any static offset will become apparent when the switching takes place.

Until the first 14 bits are occupied, the output is four times its nominal amplitude, so the attenuator is used to compensate. When all 14 bits are occupied, the output voltage is maximum. When the 15th bit flickers on, the bits are shifted and the attenuator is kicked out. The output increases at normal gain until full 16-bit voltage is reached. The problem is that the attenuator could introduce a static error, owing to component tolerances. It would not be significant over the first 14 bits, affecting only attenuation ratio. But when the attenuator is switched off (or later, on), the difference between the attenuator's error and the absolute value of the output could create a glitch in the waveform where the attenuated and nonattenuated signals are joined. The glitch would always be present at -12 dB, regardless of signal frequency. The only debate is whether the increase in S/N ratio outweighs the possibility of switching nonlinearity.

Recent work has resulted in linear 18-bit D/A converters that are both very affordable and highly sophisticated. For example, the Burr Brown PCM 64P D/A contains a test circuit to monitor settling time of the current source. This minimizes glitches to the extent that resultant distortion is below measurement levels and can be

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analyzed only through computer modeling. Although a conventional, binary-weighted architecture is employed in this particular converter, several special design considerations were instituted to attain the desired accuracy. The most significant three bits are made up of seven individual current sources; this reduces thermal errors. Bits 4 through 16 are made up of unit-valued current sources that feed the R-2R ladder network. Currents for bits 17 and 18 are derived from the unit-valued source. The relative gain of the three upper bits can be adjusted against the total weight of the 15 lower R-2R bits by trimming the scale-down network.

The chip itself is a 40-pin hybrid with a special divided layout to provide full control over laser trimming of the upper and lower bits. Supporting circuitry is located outside the chip to help maintain the chip's thermal balance, a critical concern in D/A design.

The architecture of a linear 18-bit D/A design is markedly simpler than a pseudo-18-bit method. The use of 18-bit D/A chips results in player specifications clearly superior to 16-bit designs. As described above, an 18-bit converter has four-times greater resolution than a 16-bit converter. In other words, 18-bit conversion of a 16-bit signal provides for a 12dB increase in S/N ratio while processing the data. This improvement is clearly measurable with 18-bit conversion. Of course, there is no risk of gain matching errors as with pseudo-18-bit conversion methods.

Although 18-bit converters can push quantization error below levels mandated by 16 bits, problems still abound. For example, the reference voltages supplied to an 18-bit converter must be highly accurate and stable; the converter must be carefully calibrated; and extreme care must be taken to prevent multiple channels from relative drifting. In other words, although it is more precise, an 18-bit converter has all the real-world problems of a 16-bit converter, only more so. One can imagine the problems of a 20-bit linear D/A converter. Still, the advent of 18-bit D/A conversion technology set a new standard for digital audio conversion. The primary sonic limitation in a PCM reproduction system using linear 18-bit converters is the quality of the equipment used to make the master recording itself.

This brings us to the other half of the problem. What about the input side of the system? Oversampling and 18-bit D/As save the day on the output, but an 18-bit A/D converter would still require an analog brickwall filter, as well as an impressive converter design.

The answer, of course, lies in still more clever conversion methods, which follow the philosophy that sometimes less is more. Instead of converting parallel 16- or 18-bit digital words at the sampling rate, how about converting shorter word lengths, at faster rates? More specifically, in the same way that oversampling removes the deficiencies of analog filtering by performing the operation in the digital domain, new conversion methods take away the deficiencies of parallel conversion—an analog process—by performing conversion in the digital domain. And that's applicable to both D/A and A/D conversion. We'll tackle those methods, such as NTT's MASH, Philips' Bit Stream and Motorola's Sigma Delta, in a future discussion. ■

Ken C. Pohlmann is director of the music engineering program at the University of Miami.

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Circle #141 on Reader Service Card

by Stephen St. Croix

TERMS OF DERANGEMENT

Workstation, smirkstation. Everything is a workstation (except the *playstation* I saw at NAMM)! If it records audio onto a hard disk or just into RAM, or if it is a synthesizer with a little bit of DSP, or even a synth with a sequencer or maybe one with some *green* LEDs, it's a damn workstation.

Well, that term sure has been beat to death. These days I automatically say no to anybody who calls and wants to send me a workstation to play with. I don't even like the concept! You may have seen those buttons that say, "Just say no!" I guess I am not the only one who feels this way.

Let me clarify: picture a poor, exploited, illegal alien (not Jabba the Hut), a 35-year-old mother of five, sitting with 75 others like her in a dimly lit, hot, dusty shack 120 feet north of the Mexican border for 18 hours a day sewing counterfeit union labels onto designer jeans. Now *that* is a workstation.

Disk-based recorders are becoming disk-based editing systems. These in turn are becoming digital audio wo—wahh—workstations! Aarrghh! I can't even bring myself to say it again, Sam.

TOO BUZZED TO WORK (STATION)

Okay, America, this is our chance to get it right. First of all, it looks like the trend for maximum-possible-buzzword-abuse may apply to these disk-based recorder processor machines as well. Some of them are also being called workstations. Let's all wait until one comes along that *is* a workstation, one that is really a virtual studio, you know . . . a *workstation.*

We stand today at the beginning of what I believe to be a new era in audio recording. We have grown through wax, wire, tape (rust glued to paper!), lacquer, vinyl and back to (digital) tape again (this time it's rust glued to mylar). Well, finally, we have come to the first true random-access technology: disk.

I don't really care if it is magnetic-media hard disk, optical, magneto-optical, chemical optical or what. The *concept* is what is so exciting. Finally, after all these years of physical, serial audio storage, we are opening the door not only to random access, but to the virtual world.

The idea itself is pretty radical: get that audio off the street and into RAM where it belongs! Once it has been converted into binary blocks, we can do whatever we want to it, in or out of real time. We are limited only by our imaginations and the state of the art on the day we use the machine, nothing else.

Nondestructive test edits, intelligent splicing, time fitting, zero degeneration; disassemble-able evolutionary mixing: these are some of my favorite things.

The first generation is already upon us, of course; and those of us who are using them are beginning to learn what it is about them we like and don't like.

The time will soon come when we sit back and remember those silly last days of serial recording, when edits and splices were actually done by cutting the media with razor blades and taping it back together again with cellophane tape; those old days when rewinding to the top actually took measurable time, and lifting an hour of a multitrack master up to the storage shelf could give you a hernia.

The basic concept of a disk/RAM-based recorder/DSP system will soon be the *only* concept. Sure, storage itself eventually will change to instant-access, solid-state memory modules, but that will be merely an improvement. The real innovation is currently upon us: just getting the audio into a virtual world where it can be manipu-

lated at will.

As these systems mature, both power and freedom will increase. Power to get the same job done in one-tenth the time, or to complete a job twice as good in one-fifth the time. Power to track and mix with more accuracy than ever before, to slip and conform instantly, to edit and splice noiselessly, to loop effortlessly and punch with accuracy unheard of today in our silly, limited, physical world.

Freedom. Freedom to try 30 versions of the second synth bass track, ten different drum tracks, five different EQ automation sequences, six endings and a final vocal track made up of 17 perfectly spliced segments from 25 takes. Freedom to keep every single experimental piece in the archive, just in case you feel that the first try actually had a certain something that was missing in the 20th.

If properly designed, these machines can become the magic tools that are so good they disappear themselves, leaving the creative process hooked directly to the end-product. Think of it: if it is good, you did it; if it is bad, no machine to blame.

With the radical increase in speed and versatility that the next generation of these digital recorder/editors should offer, creative experimentation may well be *encouraged* for a change, not discouraged as the realities of time and economics so often force today.

HANS ON

Hear me now and believe me later, I'm not just saying this to pump you up. Your industry is listening to you and designing these products right now. Your voice counts more today than it will for a long, long time when it comes to how these devices will act. Vote today, for you will live and work with the results for years to come. The basic operational concepts are being formed today, now that we have had a chance to use (and learn from) the first-generation "blind" designs.

Brave souls, those who dare to bring us the first generation of *any* new technology.

After this coming wave of second-generation machines, I see things settling down to much more of a steady-state, *evolutionary* growth curve for a while. Faster engines, cheaper, larger drives, improved memory density and even new concepts in electronic off-line storage will all contribute to this evolution, but the real *revolution* is going on right now.

AUTO EDITING

You can squeak into the Chevette of these disk-based machines today for under 20 kilobucks, or you can settle into a significant chunk of hardware that might be considered the Cadillac of the group for up to $200k or more by the time you get the whitewall hard disk and the tinted monitor screen. Or you can wait a bit and slide into one of the soon-to-come Porsches or Ferraris.

Personally, I'm into sleek speed and power. If Lamborghini comes out with a disk-based editor, I will buy it. We each have our strengths and weaknesses.

The point is, *you* call the shots. You go to the next AES Convention and see these machines; you tell the smiling people with the exhibitor badges what *you* want their hardware to do for you. If you don't, *they* will decide for you.

You know, you wouldn't think of letting somebody else choose what you drive to work, so why let them choose what you drive once you get there?

FOR THOSE IN A HURRY

Okay, here is the "Cliffs Notes" synopsis. Subject: disk-based recorders and editors.

1. Don't call them (or anything else) "workstations" unless they actually *are*.
2. Get in there and help define what they *will* be.
3. Buy one for every room to show that you care. This will bring the future to you now, and the quality and dollar benefits that come with it. ■

Stephen St. Croix currently operates a 40-track disk-based facility, mostly as a pure research project. He is learning a lot about what he does and doesn't want. Mainly he has learned that he wants someone else to build the perfect system, so he can buy one and have someone to call and yell at when it screws up.

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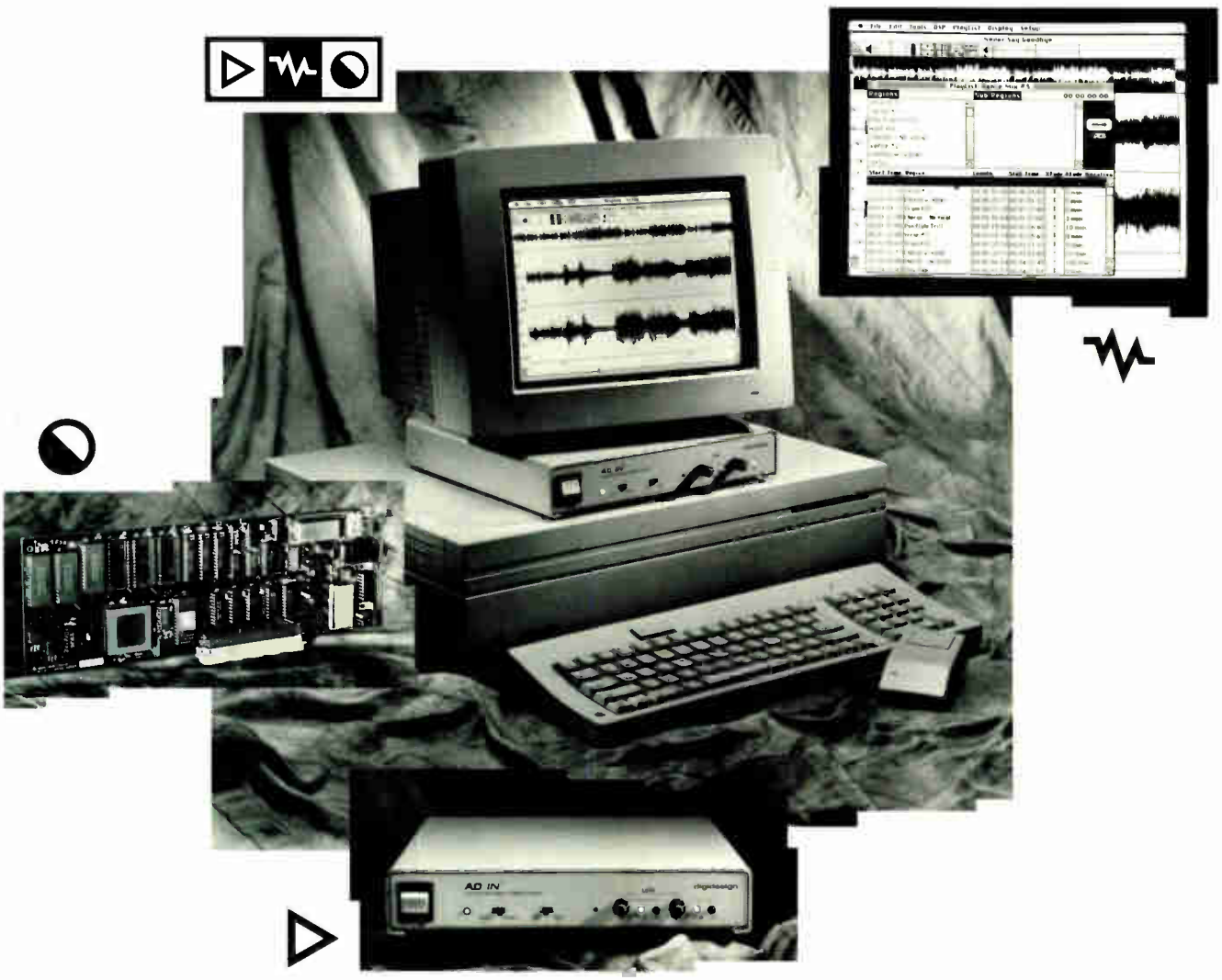

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Circle #142 on Reader Service Card

by Mel Lambert

FACILITY DESIGN & ACOUSTIC SPACES

As we become more and more experienced in this changing world of professional audio, it's not too surprising that we need to come to terms with the thorny subject of acoustics. In fact, for too many of us, the design and construction of recording facilities borders on a black art. The actual science of acoustic measurements is an exacting one, a discipline that can take years to master. What I find odd, however, is how little many seasoned industry veterans know about how sounds behave in the varied environments that make up a production studio.

In terms of the fundamentals, we can readily appreciate the need for sound isolation to keep our sound within the control room or recording area and to exclude unwanted and distracting sonic artifacts generated by the outside world. What goes to tape should be only those sounds we are tracking, not a cacophony of street and traffic sounds, or a low-level version of the string overdubs from Studio 2!

The ways we tailor the acoustics of the recording area and control room are pretty much open to an interpretation of the latest theories. If you'll pardon the pun, nothing is set in stone (not even imported Hawaiian lava rock). We owe it to ourselves as sound engineers to remain in touch with what studios are supposed to provide—a controllable space in which artistic talent and creative technology can coexist in harmony. While there exists a vast body of theoretical and, to some extent, practical knowledge within the dusty tomes of academic-styled journals, for us hands-on types, how do we keep up with all the conflicting visions of "The Right Way"?

In the mid-'70s, following the introduction of affordable multitrack hardware, I recall how we suddenly became bewitched with extraordinarily damped acoustics. The idea was to allow each instrument or group of instruments to be recorded pretty much by itself onto its own track, so we had a plethora of creative opportunities during the mixing stages. (Keeping the mics far enough apart ensured that air attenuation took care of acoustic separation; you knew after being in the room for more than a couple of milliseconds that no sound would ever find a reflective surface on the walls, ceiling or floor!)

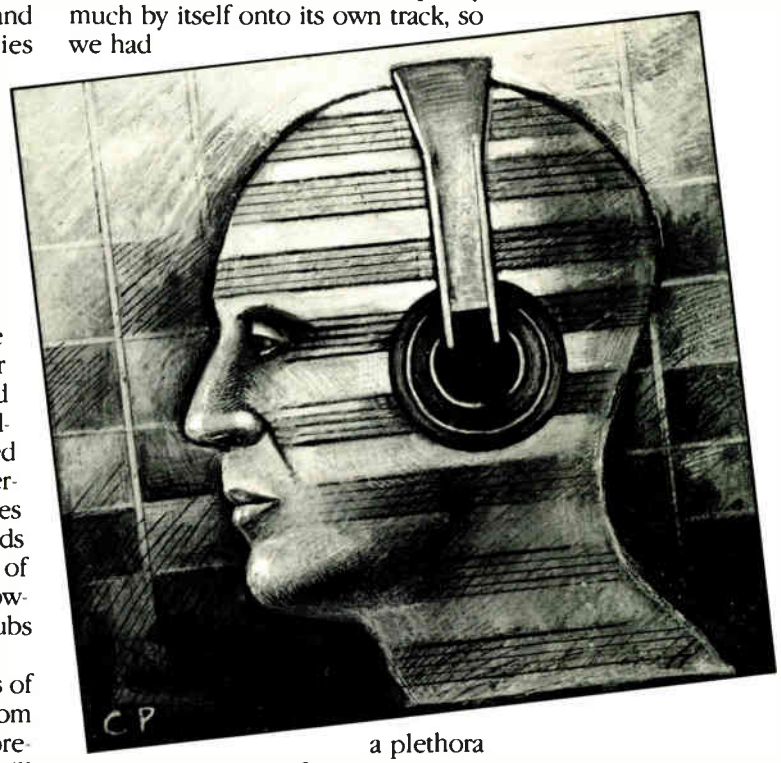

ILLUSTRATION BY CHARLIE POWELL

In the control room our monitoring systems had to provide mind-numbing levels, particularly in the low octaves, because we felt the pressing need to make sure that the tightly miked kick-drum channel really did contain only the kick and nothing else. To prevent all that energy coming back at us from various wall surfac-

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es, high levels of trapping and sound dampening became the norm, as did multiway loudspeaker cabinets capable of gargantuan sound pressure levels.

That environment remained the status quo for the next decade or so, with many self-styled acousticians and design gurus offering variants on the basic theme to studio owners and operators. In fact, consistency became something of a *cause celebre* for several prominent facilities, who made much of the fact that tracks recorded in one of these studios would sound virtually the same in another halfway around the world. This concept of sonic consistency found an eager audience in the industry, if only because it reduced the number of technical variables to consider while planning a multienvironment session.

Fortunately, many of us never quite swallowed the reasoning behind the marketing hype and were eager to return to an age of recording studios that had "character" and an acoustic signature of their own. A number of facilities began to rip out the wall treatment and expose the inner reflective walls or add reflective surface treatment. Highly sound-absorbent carpeting was removed from floors to expose wooden or concrete surfaces that would liven up the mid- and high-frequency reverb times. Since the drums would be recorded out on the floor now, with spaced overhead pairs and distant mics capturing an aural "picture" of the kit, we could maintain a sonic perspective between the elements of a mix.

At long last (so the recording wisdom goes), we had flexible, inviting rooms with character and individuality. Anyone who works in a current-generation studio or control room would readily acknowledge that we now have more interesting sound textures and more pleasant monitoring systems to work with.

The totality of the revolution we have experienced in studio design and acoustics is hardly surprising. In the good ol', bad ol' days we pretty much left it to an "expert" to provide a viable working environment. Some acousticians were good; a great number of them, however, forgot that the human/machine interface is a highly personal one. While many of us can automatically make corrections for a known first-order anomaly in a recording chain, the subconscious confusion translates into a bad time for all involved if we cannot understand the basic thinking behind the use of certain design elements in a production-studio implementation.

Those of you who have become even peripherally involved in the design of a facility—even the reevaluation of a design upgrade or the decision to liven up a room's acoustics—know what a rush it can be to understand exactly where the science leaves off and the art begins. Subtle variations can cause dramatic differences in the way the monitors sound in a "problematic" space; a minor adjustment, such as moving the HF transducers by a few degrees, can suddenly make the system's stereo imaging pop into place.

And what of the revelation when a room is converted from a conventional dead end/dead end into one of the contemporary variants of the Live End/Dead End™ design philosophy? Or even the "what end/what end" approach that involves the use of a me-

dium-power, near-field monitoring system placed in a reasonably live space, but one never intended to be excited by excessively high SPL levels (now one of the nicest, least fatiguing places to record and mix).

Monitoring systems no longer have to produce their analytical stuff from 5/6/7-way cabinets powered by fan-cooled racks of the latest technology; 2/3-way dome and fourth-generation horn systems sound far more pleasant in the mid- and high-frequency bands, while newer generations of power amplifiers are capable of producing clean, powerful, low-end response in spaces that do not require inordinate amounts of trapping and sound dampening.

The bottom line is this: today's more holistic approach to the entire concept of the human/technology interface is resulting in a more analytical and creative studio environment. However, we should continue to keep ourselves abreast of the latest ideas and concepts that come down the pike—not only from the accredited experts and acousticians, but everyone who plies his or her craft in the production industry. I have heard good ideas about how rooms could be improved and/or corrected from musicians who have no formal training in anything approaching acoustics.

All of us, I would hazard to guess, possess a powerful sense for what is correct. How many times, for example, just by looking at the geometry of a room and its wall surface (let alone by clapping your hands to get a sense of the room's time-dependent sonic behavior), have you been able to "smell" that the room is going to present problems?

Let's all keep our ears and minds open to input from every direction. Maybe that way the learning curve will be less steep, and we won't find ourselves looking back over a disappointing decade during which we had to compromise with studio designs that, damn it, everyone knew were a bear to work with, but that nobody thought to question, primarily because we had been blinded by the expert's sleight of hand. ■

Mel Lambert has been actively involved with professional audio on both sides of the Atlantic for the past decade, and is president of Media& Marketing, a consulting service for the pro audio industry.

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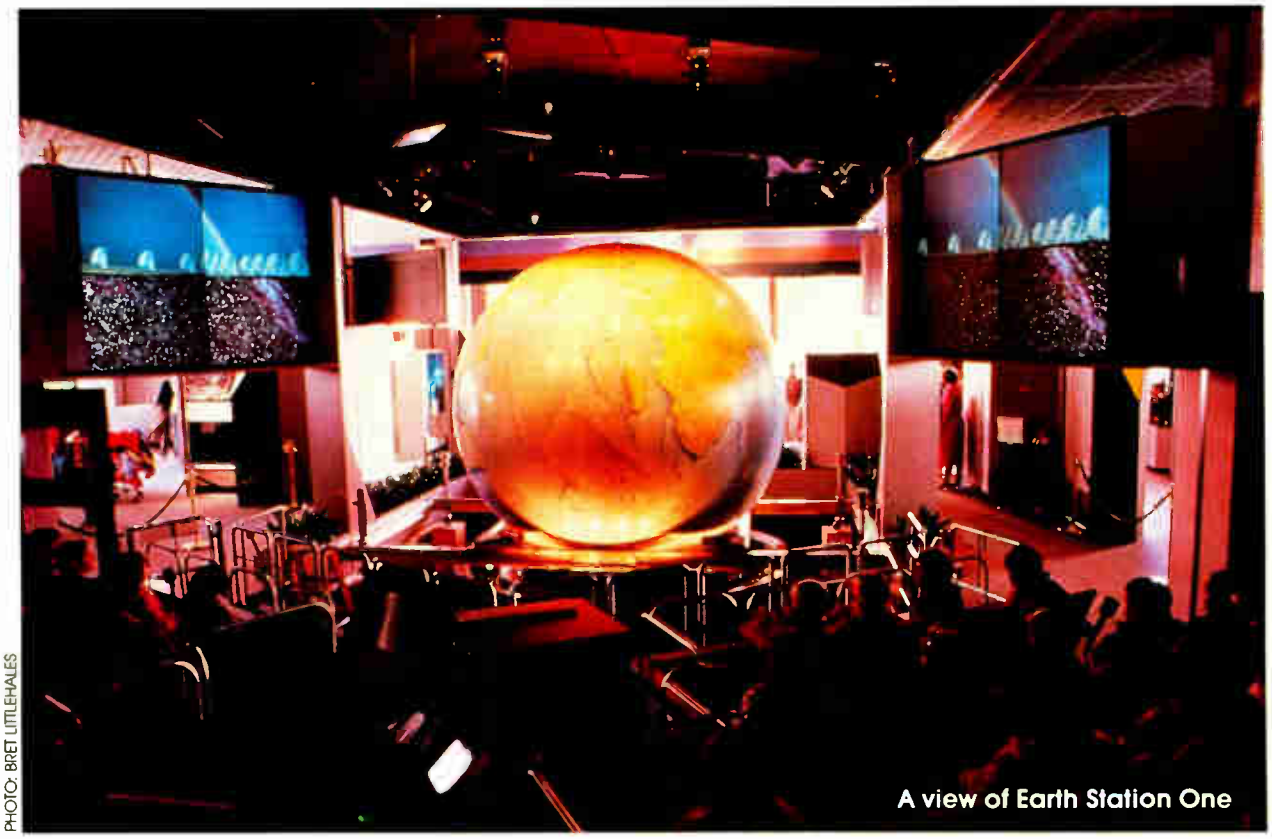

PHOTO: BRET LITTLEHALES

A view of Earth Station One

SOUND SYSTEM DESIGN FOR THE NATIONAL GEOGRAPHIC SOCIETY

Most of the work performed by our company, Ergo Designs, centers around recording studio and MIDI room design and upgrades, with an occasional performance system and audio-for-video system. So we were fascinated when approached by Exhibit Technology to design three sound systems for "Geographica," the National Geographic Society's new interactive learning center. Geographica is located in the Explorer's Hall at the

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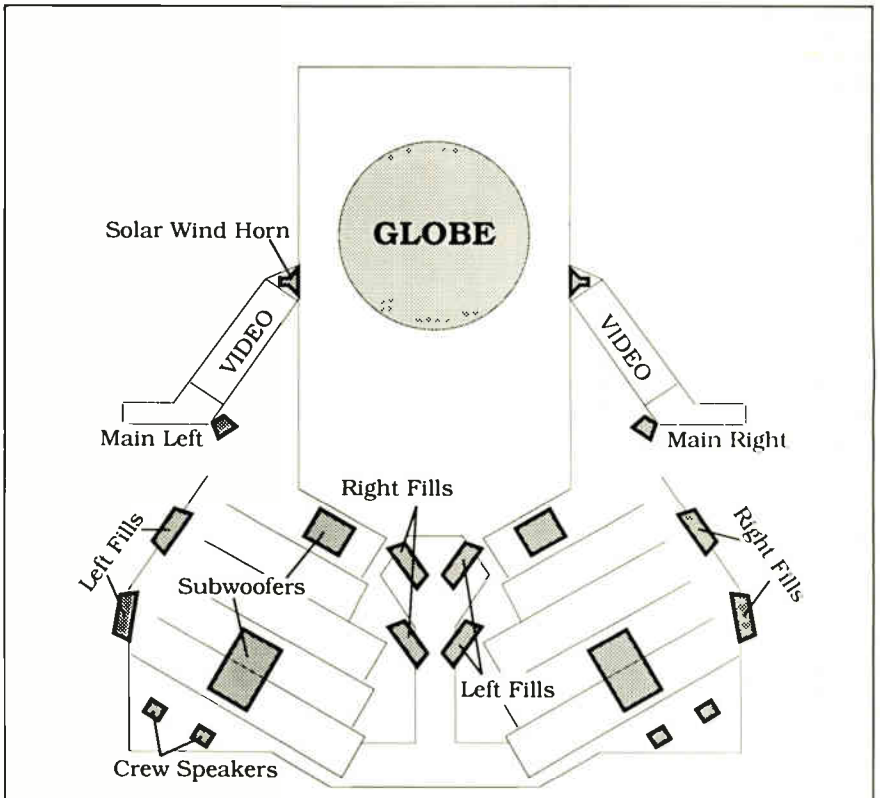
society's headquarters in Washington, DC.

This project presented acoustical constraints and audio system design problems that we rarely (if ever) encounter in the controlled environment of a recording studio. Most studios don't host thousands of visitors every week. Most studios don't expect their systems to function almost continuously, 364 days a year.

The architectural acoustics of the Geographica space made the project even more intriguing. The main design criterion was to create three sound systems that would deliver full-range, high-impact audio without excessive leakage into adjacent exhibits. As with many projects, the layout of the space was finalized before we were brought in. Due to timing constraints and active on-site construction, we were unable to perform any acoustic tests before submitting our final designs. The same timetable affected the installation, which required us to install, wire, test, tune and tweak, all in short order.



Earth Station One speaker locations

FIRST STOP: METAVISION

The Metavision theater is the first presentation you encounter upon entering Geographica. It is a small theater that holds about 45 people for a seven-minute introduction to the exhibit. This show is presented on an extremely wide projection screen from three videodisc players. The audio system is based on a stereo digital audio program that is stored on one of the videodisc players and converted to the analog domain by Metavision DAV-15 digital-to-analog converters, which are compatible with Pioneer LP-6000A videodisc players. This signal is then sent to a Yamaha DSP1 surround sound processor, which generates the signal for the two main speakers, a subwoofer located under the video screen, and six surround speakers located across the rear of the theater.

The theater's basic audio requirements were specified by Metavision, creator of the presentation. In this case we took the signal flow diagram from Metavision and adapted it to the particulars of the space through equipment choices and driver placement. The equipment was a combination of new purchases for the mains, existing NGS equipment for the subwoofer and surround speakers, and the Metavision-supplied D/A converters.

CLIMB ABOARD EARTH STATION ONE

Earth Station One is Geographica's centerpiece. It is based around an 11-foot, hand-painted globe of the Earth, under computer control for rotation in any direction. On each side of the globe are large multiscreen, rear projection video displays. In the center of the theater, a presenter's station contains all video, computer, audio and globe control systems. Projections can be made on the globe from the presenter's station, while a camera can project images of the globe or the audience onto the video screens. The theater risers and globe are suspended over a pool of water. Each of the 72 theater seats has a selector panel that allows the audience to interact with the presentation.

Six analog audio tracks are stored on videodiscs and reproduced on a speaker system that includes ten mains, four subwoofers, two HF horns and four small accent speakers. The program called for several sound effects, including a solar wind effect when the globe is rotated, simulated crew conversations and low-frequency rumble as Earth Station One prepares to "take off."

Because of the lack of full walls in this theater and the proximity of other exhibits, the problem of sound containment is most pronounced in Earth Station One. To produce high-quality, full-range audio at acceptable intensity levels and simultaneously overcome the problem of leakage into adjacent acoustical areas, we incorporated a distributed near-field approach into the speaker system design.

The architecture of the audience space creates two distinct seating areas separated by the presenter's console. We placed two speakers just outside the left and right video screens, and suspended eight speakers over the audience. The levels of each driver were carefully balanced to allow the two front speakers to localize the primary stereo image at the video screens and globe, with the near-field speakers reinforcing each section's secondary stereo image (see illustration). The main speakers are Meyer Sound UPM-1 cabinets (ten in all). Not only do these speakers blend well with the high-tech appearance of the theater, but their extended low-frequency response and controlled

The MIDI Studio at Manny's.

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Manny's Music
PROFESSIONAL AUDIO DIVISION

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dispersion pattern conformed well with our design requirements.

To cover the lower frequency range and provide the necessary tactile response during "take off," four subwoofers are mounted under the audience risers (but above the water!). Two JBL 2235H drivers were custom-mounted in small cabinets that use the audience floor as a rear "wall" or "panel," while two Cerwin-Vega B119 subwoofer cabinets were attached to the rear riser supports for acoustical and mechanical coupling to assure maximum sensory effect.

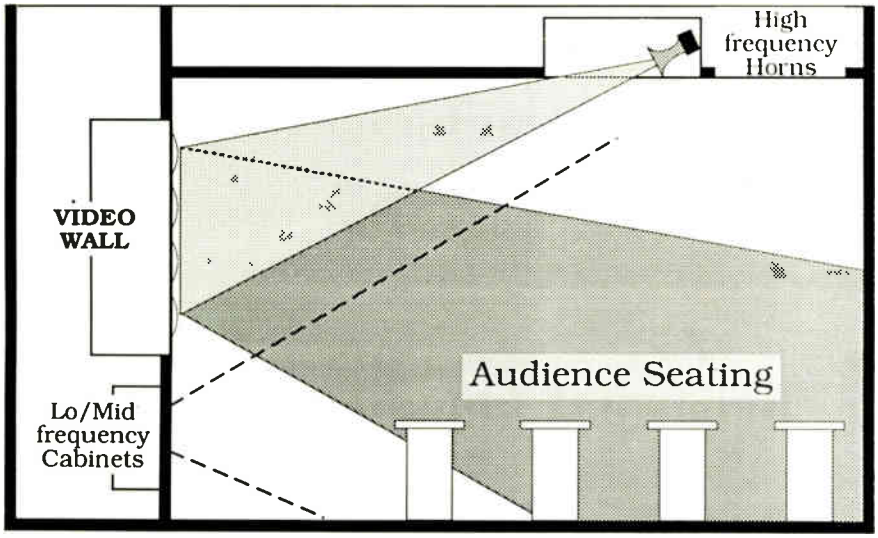
We placed the high-frequency horns (used to reproduce the solar wind effect) in the columns under each video screen and directed them toward the globe. This let us reflect the sound from the horns off the globe, placing the apparent sound source at the globe while also dispersing it evenly over the audience.

Another sound effect was simulated dialog from the "spaceship crew." We reproduced the effect over four Sony APM speakers placed at the rear of the theater. This sound occurs just before "take off" and offers unique sound sources separate from the main stereo image. The solar wind and crew dialog sounds were stored on separate videodisc tracks, giving us extra flexibility in routing and processing these sounds.

TUNE IN TO "NGS-TV"

This small theater is located near the end of the exhibit. Its presentation is based around a video wall, four screens high by four screens wide. Each video monitor is fed by a separate videodisc player, and all these players have identical stereo audio.

We placed low- and mid-frequency drivers below the video wall, and high-frequency horns in the ceiling above the audience, facing the video display. This delivers to the video wall extremely directional high frequencies that bounce off the monitors to create the illusion of a sound source coming from the image (see illustration). The horns are mounted flush with the ceiling and are covered by grille cloth, so there is no visual cue for high-frequency delivery. The curvature of each video screen helps disperse these high frequencies, thus providing uniform, controlled coverage. This approach required some time delay correction between the high- and low-frequency drivers. The aural result conformed exactly to our



Earth Station One TV driver placement

original design, providing excellent sound containment, impressive localization and the effect of one *big* TV.

NGS Television and Earth Station One share a common audio distribution system by Innovative Electronic Designs (IED). Due to its modular construction, the IED 5000 system allowed us to combine all necessary routing capabilities in a single 3U rack-mount unit. This system called for flexibility in setup and expansion capability. At the same time, once set up, it could not be modified accidentally and had to be extremely reliable.

The IED system also provides impedence matching from the high-impedence videodisc players to the low-impedence audio system. A gradual turn on/off allows the museum staff to power the entire system without transient spikes causing loud pops or equipment damage. Special VCA cards provide audio level control at the presenter's station in Earth Station One without subjecting the audio signal to excessive cable runs.

We installed the IED 5000 rack in the main audio control center close to the video and computer hardware for Earth Station One and NGS Television. Here too are Meyer Sound P-1A control units for the UPM-1 drivers in Earth Station One, an Audiologic X324 crossover and various line amps.

ALL SYSTEMS GO

The Geographica installation went as smoothly as any we have ever done, thanks to the staff at the National Geographic Society (NGS). The NGS machine shop constructed three types of mounting hardware for the Meyer UPM-1 speakers and custom mountings for the HF horns in the NGS Television theater, which allowed fine-tuning the horn orientation to achieve proper imaging. The NGS construction shop built enclosures and mountings for the subwoofers in Earth Station One.

For this installation we used QSC amplifiers, distributing them around the museum space to keep the speaker cable runs under 60 feet. As a result there are five different equipment racks, one each for Metavision and NGS Television and three for Earth Station One, in addition to the main audio control center. All point-to-point wiring was pulled through the chases by the NGS staff.

The fine-tuning of Earth Station One was unusual. In addition to testing the Meyer speakers with their speaker sense circuit, we balanced the relative levels of the ten UPM-1s to create the proper stereo image. We tuned the crossover between the UPM-1s and the subwoofers so only the "take-off rumble" effect and low frequencies in the music would be reproduced by the subwoofers, while the narration would remain exclusively on the UPM-1s.

The overall balancing involved adjusting each system to optimum performance *and* assuring that theater-to-theater leakage would be kept to an absolute minimum. The theater audio systems were completed before exhibits were placed in Geographica, so leakage constraints had to be estimated as well as actively measured.

We also installed a wireless microphone for the presenter in Earth Station One (the show currently runs on "auto pilot" but plans include a presenter to interact with the audience and control the presentation). With the computers, video devices and audio and power lines running through the space, we were concerned about the possibility of RFI or other transmission problems associated with wireless mics. Happily, this did not develop into a problem due to the true diversity wireless system and the conscientious AC grounding scheme provided by the NGS electricians.

IN CONCLUSION

One positive result of this endeavor occurs when one actually hears the three systems operate. Each theater has its own unique audio presentation: the surround sound in the Metavision introduction; the compelling localization in NGS Television; and the multifaceted audio/sensory impact of Earth Station One. It was indeed a pleasure to become involved in this ambitious installation and to work with Jeffrey Dering, the designer behind the entire Geographica exhibit.

Since we developed much of the original audio system designs on paper without as much acoustical testing as we would have liked, we were surprised and pleased by the excellent isolation between the theaters. The Geographica exhibit will continue to evolve as exhibits are added and shows are modified. Throughout this development, we will augment and refine the electrical components and run complete acoustical tests.

The Geographica exhibit is all about how wonderful and fragile our planet is. It encourages us to learn more about Earth, and to appreciate it more—not a bad idea. We hope to see you there. ■

Along with their Ergo Designs duties, Alex Noyes is an instructor at the Institute of Audio Research and engineer at Studio PASS, while Mark Ramsay teaches recording technology, electronics and audio equipment design at New York University and is studio manager at the Center for Electronic Music (CEM).

Take A Good Look... At The Industry Standards.

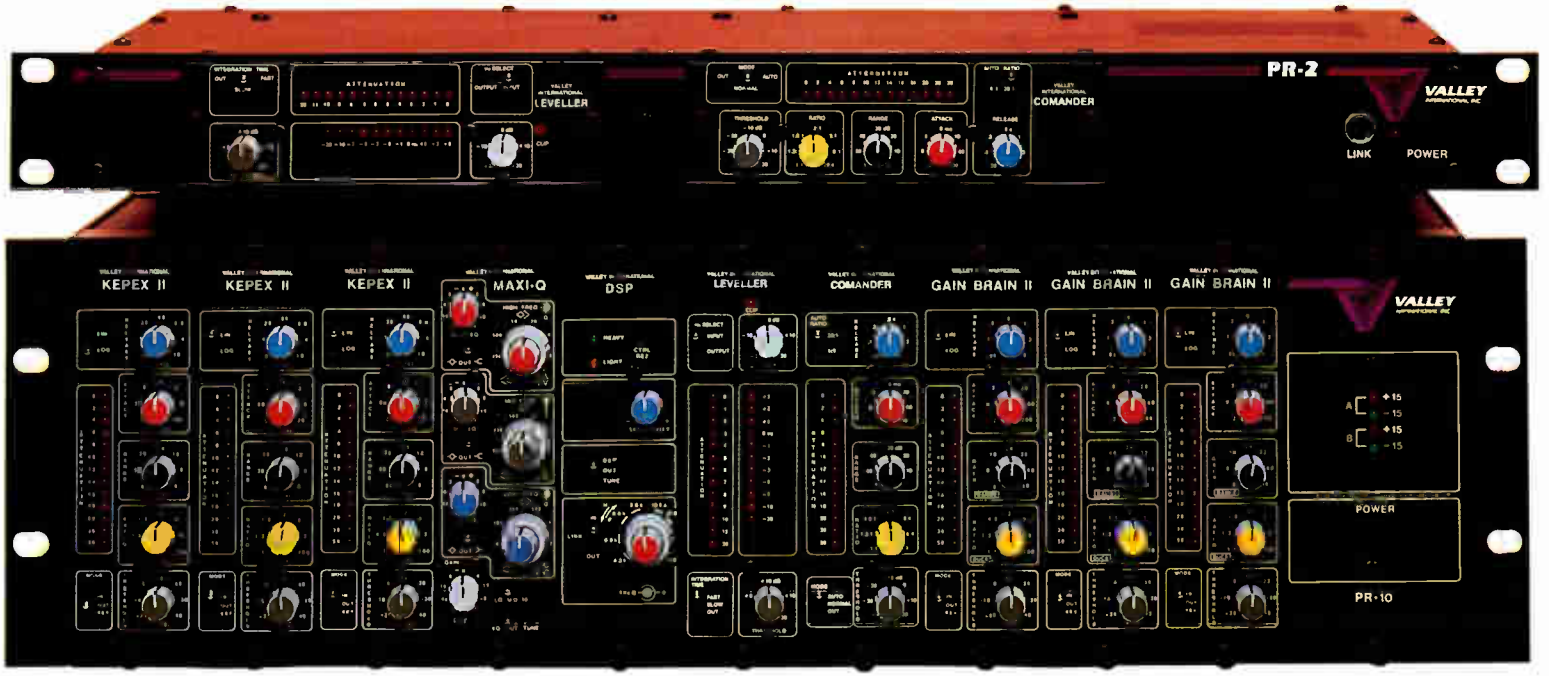


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PHOTO: PETE TURNER

DESIGNING FOR DIGITAL

by Linda Jacobson

Here's the understatement of 1989: Digital audio recording and editing systems have changed the way studio folks work. Moreover, as studio designer

This new online edit suite at Western Images (San Francisco) was designed by Chips Davis. It features a Harrison 790 console customized with four audio channels for compatibility with D2 digital video systems.

PHOTO: AL GUITERAS

Russ Berger of the Dallas-based Joiner-Rose Group notes, "The development and widespread acceptance of digital audio technology has placed great demands on almost every aspect of recording facility design."

When we contacted several leading studio designers and consultants, a couple responded to our topic with comments like, "digital, per se, has not been a particular focus in building what I call a 'high performance' facility." Nonetheless, most agreed with the viewpoint taken by LEDE® design pioneer Chips Davis: "Everybody is designing studios that are able to accommodate a digital audio system of some type, disk-based or tape-based. Whether it's going in now or in the future, you have to design for digital."

OVERALL NOISE CONSIDERATIONS

The purity of digital recording requires increased attention to a studio's sound isolation and noise floor. According to Bob Todrank (Todrank Raymond Associates, Nashville), "Anything several dB down that used to be ignored because it would be hidden by [analog] tape hiss can't be ignored anymore. In terms of noise and mic levels, you can pick up air-conditioning rumbles and noises that weren't a problem before. Studios have to be another 10 dB quieter."

"You must look at problems you wouldn't normally deal with in analog," says Chips Davis of Paoletti/Lewitz/Associates (San Francisco). "For instance, many rock and roll engineers overdrive tape machines on certain tracks to get certain sounds, which gives you a soft type of clipping in analog. In digital you can't do that because you can definitely hear it. The problem is to keep mixes clean and be able to hear what's going on with digital's extended dynamic range. You have to be able to hear down *into* the mixes when mixing a large number of tracks.

"Analog lets you get away with using noise reduction and miking closer to come out with something acceptable," Davis continues. "You can't do that on those digitally mastered records with open air [between cuts] and fades that go down into air."

LESS OVERALL NOISE IN THE RECORDING SPACE

Digital's wide dynamic range requires an extremely low noise floor in the recording space—a space that must

allow for "the clear, 'unmuddied' recording of transient musical events," says Russ Berger. "The studio design must eliminate all noise sources, such as HVAC-generated noise, *and* provide adequate 'room support' for musical performance."

Berger's design goals include an inaudible, low-velocity HVAC (heating/ventilation/air-conditioning) system that serves both studio and control room. "The tonal nature of fan-generated noise and the ability of digital to capture low-level signals make this imperative," he says. "Design techniques include standard features such as low-air velocity, lined-duct systems with silencers, and custom-designed items incorporating an end-reflection loss and impedance mismatch systems used at the end of duct runs to provide additional sound attenuation.

"Studio isolation from both the control room and adjacent spaces, via the floors, walls and ceilings, must be complete to provide a 'digitally acceptable' noise floor," continues Berger. To achieve this, the Joiner-Rose Group uses isolated floor slabs and isolated, dual-wall construction. Roof and ceiling construction typically includes isolation hangers and multiple-layer drywall and concrete construction.

Digital multitracking is just one concern, as Berger points out. "To support digital sampling techniques, a studio should allow for a clear recording of the most transient musical events without the arrival of disturbing reflections. Repeated 'flutter'-type reflections associated with parallel wall placement must be addressed. Even if no slapback-type flutter echo is audible, low-level reflections spaced evenly in time may add a 'graininess' to sampled material. Therefore, we evaluate and control second-and third-order reflections that determine a studio's acoustical character.

"While a low noise floor and elimination of specular reflections via room shaping are large concerns, the ability of digital recorders to capture low-frequency energy creates additional design criteria. Below a given frequency range, reflections are no longer specular and we must have special design considerations for low-fre-

This 450-seat film screening and dubbing theater at Disney Pictures (Burbank, CA) was completely remodeled and includes digital audio technology; Dave Schwind handled the acoustical design.

The Ergonomics of MIDI Rooms

"Ergonomics" is the study of how a work environment affects a person's ability to perform in it. Ergonomically speaking, the MIDI studio possesses unique characteristics that can make it a truly productive workplace—or a new-age torture rack.

—CONTINUED ON PAGE 43

Al Fierstein designed the MIDI room at NYC's D&D Recording complex. Note the location of the keyboardist's position relative to the monitors and mix position at the Amek/TAC Scorpion console.

Oasis Music (Manhattan), located in an office building, is a music composition suite for scoring to picture. Architect John Storyk designed Oasis around the Fairlight Series III, and all equipment sits in the middle of the room. Audio is digital here, mostly MIDI, and Storyk notes that digital's lower noise floor had "a direct effect on my life," especially because "we needed more isolation between the vocal booth and control room. I had to deal with potential transmission loss in excess of 60 dB, using lightweight gypsum board construction due to NYC's floor-load construction restrictions."

quency signals," continues Berger. "We have had success using a larger version of the quadratic residue diffusors developed by RPG Diffusors. Similar to our control room rear-wall designs, our studio spaces have large-scale, low-frequency diffusing systems in studio spaces that are sometimes over 30 feet long and 14 feet high. We developed some inexpensive techniques to field-fabricate these large diffusing series on the job. By adding low-frequency diffusion into the studio, we can control the uneven bass response often attributed to room modes. This allows more accurate low-end recording."

SOUND ISOLATION

When it comes to designing a new recording space, Dave Schwind (Salter Associates, San Francisco) asserts, "You haven't done anything until you've gotten the first two things right: sound isolation and air handling. With sound isolation, the idea is to keep noise intrusions well below the constant sound level produced within the building systems and by outside noises."

Designers can now create a room that's quieter than mice; indeed, notes

Schwind, "We can go down to the threshold of hearing if required. It depends on what you're doing. The best example is at Lucasfilm, where we designed rooms at NC20, NC15, NC10 and NC5. The quietest one [NC5] is the Foley stage, where they apply tremendous audio amplification to raise the loudness level of an effect. The idea is to not pull the background noise up with the amplification.

"There are some conditions under which the quieter [the room is], the better. But in other cases, it's better to have some masking sound. For instance, with two mixing studios adjacent to one another, there is potential for noise intrusion from one to the other. Our perception of sound isolation between the two rooms is the sum of two factors: the isolation provided by the building and the masking provided by the ventilation system. You can make them work together. Where background noise does not *need* to be excessively quiet, it should *not* be excessively quiet, because it adds to the perceived sound isolation."

HANDLING AIR

The movement of air makes noise. With decreased background noise lev-

—FROM PAGE 41

The constraints of the typical MIDI room's small size and shape, along with the physical attributes of electronic music gear, require design approaches that differ from the studio norm. Adherence to a few basic tenets of MIDI design can contribute to the success of a commercial MIDI operation and its ability to maintain an edge over high-end home setups.

Lately, Alan Fierstein of Acoustilog (New York City) has been designing home MIDI studios for many producers and musicians. He performs the same service for commercial studio owners, who find that their best offense against the home operator is professional acoustical treatment. Fierstein points out, "People living in rental apartments or co-ops can't make the noise of construction or afford the investment."

Properly mounted large speakers (along with one or two sets of near-field reference monitors) also help separate the pro environment from the semipro. However, as veteran San Francisco-based engineer Fred Catero once wrote in this magazine, "Don't install more speakers than the room can handle. They should sound right at the critical areas of work at all volumes you will be using. Proper installation is a must, and qualified, professional help in this regard is crucial."

D&D Recording recently built a MIDI room in its facility. Since rates include an engineer, the monitors are aimed toward the mixing position. But Fierstein designed the room so "the person who plays the keyboards—who is usually the client—can also be in a good position to hear the speakers, just from further back. That necessitates a lengthwise-oriented room with the speakers at one end." D&D's room is about 13 feet wide by 21 feet long. "If the room were wider than it is long," says Fierstein, "the engineer and the keyboardist would not both get a good stereo image, as one would be more on the left side of the room, and one would be more on the right.

"So, in MIDI studios where it's important that both people be able to monitor accurately," continues Fierstein, "you must have a lengthwise room or a very big room. But if the room is *too* big, it presents problems you cannot eliminate, such as the speakers lacking punch because you're too far from them and the sound spreads out quite a bit."

Concerning the physical orientation of the MIDI gear, Fierstein says, "You do want it to surround you to some extent. In a commercial MIDI studio, the auxiliary equipment and patch bay, in addition to the console, must be within easy reach of the engineer's position, while the MIDI instruments must be easily accessible to the musician. The engineer and musician don't necessarily have to be in reach of each other."

In a personal-use studio, however, "you do have to have everything [in reach from the main position]. You want to turn around from the console and have the keyboards right there.

"What works well in some MIDI rooms," Fierstein adds, "is setting up the keyboards so they face front, toward the monitors. Then the operator just turns around when it's time to adjust things on the console, because you seldom go to your console [in a MIDI session]."

MIDI devices most often end up in racks and support stands. This large, obtrusive hardware can reflect sound from the monitors, thereby causing inaccurate imagery. Fierstein dealt with this problem at Broadbeard Productions (NYC), a music production company "supergeared toward MIDI in the control room," he says. "All the 'keyboards' are rackmount units, with just one [Korg] M1 [keyboard] controller. All these 'keyboard' units share the same space as the auxiliary equipment but in a separate set of bays. You know how the typical studio puts an island of auxiliary equipment behind the console? In this case, imagine two islands of equipment, one in back of the other. The two bays can be separated for maintenance or butted up against each other so they look like one big table, with the outboard equipment bay facing the speakers in the front of the room and the MIDI equipment bay facing the tape machine room in the back. Monitoring-wise, the MIDI equipment is totally acoustically shielded by the auxiliary equipment."

(Speaking of racks, don't fill every space when you initially set up the MIDI room. Plan for future equipment purchases.)

Since the MIDI operator's objective is to work effectively and comfortably, sight- *and* sound-wise, good lighting is critical (such as adjustable track lights with 150W spots). Glare is thine enemy, especially glare on computer screens and LCD displays. High-quality office chairs on casters, with adjustable height and backs, will make it easier for computer jockeys to work for hours on end.

If the MIDI room handles audio for picture, avoid installing the video monitor as seen in major control rooms (up high, between the mains). Instead, position the video monitor lower down, in such a way that the operator won't get a stiff neck.

—Linda Jacobson

els and all the computer-based gear that tends to run so hot, quiet air handling and ventilation systems catch a designer's attention more than ever. Says Vin Gizzi (Benchmark/Downtown Design, NYC), "Controlling the noise of AC systems, cooling fans in the equipment and external noise is extremely important, especially in the control room."

The soundstages designed by Dave Schwind and his Salter colleagues display "a widely varying thermal load and therefore widely varying air volume, which is cubic feet of air per minute flowing through the room," explains Schwind. "This air volume varies so much that we put in variable- and/or multi-speed fans, the idea being that the slower the fan goes and the fewer people in the room, the lower the noise level. Many different manufacturers make variable-speed drives for big fans, and multi-speed motors have been around for years, but we recommend them frequently now. In the past, the ventilation system was not as important."

To achieve extremely quiet air delivery, Salter Associates has helped develop systems for "low-velocity, supply and return air," says Schwind. "In some cases we don't even use those metal air registers in the ceilings. With the architect's help, we create architectural slots as part of the design, and the air just flows out of these slots to a duct above. The air delivery is slower, and the noise generated at the diffusor is directly related to the velocity of the air passing through it. Noise goes up rapidly as speed goes up."

CONSIDERING THE CONTROL ROOM

Silence was never so golden. In addition to the quiet needed in the studio, Vin Gizzi stresses that "more quiet is needed in the control room because your monitoring situation has to be on the same par [as the recording space] in terms of noise."

Chips Davis points out that control rooms must be designed with "very little smearing inside the acoustic domain, no masking caused by reflections, modal problems, monitor problems or electroacoustic problems. If you design for the best possible dynamic range so you can hear down into the mix, you then have the capability of mixing dimensionally. Not just two-dimensional left and right, but front/back and up/down. By being able to mix dimensionally, with digital's dynamic range and all these factors involved, you can get mixes that just *layer* very well. Done right—in good rooms—that dimensionality can be heard on a car radio or on television."

ZAP PROTECTION

Thanks to the vagaries of electrical power, "mysterious problems can crop up," warns Gizzi. "You not only need lots of power, but with the complexity of equipment running off it, it really has to be clean—conditioned, regulated and properly grounded."

The threats of lightning strikes, blackouts, brownouts, and surges and sags above and below nominal line current pose great potential danger to a studio's data (music, sounds and control settings that reside in some volatile memory bank). Digital devices themselves serve as major sources of electrical interference.

David Carroll of David Carroll Electronics, Berkeley, Calif., consults with a studio design team's electrical engineer to nail down the required technical grounding and isolation. "In terms of AC [mains] power require-

ments," Carroll says, "the traditional, isolated ground power system is even more critical now because of the switching power supplies in most computers. Switching power supplies have a tendency to dump high-frequency hash into the ground lines. The quality of a ground as it relates to audio becomes impaired as the noise voltage on the U-ground increases. Any equipment that introduces noise currents back down its ground lead will create a corresponding voltage at the U-ground, which can be passed along to any audio equipment sharing that ground. So it's critical to provide any such equipment [e.g., disk-based systems with large power supplies] with separate branch circuits and independent ground wires to ensure that all audio equipment is given clean reference.

"If you're in an area with many lightning hits, then surge suppression is extra important. Those surge-suppression strips you get at the hardware store are a joke when it comes to a serious power surge. They can burn up," continues Carroll. "If you use computer-based equipment in an area with lightning strikes or power problems in general, you'd be wise to install a power conditioner for the technical power.

"As for audio [wiring], there's no difference between good practice for analog recording and good practice for digital. However, the extent to which you can get away with small travesties is reduced because of the noise floor requirements. There's no way you can use any unbalanced gear—everything has to be balanced in and out. That eliminates the last bit of common-mode noise that *does* exist on the third wire of your AC power plugs."

MACHINE ROOMS

"More than ever, a machine room is the way to go," nods Gizzi. But you knew that already. Still, it's ironic, as Carl Yanchar of Lakeside Associates (Los Angeles) points out, "because all these digital machines that are supposed to decrease the noise level on tape or disc put out more acoustic noise than any other machine! Machine rooms are now almost everywhere, ranging in size from a closet to an entire room. There is resistance from some clients about that. They want to have the machine within arm's length, but when the machine's noisy, they don't have a choice."

MONITORING REQUIREMENTS

Designers today are paying more attention to the control room monitoring system, according to Gizzi: "The accuracy of digital reveals flaws in monitors that analog tended to be generous to. Any imaging problems in the control room tend to be greater with digital. We're designing larger workspaces, so good stereo imaging and better off-axis response are real factors. Highly directional monitors are not as effective in this situation. Tannoys are popular here because they have better dispersion, and some of the soft domes are getting attention."

The Boxer, an all-dome system made in London, is the monitor of choice in control rooms designed by Bob Todrank. "The monitoring system is critical," he notes. "We need wider dynamic range monitoring systems that have wider frequency response with better phase response and higher SPL levels at reduced distortion. The only thing I've found to be capable of that is an all-dome system. I can't get any horn-loaded systems to do all of those things together. The Boxer has made a real difference in the kind of things we're doing."

Many new rooms serve as control room and studio, especially those audio-for-video suites now incorporating digital audio workstations and disk-based recording systems. These tend to pose a different problem, explained by Chips Davis: "In most cases it's not a [new room] design, but an existing room. They just set up equipment and throw in a set of monitors. Everyone's going near-field but that doesn't solve the problem. You're still dealing with the room's acoustical environment, and certain notes—say, B or E—will be a natural resonance of that space and will mask other parts of the spectrum you're trying to hear. When you can't change the physical space, you can optimize it. By spacing diffusors and putting up absorption, etc., you deal with the acoustics as an entity to fix the room's monitoring situation."

FLEXIBILITY RULES

Another major design consideration stems from the larger control rooms requested by clients because they're using more portable equipment, particularly synth keyboards, personal computers and remote control keypads.

"Clients are spread out much more than they used to be," observes Gizzi. "The engineer doesn't just sit at a point in the center of the console. So clients want a flexible space because they know the equipment will change and the way they work will change. They don't want as much built in as they used to. Instead, they want more equipment like processors, computers and synchronizer keyboards in cabinets on casters that they can move around easily. In many cases we design control rooms that contain different 'workstations' with a dedicated synchronizer/editor area, dedicated synth keyboard area, etc."

Davis agrees. "Now you have to give synthesists room to work in the control room, along with the engineer, and they don't want to monitor over cans. So you have to control the acoustical environment to be able to have a diffused field to give the widened image" that is required to please both synthesist and mixer.

Gizzi cites lighting as another operational design consideration wrought by digital. Good lighting is critical, he

—CONTINUED ON PAGE 81

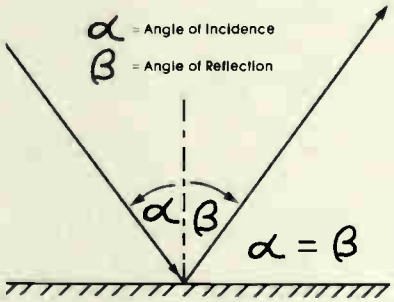
JOHN WORAM'S BASICS

REFLECTION, REFRACTION & DIFFRACTION

Although it is convenient to discuss sound-transmission theory in terms of a free-space environment, in practice the sound pressure wave encounters all sorts of obstacles in its path. In addition to the regular room surfaces—walls, floor and ceiling—there may be any number of additional acoustic barriers placed between a sound source and the listener or a microphone.

Each of these surfaces has an effect on the sound that is eventually heard, and the effect usually varies considerably over the audio frequency range.

In the following discussion, "incidence" and "incident sound" refer to a sound pressure wave striking a surface. The "angle of incidence" is the angle between an arriving wave and a line drawn perpendicular to the surface. See Fig. 1.



REFLECTION. When a pressure wave reaches a surface barrier, the wave is reflected back into the room. The angle of incidence and the angle of reflection are shown in Fig. 1 and are found to be identical. However, it is important to remember that no surface is a perfect reflector of incident sound. Some energy is absorbed by the surface, and the amount of this absorption varies according to both the construction materials and the wavelength of the incident sound wave. The "absorption coefficient" of a surface is its ratio of absorbed to incident energy. The absorption coefficient of most surfaces varies over the audio frequency range.

REFRACTION. Refraction is the bending of a waveform as it passes from one medium to another, or as it experiences some change (e.g., in temperature) within the medium. The angle of refraction is a function of the speed at which sound travels in the medium. Since the speed of sound in air is a function of temperature, a sound wave will bend upward if the air above a surface is cooler than the air nearer the surface, as may be the case outdoors in the early morning. Later in the day, the upper air may become warmer than at the surface, and the sound wave will be refracted downward.

DIFFRACTION. In order to hear a sound, it is unnecessary to maintain a straight-line path between the source and the listener, for as is well-known, a sound wave will bend around any obstacle placed in its path. "Diffraction" describes any change in direction brought about by such an obstacle.

The angle of diffraction depends on the ratio of wavelength to barrier size, and is therefore inversely proportional to frequency. In other words, the higher the frequency,

—CONTINUED ON PAGE 81

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THE CLASS

The Stage D film mixing facility at Todd AO Studios East, NYC, features a Solid State Logic 5000 M Series film production system, configured with 60 inputs and a G Series computer with Total Recall and Instant Reset.

Manhattan Center Studios' Studio 7 in New York City now features an SSL G Series/56 and Richard Rose-designed monitoring systems with soffited, shock-mounted Tannoy FSM-U mains and Tannoy AVM near-fields.

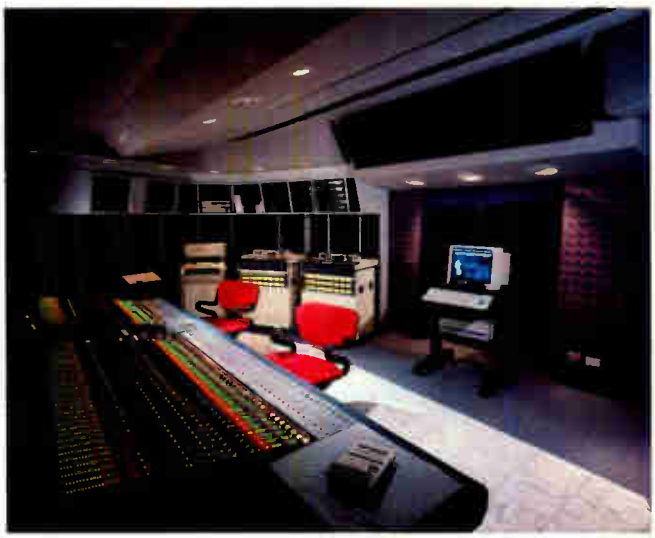
PHOTO: C.R. CONANT

Steven Durr used glass in the design of AD Productions in downtown Milwaukee to give the album tracking/video post room an open, spacious feeling. A 48-input Neve V Series looks out over Lake Michigan. Construction by Gary Beckman.

The mixdown room at Echo Sound, L.A., opened in April with an 84-input Trident 80C. Room design by Albert V. Siniscal, A-1 Audio; electrical design by Mike Williamson.

OF 1989

PHOTO: ED MALLES

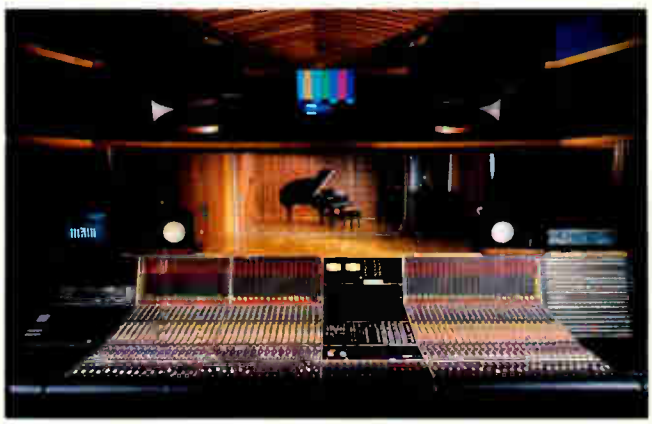


The new Full Sail Center for the Recording Arts in Winter Park, FL, was designed by John Storyk, with installation by VP Gary Platt and electronic design by Ted Rothstein. All rooms float within the six-studio complex, including this 60-input Neve room.

The new Studio B at Hit Factory Times Square, Manhattan, opened in September 1988. An SSL 4000G master studio system, with 56 inputs, G Series Computer and Total Recall, was added in 1989.

PHOTO: GENE DUNCAN

Disney/MGM Studios in Lake Buena Vista, FL, with an SSL SL 5000M film production system (96 inputs!). Pictured is Kent Tunks. Design by Phil Mendelsohn.



Alpha Studios in L.A. opened a new room in February, with one of only two AMS/Calrec UA 8000s in the U.S. The in-house design was based on Warner Bros. Studio E.

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PHOTO: ON-LOCATION PHOTOGRAPHY

David Koenka (architectural) and Vin Gizzi (acoustical) teamed up on the design for Groupe Andre Perry's new room in Washington, DC. Featured is a DDA DCM 232 console.

PHOTO: LARRY KAPLAN

Studio Center, the post room of Ron Rose Productions, Southfield, MI, houses a 32-input Neotek Elite and was designed by Ron Rose and Bill Bryan.

Power Play Studios, Long Island, redesigned this room for MIDI in September 1988. Corey D. Hart design. An SSL 4000E should arrive by presstime.

E.A.R.S., Inc. handled the design at Digital Multi-Media Post, Orlando, FL, a Dolby-approved facility for encoding of film soundtracks.

(Middle left) New Age Sight & Sound in Atlanta added an oak floor on sand-filled platforms in May; consulting by Jerry Milam Audio. The Neve V Series works with the BOSS/2 on video chase.

Studi 01, the new Synclavier room at The Plant Studios, Sausalito, CA, opened in May. Remodeling designed by Arne Frager and Bob Skye.

Thoughts on Recording, Automation, Console Design and the Future...

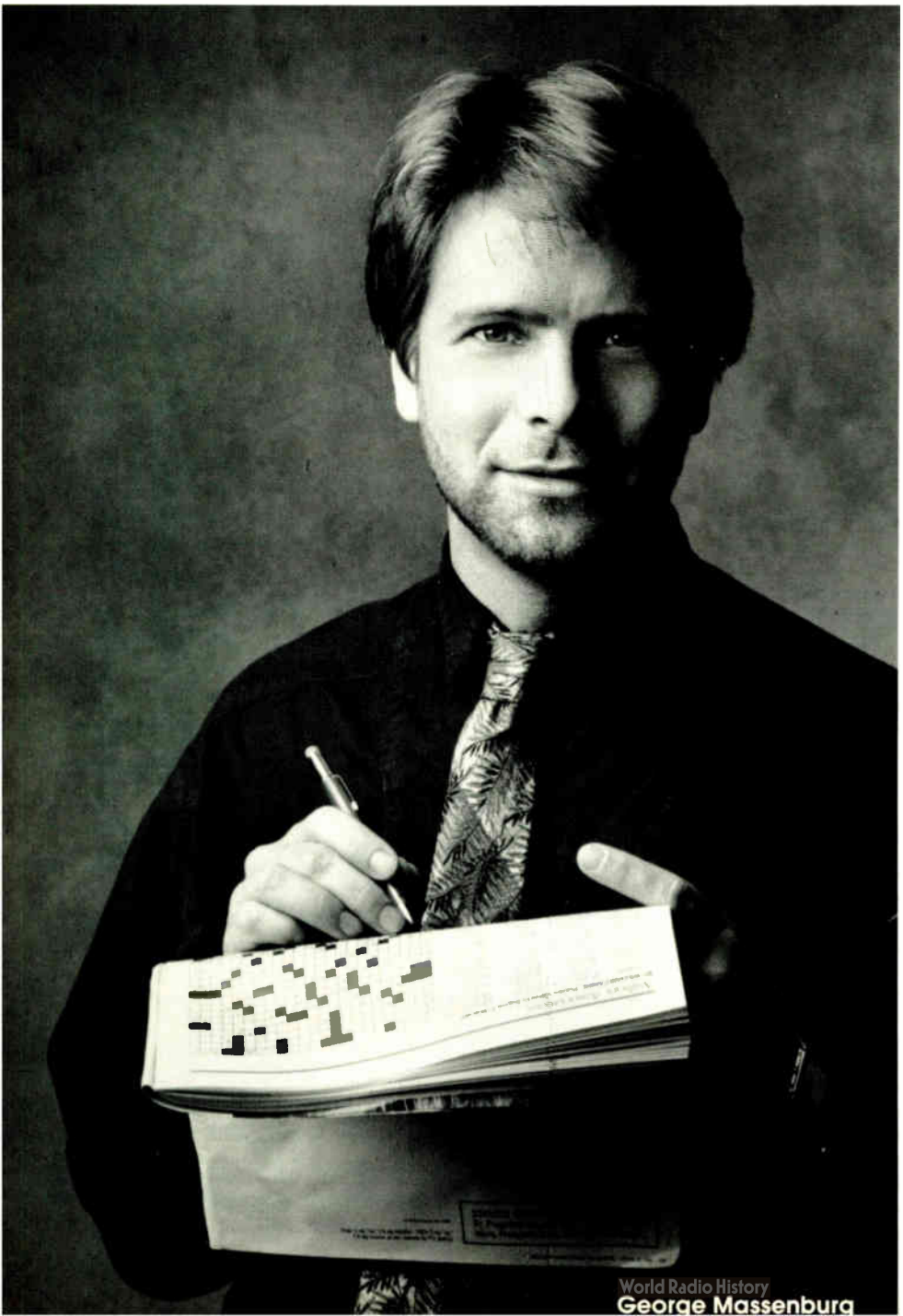


PHOTO: COURTESY OF WARNER BROS.

by George Massenburg

[**Editor's Note:** In this first installment of a three-part series, this well-known audio authority, inventor, studio designer, engineer and producer speaks out on the state and the future of studio electronics and automation systems. This series was written while George was finishing the production of Linda Ronstadt's new album at Lucasfilm's Skywalker Ranch.]

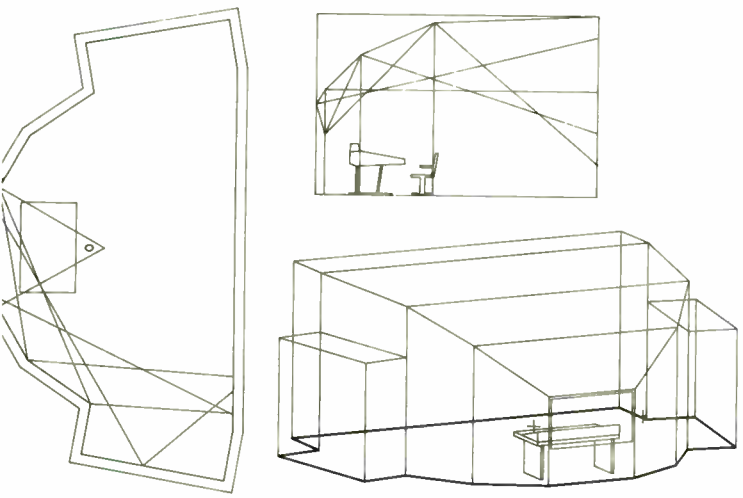
DESIGNING AND USING EQUIPMENT

I've been designing and building equipment just a little longer than I've been making records, which is sometimes longer than I care to remember. I started making things mostly because I was limited by what we had in the studio at the time, and I was annoyed at often being put in the position of having to tell artists or producers, "You can't do this, and you can't do that..." It seemed like either I was saying it all the time, or other people were saying it to me. Things were rather more primitive in the early '60s than they are today.

Actually, my very first electronics work had nothing to do with the music business. I was about 15 years old, and I was working in Dr. Curtis Marshall's medical electronics laboratory, helping on a front end for an EEG unit, which was called a computer of average transients. It used a Radichon storage tube for memory and was mostly a vacuum tube device. This was in the early days of data storage and retrieval. Back then, data storage was clearly a case of engineers trying things—people asking the musical question, "What if?" and hearing the answer, just as often, "No way." It was

Design

by: Acoustical Physics Laboratories



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pretty chaotic and inaccurate, at least until core memory was widely adopted.

That was my first exposure with unreliable systems and inappropriate technology, and the work I did (and the disappointments I experienced) in those early days has clearly shaped the way I think about electronics now.

I have worked in every kind of recording, from 2-track on up, as a musician, engineer, producer and almost every other segment of the business—mastering, graphics and layout, printing and pressing records. But I've always kept a strong hand in the electronics and design side, and it is out of love for that field that GML (George Massenburg Labs) evolved.

I really have the best of both worlds. My work at GML and my work in the studio are pretty complementary. I design things, and when I use these things to make records, problems show up quickly. I've always done that. Before GML there was ITI, where the first recording studio parametric EQ was born, and after that, Sontec.

The best part about building products we design—the automation system, the compressor, the parametric equalizer and the mic preamp—is that the stuff I design and build gets into other hands. Then I get to talk to engineers who would never open up to another recording engineer. There are people out there who use the equipment I make in ways I would never have thought of, and more often than not, they know where to go with refinements in the design. The stuff GML makes is not mine so much; a lot of it ends up coming from the people working in control rooms who know in their hearts how things should work.

As a designer, I get a lot from outside sources. I devour other designers' work, often studying other systems for the fun of it. Guys like Mick Guzauski and Ron Pendragon have made major contributions to our systems that cannot go unacknowledged. Mick, for example, contributed to essential concepts in the automation system control interface, and still gives us ideas about it. It's a symbiotic relationship, because these guys come up with ideas that will make the equipment better and cleaner and easier to use. And as these ideas are incorporated into the systems, those engineers in turn use that upgraded gear in the studio—with no small amount of pressure—and it works or it doesn't, and we hear about it pretty quickly.

From there we get into a related area that deserves more than a brief discussion, though the somewhat limited space we have here will have to suffice: What will shape future audio equipment designs? What high-tech developments will have to occur outside the audio industry in order for us to overcome the limits of the technological building blocks with which we now must work? And finally, what are the separate but related roles of the engineer and his or her equipment—where do they coincide, and where must they diverge?

Let's begin by taking a look at a number of existing audio technologies and trying to hypothesize where developments may lead them—and us—into the future.

CONSOLE DESIGN AND AUTOMATION

At GML, we've always tried to make our automation systems as easy and logical to use as the available technology will allow. We hope that at some point—most likely years from now—automation will become such an integral part of the console that it becomes second nature to the engineer because it is part of the board's design. That would be the ideal scenario. When or how it happens will depend on a number of things, including how quickly certain new digital processing technologies are developed by the high-tech powers that be (mainly, such inscrutable entities as the aerospace, defense and computer industries). At any rate, at GML we've always been more interested in the progressive simplification and reduction of that user-interface aspect of automation than any other area. But let me digress for a moment and look at some of the how and why of modern console technological and ergonomic design.

The physical organization, or topology, of consoles today is sort of an artifact of some topologies that result from efficient use of logical electronics layout. That is to say, a recording console is not laid out in a certain way because someone actually said, "How about if we put everything in a vertical strip and the tape monitor can go right there, and maybe an equalizer right above that, etc." Some singularly inspired engineer did not one day sit down and say, "I think that it

—CONTINUED ON PAGE 136

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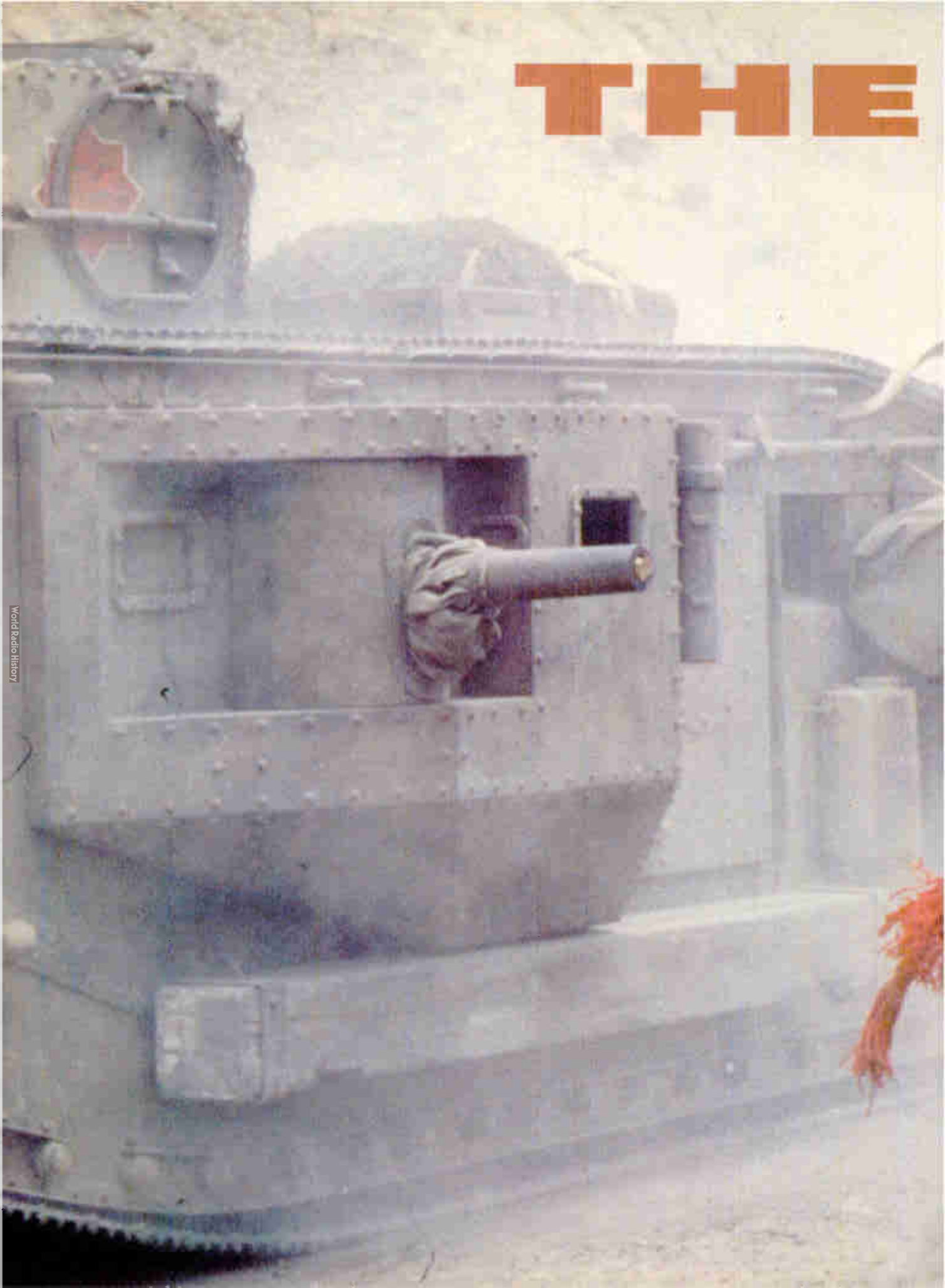


SOUND

OF INDIANA JONES AND THE LAST CRUSADE

An Interview with Gary Summers

For 80 days during late 1988 and early 1989, an elite crew of sound technicians and craftsmen worked feverishly in a secluded rustic valley of Northern California to complete the mixing of the final segment of a trilogy of blockbuster films started nearly a decade ago.

For Sprocket Systems (the post-production division of Lucasfilm, Ltd.), *Indiana Jones and the Last Crusade* was the culmination of work on the adventure series that began with *Raiders of the Lost Ark*.

For sound designer Ben Burtt and dialog and re-recording mixer Gary Summers, who collaborated on the first two Indiana Jones films, working on the last of the series brought the challenge of creating a freshness to the track over and above what was achieved in the first two films of the series.

DAT recorders and a Synclavier were put to use in recording effects tracks. Due to its superior generation-to-generation transfer capabilities, the Dolby SR (Spectral Recording) noise reduction system was used by the Sprocket Systems crew throughout the mixing—in what Summers says is the closest anyone is likely to get to a digital-quality, sprocketed film sound mixing system.

Unfortunately, Paramount Pictures, the film's distributor, decided not to release the film in SR because of logistical complications relating to the double-inventorying of release prints (the simultaneous distribution of the film in both SR-encoded and standard

PHOTO: MURRAY CLOSE

BY NICHOLAS PASQUARIELLO

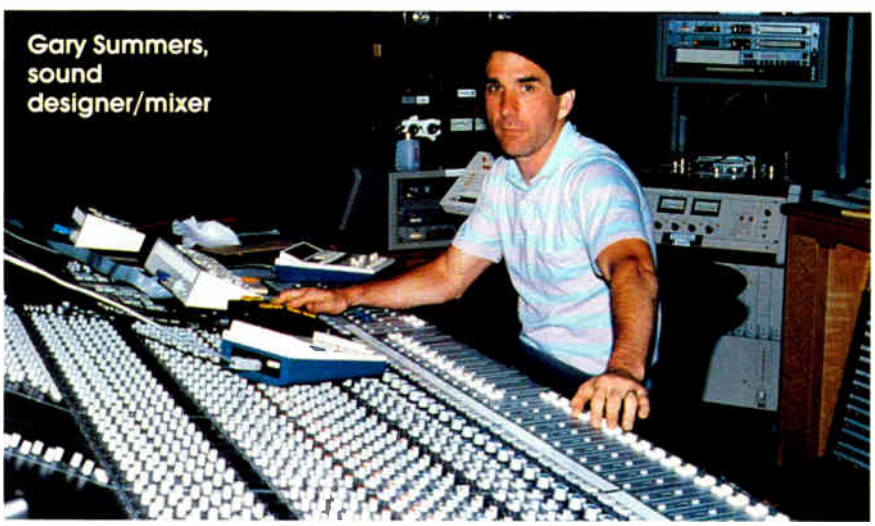
ALL INDIANA JONES PHOTOS: MURRAY CLOSE

formats). However, in case the situation changes, the film's executive producer, George Lucas, had an SR master made.

Summers, a veteran member of the Sprocket Systems team, was hired by Burtt in 1979 to work on *The Empire Strikes Back*. Since then he has mixed 13 features, as well as a host of special projects (such as the Disney/Lucas/Coppola collaboration, *Captain Eo*), Imax films and TV shows. He was nominated for an Academy Award for Best Sound on *Return of the Jedi* in 1983.

Mix: How did you approach the mixing of *The Last Crusade* soundtrack differently than the previous two Indiana Jones films?

Summers: We went into this film with the idea that this may be the last Indiana Jones film, and what are we going to do to satisfy ourselves creatively? How can we do something different on this one? Filmically, it's similar to the others in concept: there are chases and gunshots. Although there's some neat and interesting stuff in this film, we were trying to figure out how we could add some shine to it, a little something around the edge. Ben had his work cut out for him in coming up with sounds for the new material in the film, such as the vehicles, weap-



Gary Summers, sound designer/mixer

PHOTO: HALINA KRUKOWSKI

FOLEY FOR INDY

David Slusser, Foley recordist for *Indiana Jones and the Last Crusade*, has been involved in recording, mixing and editing sound for film for 15 years, and started at Lucasfilm five years ago as an audio technician. He says that the successful recording of the Foley effects was a collaborative effort involving supervising sound editor Richard Hymns, who spotted the film, sound designer Ben Burtt, dialog and re-recording mixer Gary Summers, Foley editors Sandina Baillo and Jeannie Putnam, Foley artist Dennie Thorpe and himself.

All Foley work was done in the new Foley room at Skywalker Ranch. It was a real challenge on this film to make the Foley sounds compatible with John Williams' soundtrack and Ben Burtt's larger-than-life sound effects. "If you draw attention to the Foley, you're not doing a successful job, and yet you have to do something to get it to stand up to the other sound

—CONTINUED ON PAGE 62

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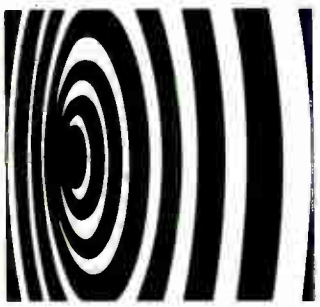

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ons and rats, etc. We also looked at technical considerations. We knew there would be a large release in the 70mm format. We'd done Imax films and I had done a film for Disney, *Captain Eo*, all using the stereo surround format, and we had a lot of fun creating that kind of environment.

We talked about creating stereo surrounds for Indiana Jones and went ahead with it in our creative planning. Then Paramount picked it up and said it was a great marketing device. [The second film in the series, *Indiana Jones and the Temple of Doom*, was done with just a mono surround channel.] The 70mm prints can be played in any 70mm theater because they are mono surround-compatible.

We could see from early screenings of the film that there were many opportunities for the stereo surrounds to be used effectively. That's when we coined the expression "Full Field, Split Surround." We feel it is different from other split surround films. The surround channels are always active, not just for isolated effects or music.

It's the sort of thing the audience may not always be aware of, and that's good! You don't want the sound to take people out of the picture; it should enhance, it should draw them further into the image.

Mix: Did you use the same format as was used on *Apocalypse Now* with respect to stereo surrounds?

Summers: Yes, it involves the six tracks of the 70mm print: left, center, right, surround, and the two low-frequency enhancement channels. In designing this system, Dolby wanted to use stereo surrounds and still have the subwoofer channels. So they built an encoder box, which essentially is a series of lowpass and highpass filters. Tracks 1, 3 and 5 are left, center, right, untouched and unfiltered. Track 6 is the mono surround channel in a conventional system, and in a split surround theater frequencies below 315 Hz are sent to left and right surround. Tracks 2 and 4, below 100 Hz, go to the subwoofer channels in both types of theaters. Frequencies on tracks 2 and 4 above 315 Hz contain the stereo information for the split surrounds.

Mix: Did use of your Full Field, Split Surround technique affect the way you mixed your dialog?

Summers: It did, from a reverb standpoint. Most of the time I would add a separate stereo reverb to the stereo surrounds. The characters are often in caves or castles, and in those situa-

tions when someone yells, there's a great opportunity for the echo to be everywhere. So I put the stereo Quantec (QRS-XL) in the rear channels and used the Lexicon (224XL) across the front. From a creative standpoint it was fun to do it that way.

There is some panning of dialog across the front channels. Ninety percent of the time the dialog will come out of the center speaker, but there are some shots—like the German staff car scene—where one guy's head is in the far corner, another guy's almost directly in the middle, one guy is walking alongside the truck and they're all talking. The average 70mm screen is 45 to 50 feet across, and having all that dialog come out of the center channel seemed very strange, so we just panned the lines into the characters' mouths.

You have to be very careful in those situations, because the audience is used to having it come out of the center speakers. If you notice that it's happening, you've got to fold it back in, because you don't want to shake people out of their seats. You don't want to make them aware of the soundtrack to the point that it distracts them from the experience as a whole.

Mix: How much of the final dialog track of *The Last Crusade* was looped for ADR?

Summers: About 25 percent, which is very low for our films. *Temple of Doom* was around 65 percent; *Willow* was 85 percent.

Mix: Why was there significantly less looping on the last Indiana Jones film?

Summers: A lot of the credit goes to Tony Dawe, the production recordist. Also the one thing that Steven [Spielberg, director] told me was to use production dialog at all costs, because that's the performance he liked.

Mix: Did you do a temporary mix?

Summers: When we work with George [Lucas], we always do very elaborate temp mixes for two reasons: first, it allows us to experiment with sound against the picture to see what things will work and what won't; second, it allows the director and the picture editors to begin to see the film closer to its final form. This aids them greatly in their task of telling the story. Even though it's a temp soundtrack and the music is not the real music, it begins to look and sound like a movie. When we did the temp mix for *The Last Crusade* we were contemplating a stereo surround release, so it was an opportunity to try some creative experiments. We were quite pleased with the results, although we didn't get any direct feedback from Steven or George at that point, because they were preoccupied with the picture editing. John [Williams, the film's composer] also finds these temp mixes valuable, because it gives him a rough fingerprint of what types of musical moods work or don't work.

Mix: How much did Spielberg participate in the mix?

Summers: Steven was at the mix a total of six or seven days. Not a whole lot! I think this was greatly due to his previous trusting relationships with Ben and the rest of the crew working on the sound. He knew he didn't have to be there every minute to make decisions. We did all the premixing without the director there and had very few changes once he heard what we had done. Once the premixing was done, Steven would fly up to look and listen. We previewed the first six (of the total of 14) reels for him, then we mixed them, and he came up the following week. We would preview the next eight reels for him and play him the reels we had already mixed. He would make his notes and changes

for those reels, then we would implement those changes. After he left, we mixed the next eight reels, and when he came back up we screened those eight reels for him, after which he made some notes and changes. Then we had a preview screening with an audience at the Northpoint Theater [in San Francisco]. After that screening they made myriad picture changes. It took about two weeks to incorporate all the changes into the soundtrack. We had a final screening for Steven here at the Ranch so he could give us the okay to begin making the final masters. ■

Nicholas Pasquariello is a freelance writer and filmmaker based in San Francisco.

—FROM PAGE 58, FOLEY

that's going on," says Slusser. Practically none of the production sound was used, in part because it was also going to be released in foreign language versions.

Slusser used a Schoeps mic for some of the Foley recording, but went to a special Neumann U87, modified by mic specialist Klaus Heyne, to produce a hotter signal with respect to the noise floor, which is rated at NC5. "We also saturated the tape and used Dolby SR with the SSL board." As many as 22 separate mono tracks of Foley were recorded for certain scenes. Slusser recalls, "In some cases we used every track on the tape. We put SMPTE on track 24 and a 60Hz pilot tone on track 23 as a safety measure, in case we experienced problems locking to picture."

In order to get the sound to work, Slusser made judicious use of compression to achieve a little more ringout—something which he says is not normally done in Foley work—and EQ to bring out the most recognizable aspects of a given sound. "In the case of footsteps in the cave, for example, we also used some predelay so it sounded like they were actually recorded in a cave." Slusser says. "For outside scenes we set up baffles in the room to absorb all reflections, and changed the pattern on the mic to make it more directional, thereby minimizing any reflections off the room walls." Any addition of reverb or other effects happened later, in the mixing stage.

"Sometimes we use very unconventional props to get the sounds; other times we go for the real thing," continues Slusser. "For example, we used real pottery to create sounds of breaking pottery. Or in a scene where one character drinks from the wrong cup and disintegrates, we found some old cow bones out on the Ranch property, and we used them to recreate his disintegration by shattering the bones on cobblestone."

It took about two weeks to record all the Foley effects for the film. The fast pace was possible due to several factors: the Foley room had been fine-tuned during a previous release, *Fletch Lives*, using the same team of people as on this release, and Foley artist Thorpe did her homework before she came into the studio, actually getting into the characters of the people she was working on, practicing their performances to make the effects more convincing.

"She has an extensive set of props to get just the right set of sounds," comments Slusser. Thorpe, a veteran of more than 45 films, including *Indiana Jones and the Temple of Doom*, adds that often the process of creating the right sound is a matter of "pulling it out of the hat. For example, when we did rat footsteps, we used leather gloves, and I glued fake fingernails to the gloves to produce a realistic effect of rat scratching sounds on the casket. I whacked a wet chamois against a piece of concrete for when a rat falls on her shoulder." Thorpe claims to be most happy with the sound she created to accompany the brushing away of spider webs. "That's a tough one because it's an extremely quiet sound, but it has to get on tape. Someday I may say how I did it, but I'm not ready to say how I did it right now."

Regarding the use of digital techniques in Foley work, Slusser explains that for smaller video projects they sometimes make limited use of the Synclavier, but "for big-screen productions like this, we feel it's much more convincing to go with a live Foley performance."

—Paul Potyen

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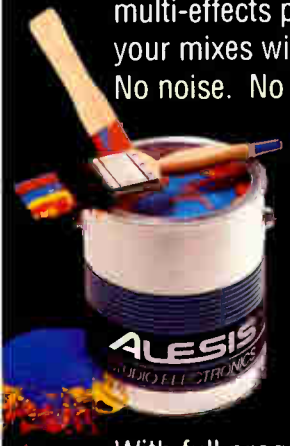

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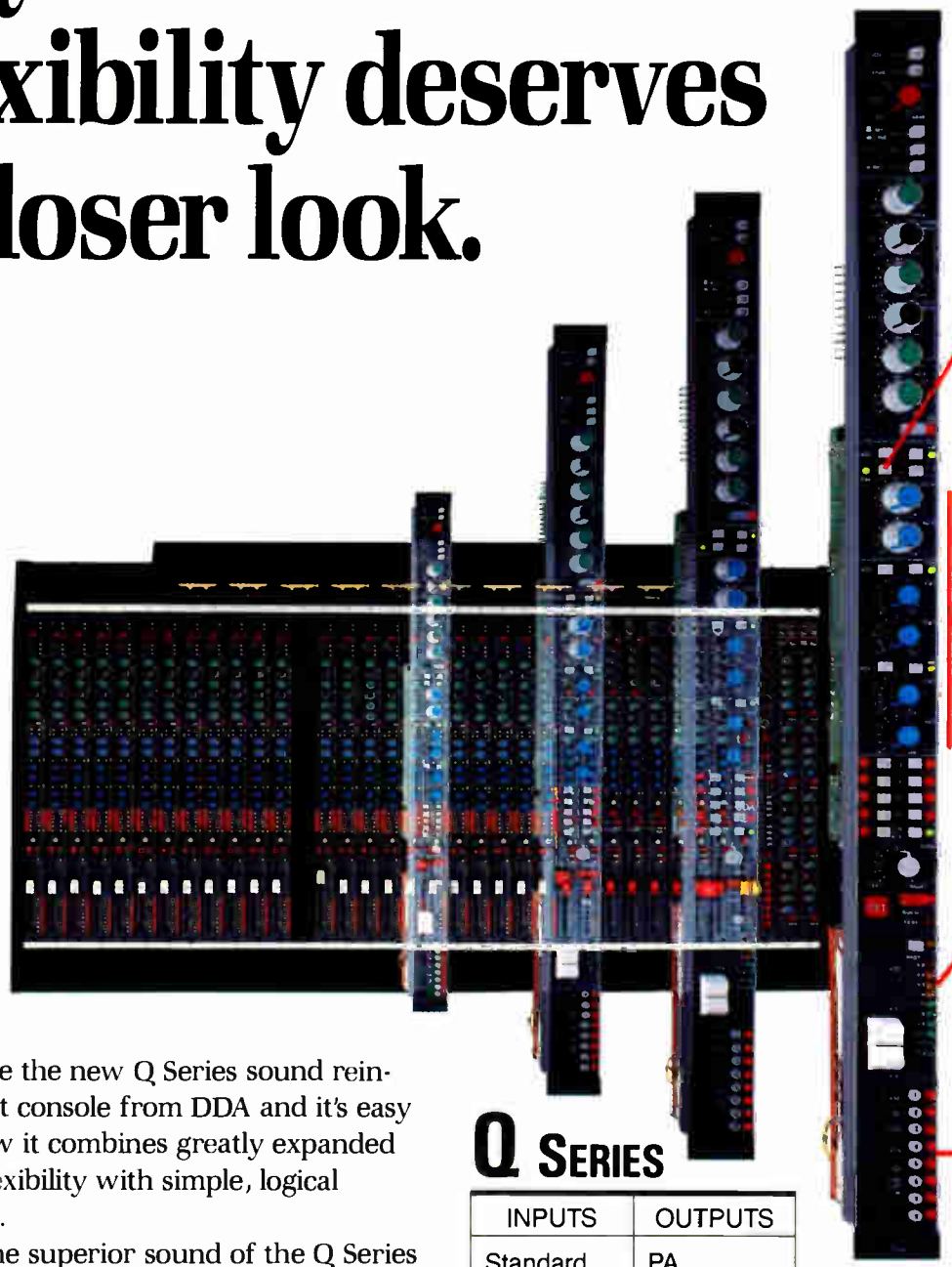

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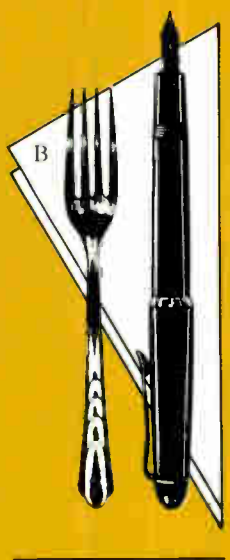
by Mr. Bonzai

DR. JOHN

RIBBIN' & RAPPIN' WITH THE HOODOO KING



This story begins in Montreal, Canada, 1973, with Dr. John *The Night Tripper* at the tail end of his gilded hoodoo period. It was the year of "Right Place Wrong Time," and the stage was full of New Orleans festivity, with Dr. John in feathered headdress, painted face and draped in coats of many colors, generously tossing handfuls of glitter to the ecstatic crowd. A party with this man as the High Priest is a sight to behold, an intoxicating revival of humanity in harmony.

The conversation we had that night has never been published, and it aired only once in a radio documentary I produced with the infamous Captain Squid. (Remember "underground" radio?) We zoomed in on Dr. John after the show and subjected him to a volley of thorny questions that would puncture a timid soul. But the Doctor was immediately hip to our jive, and joined us in a little leg pullin'.

Capt. Squid: Do you believe in the Devil?

Dr. John: Yes, but only on Thursdays at midnight when I see him comin' around the corner. I know that's the Devil—but that's only because he makes me buy things.

Capt. Squid: Are you the Grand Zombie?

Dr. John: Yeah, you're right. Always have been, always will be and always was.

Capt. Squid: Are you ready to admit that your magical capabilities have led you to have such a massive following?

Dr. John: Only when we play music—that's the only time that I will admit that. But at other times I admit to nothing.

Mr. Bonzai: You had trouble getting across the border because you declared your occupation as "witch doctor"?

Dr. John: Yeah, and they said they wouldn't let me into the country because I was a threat to Canadian/American relations. It was a hang-up because of all my roots and herbs.

PHOTO: WILLIAM COUPON

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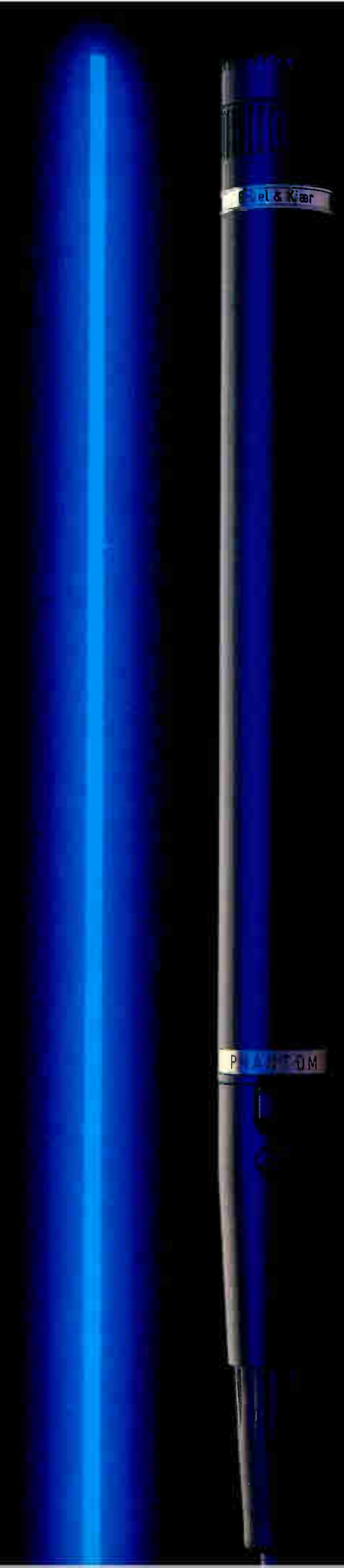

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They couldn't check 'em all. They said they would have to get a herbologist to figure out what all the stuff was.

Capt. Squid: Do you keep this strange stick everywhere you go?

Dr. John: Yes, my conjure stick—it helps me walk. I have another one I keep in my room that is smaller that I use for walking in the streets. This one is for walking in the audience and on the stage.

Capt. Squid: And backstage, so you can answer my questions. . .

Dr. John: That's right, because I wouldn't have the confidence to give you a lying answer if I didn't. I knew I could pull your coattails and let you pull the covers off of me and expose me for whatever I wasn't. You rip and rap in the true spirit of kicks. Nobody ever asked me no kicks questions never before. I'm glad you guys came.

Capt. Squid: Do you think your audience is putting you on, or are they just clapping for fun?

Dr. John: You mean are they laughing at me or with me, or are they clapping at me or against me?

Capt. Squid: Are they just putting you on with all the stuff they do, or are they serious?

Dr. John: I think they've been putting me on since before I was born, but besides that, I been putting them on, too. We often put each other on, but that's what *gets* it on, because we all know we're kiddin' and ribbin' and rappin' and mackin' and jeffin' each other. As long as we know that we have good Mardi Gras spirit and nice vibes amongst each and other, we all should get along most *desitively bonnaroo.*

• • • •

Sixteen years later I met up with the good Doctor once again. A magnetic and gentle soul, he wore a stylish three-piece suit and a sporty straw fedora. To launch his new album, *In a Sentimental Mood,* the record company called for an intimate evening at Hollywood's Club Lingerie. Seated at a pure white grand piano, with a band that kicks up a storm, Dr. John captivates, mesmerizes, sings his soul out and makes absolutely every song come to new life with a casual, well-seasoned exposition. It's so down to earth it's heavenly.

Bonzai: Your new record is getting a lot of attention. Is this the Second Coming of Dr. John?

Dr. John: That sounds okay to me.

Bonzai: Is it true that you started out in show business as a model, and that your baby picture was on the Ivory Snow soap package?

Dr. John: Yes, but I really never saw whatever I did. I know about it from a lot of people and from my family. When my mother was modeling, she ran me out, too, as a little baby, and that's why I had a social security card from when I was a 1-year-old.

Bonzai: Did your dad own a record store when you were a kid?

Dr. John: Yes, he had an appliance store and fixed radios. Then he started sellin' records, too—this was next to a black college called Dillard University in New Orleans, on Gentilly Road, a great spot for me as a kid. I used to hang around and check out the records that these people were into. There was all these bebop records, and what they used to call race records, which were blues and R&B records, and hillbilly records, or as they call 'em today, country and western records. Also, my father worked with a guy who ran a recording studio in New Orleans and ran a record service in the hotels on South Rampart Street and other places. They had great blues and traditional jazz records. I'd get all of the old records from the hotels when they were too scratched to play in the jukeboxes. As a little bitty kid I had a great collection of records.

Bonzai: Did you study guitar with Sister Eustache at the Temple of the Innocent Blood?

Dr. John: Actually, I took lessons from her nephew, Roy Montrell, in this little woodshed behind their house, which had a storefront church in the main house. If he didn't feel like makin' a gig, or had booked another gig, he would pick me to sub for him. I learned a lot of old hymns and spiritual church music and met a lot of people through those days who turned me on to a whole different kind of music.

PHOTO: JIM MARSHALL ©1989

Dr. John in the early '70s, complete with gris-gris accoutrements.

Bonzai: Is it true you switched to bass playing because you got shot in the finger?

Dr. John: Yes, in 1960, I was playin' in Jacksonville, Florida, with Ronnie Barron, who couldn't have been more than about 15 or 16 years old. I went to get him for a gig one night and walked in the room and a dude was pistol whippin' him. I went to try and get the gun out of the guy's hand, and in the altercation that ensued, I thought my hand was over the handle, but it was over the barrel. When the gun went off, it blew the tip of my finger off. They sewed it back on, but to this day I can't use it too well on the guitar, but I can use it to some degree on the piano. While I was recuperatin' I played bass with a dixieland band on Bourbon Street, at a nightclub called the Famous Door. I also played drums for a little while

around the same time.

Bonzai: You used to back strippers?

Dr. John: Oh yeah, I was doin' that from early on to make music. My family had gotten me a work permit to work with these older guys, because for some crazy reason they trusted me with them. They didn't know it, but I was runnin' out at night and playing gigs at strip joints and dances. I had no idea where they thought I was playin', but I had a work permit, so when the police would come shake down these clubs, they wouldn't hassle me.

Bonzai: Your first record was financed by Sonny Bono?

Dr. John: Yeah, my first vocal record.

Dr. John Goes With the Flow

"I waited a number of years to get a record deal, and I had a number of fights, even with some companies affiliated with Warners," Dr. John says of the road leading to his new album, *In a Sentimental Mood*. "I was about to re-sign with Atlantic, and [label boss] Ahmet Ertegun was saying to me, 'Well, what's the single you've got?' And really, I was trying to come up with what he wanted, but it just got to the point where he said, 'Yeah, that's a single! But it's for Lynyrd Skynyrd or somebody...'

"That stuff goes on all the time, and I've got to remember that going in the door, 'cause I'd hate to get caught up in that mess again! I've been there and it's not a fun place to be, nor is it conducive to being creative."

After a checkered recording career spanning two decades, Dr. John knows something about being caught between the needs of a record company and the whims of the public. Yet he has doggedly pursued his own path, wherever's it's led him.

Which is where *In a Sentimental Mood* comes in. Produced by Tommy LiPuma, the record is a collection of standards—ranging from "Accentuate the Positive" to "More Than You Know"—that finds Dr. John in a reflective mood, rather than plying his usual New Orleans funk. Anchored by a duet with Rickie Lee Jones on "Making Whoopee," the disc successfully redefines the possibilities for Dr. John's music.

"It's funny, because if we'd tried to do this record four, five years ago, I'd have gotten a big 'ix-nay' from the record company," he says, shaking his head. "But this is the third album I've done with Tommy LiPuma, and each record has been a departure for me, so I can have a different kind of growth within what I'm doing musically. Tommy's important, because a lot of producers get in the way of the record and what's happening, and I gotta be careful about that."

It's hard to imagine Dr. John being undermined in the studio. Mention this and he grins, shakes his head again, then leans forward and says conspiratorially, "One of the things you've got to understand is that when you're making records, it's got nothing to do with making music!

"All I can do is try and avoid getting caught up in it—and try to help the guys I know not get caught up in it, either. I mean, that's one of the reasons I wanted to do this record all *live*—to get as far away from that whole scene as humanly possible. The business and the way music is made is so far removed from everything I learned about music and making records.

"Grandmaster Flash told me one time, 'Dr. John, you're obsolete! We don't make records like that anymore. We use tape loops, we do this, we take these tapes and use peaks of other records.' I was listening to him and thinking, 'Man, I kind of like some of those records, but I don't like how they're actually made.' I mean there's so much technology and so little from *here*," he says, putting his hand over his heart, as if swearing allegiance to a purer way of doing things.

Although *In a Sentimental Mood* was ultimately recorded live in the studio, the process of deciding what would be included on the record was a highly organic process that changed as the project evolved.

"We were originally intending to

An album called *Gris-Gris, Dr. John the Night Tripper*. We started recording it in '67 and finished in '68. While Sonny and Cher were doing their first movie, we started doin' this record on studio time that they weren't able to use because they were stuck on the movie lot. Sonny liked the idea of it and told me to go ahead and finish it. All of a sudden, Ahmet Ertegun was do a tribute to Louis Jordan, and we started cutting some stuff like that," Dr. John recalls of the early sessions. "Then something happened—one of the arrangers got sick—and we changed gears.

"I was gonna cut a duet with Mavis Staples on an original song. We'd done this duet of 'Don't Let the Sun Catch You Crying' on that *Sunday Night* TV show and Prince saw it. Then he decided to do an album on her, so scheduling her got real tight.

"Things kept happening with this project. We kept making left turns where we weren't planning to. It's cool. That's how things go in real life. It might've been a totally different album if things had gone as originally planned, but all the changes made this album more interesting. And if this was being done the way 'records' are made, we'd have never been able to flow with the changes.

"After you've done a song awhile and you've played it a few times, something gets locked in your head about what you're gonna do. But when it's material that's really new to you—which most of these songs were—then you've got no idea in the world *what* you're gonna do with it. So all of a sudden you're playing real creative stuff, 'cause you're not falling back on the same old-same old."

In a Sentimental Mood may seem like a bit of a curve ball to some, but Dr. John has made a career of confounding expectations. "I always try to make records that are different," he says.

"*I* might be able to make the 'definitive' record of me, but somebody else would just be taking me and making me into something they believed was me and wouldn't be. And that becomes real jive shit, to make the long story short."

—Holly Gleason

stuck with a record he didn't know what in the world to do with.

Bonzai: You followed that with *Babylon*, a landmark...

Dr. John: I was so shocked that we were doin' a second album, I wasn't prepared to do one—even though my band was really great and tight at the time. I used to challenge any band that was on gigs with us to a battle-of-the-bands on the spot. Half the material on *Babylon* was leftover material from the *Gris-Gris* album, and the other half was my version of a protest record—protesting all the regular things that everybody else was protestin' at the time. It was also my version of an anti-psychedelic record, which is completely the reverse of what it represented to the people who bought it and liked it. I noticed when we got to Europe that we was considered some sort of political thing, as well as a psychedelic act.

Bonzai: You were a major attraction for the psychedelic crowd.

Dr. John: It's what kept us workin'. In hindsight, had it not been for that, I'm sure we would have never survived the time. From the basic type that I was meetin' at the love-ins and be-ins and whatever gigs we were doin', I had this totally confused look at all of this—like, oh man, this is the worst thing that could happen. This is considering what me and my whole band were like. Most of them were fresh out of New Orleans, and the whole scene that was around represented Armageddon, or something else bizarre. They were all confused and in a complete quandary as to what in the world was going on around us.

We were unconsciously promoting what we were trying to argue against. It just shows to go ya, that no matter where you go and what you do in this industry, things can get distorted so quickly. I think we got our point over to certain groups who were open. But the ones that weren't open—I think we had some very sour reactions in areas.

Bonzai: Are you happy with this new record?

Dr. John: Oh yeah, I like anything I've done with Tommy LiPuma, and I feel good about this one, too. This is the third album I've done with him, and everything I've done with him I've always felt good about.

Bonzai: Any advice for people thinking about a career in music?

Dr. John: I think if they get into music 'cause they love to play it, they are doin' it for the right reason. I really discourage a lot of people from getting into this racket. I don't think it's something you should get into for the money. You should get into it because you just love to do it.

Bonzai: Who makes the best gumbo in the world?

Dr. John: Being very prejudiced about gumbo, I think my daughter in New Orleans, Karla, makes the best gumbo.

Bonzai: What's the biggest mistake of your life?

"No matter where you go and what you do in this industry, things can get distorted so quickly."

Dr. John: The biggest mistakes I ever made was when I turned down every big gig that was offered to me—like when they asked me to play at Woodstock and I turned it down to play another festival. I turned down gigs that didn't seem like much of anything and they turned out to be huge issues. But I've consistently done these kinds of things, so I guess it isn't such a big mistake in the long run, 'cause things have a way of straightening out anyway. Whatever mistakes I've made, and I've made a whole gang of 'em, have led to something pretty cool.

Bonzai: Have you ever witnessed a miracle?

Dr. John: When I used to be around the Temple of the Innocent Blood in New Orleans, I actually believed Mother Catherine did something that could be akin to what people call miracles. I remember a woman who

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ALLEN & HEATH

had had an abortion, a real coat hanger-type job, and the hospital was sayin' this woman was going into shock quickly and would croak. Mother Catherine took this girl and just through some layin' on of the hands, and whatever else she did, brought something out of the girl that was deadly, savin' her life so bizarrely and so quickly. Also, I saw Mother Catherine save a little baby one time when the doctors had chalked this kid off as 'gonna croak.' To this day, I have no idea what she did, and she claimed it was nothin' like a miracle.

Bonzai: Do you believe in reincarnation?

Dr. John: Well, I tell ya, I have a two-sided look at reincarnation. One side of me tells me that when you're six by six, you're six by six. The other side tells me that there's enough connections floating around with strange occurrences that may lead my brain cells to believe that there is some sort of continual issue goin' on. I was always told by my pa that it is better to believe than to not believe. If you croak and you find out that everything you heard was true, then you're okay.

Bonzai: How do you feel about getting older?

Dr. John: I've always believed that age is a state of mind. We age ourselves only in the ways that our spirit is aged. The meat may decay, but the spirit never will. As long as we keep some focus on the spirit, we're doin' all right. The spiritual side makes it all immortal.

Bonzai: I'm Irish, and we have a style of celebrating death...

Dr. John: I think we stole our New Orleans jazz funerals from the Irish. I've heard from quite a few reliable sources that it was directly copped from the Irish folks that once lived there. Now it's no longer an Irish community, but it's still called the Irish Channel. This is where the jazz funerals originated.

Bonzai: What do you have in mind for yourself when they carry that big box down the streets of New Orleans?

Dr. John: I was hoping they would have a large, fiery ceremony—maybe they can set me on fire and let whatever is still burning go adrift down the Mississippi River.

Bonzai: How about the music?

Dr. John: I just want some funky music. I want the embers to go out dancing to some crucial, chronic New Orleans funk.

Bonzai: How are you feeling these days? How's your health?

Dr. John: I was in a wreck about a month ago and broke three ribs and got a pinched nerve in my back. Then two weeks later I was in another car accident and got some stone bruises on my shins, and some other stuff. Considering all that, I think I'm in great health. I haven't missed a gig, and I was on the road the night after the first wreck and after the second accident. I haven't missed a gig, even against the doctor's orders. Music is a healin' force around me.

Bonzai: Do you have any big surprises coming up?

Dr. John: I am always surprised that I am still giggin' and surprised that I'm makin' another record. Every day of my life, since I've been in this business, has been a surprise. ■

Mr. Bonzai is Mix*'s editor-at-large, interviewing interesting personalities and getting some gumbo out of the deal.*

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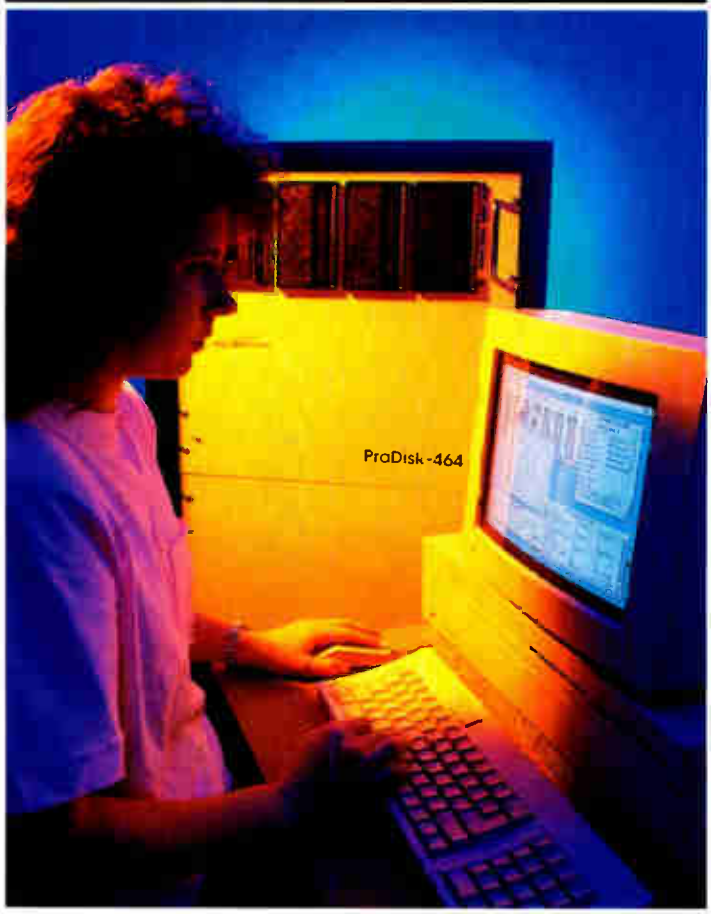

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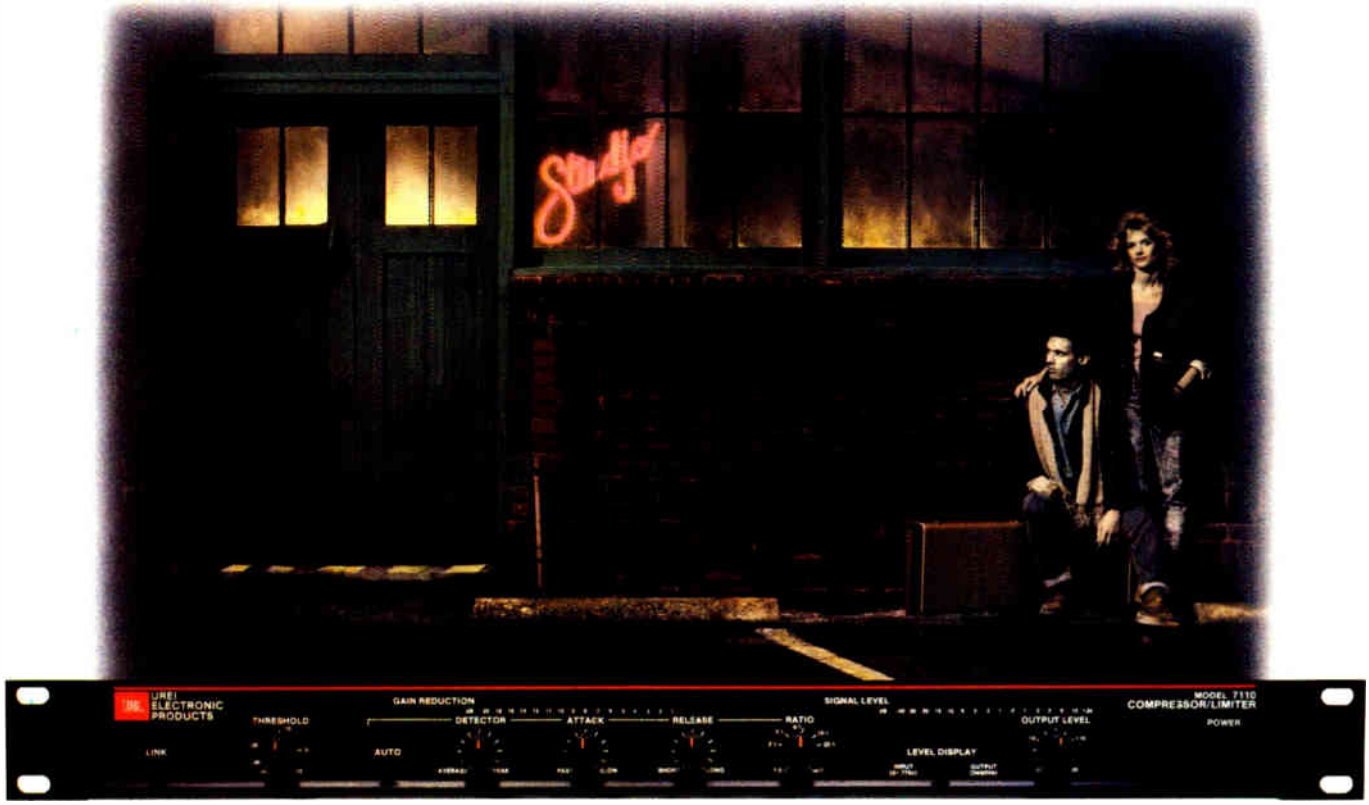

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STUDIO MONITORS

by George Petersen

SPECULATION ON THE NEXT GENERATION

While signal processors, tape recorders, consoles and musical instruments seem to make quantum leaps in technology every year, studio monitors—a critical factor in the recording chain—seem to be stuck somewhere in the Paleolithic era. The evolution of studio monitors has been a continual process, and the integration of exotic materials, interactive electronics, innovative transducers and new designs into the studio listening environment could mean some big news for the control rooms of the next decade. We checked in with some speaker manufacturers, soliciting their views on current market trends and what we might expect to see in the next generation. Perhaps the best is yet to come.

Before we embark on any discussions concerning studio loudspeakers, a few ground rules are necessary. Edward M. Long, of Oakland, California-based E.M. Long Associates/Calibration Standard Instruments originally coined the phrase "Nearfield Monitor™" and holds the trademark on the phrase "Time-Align™". "The word 'monitor' comes from the Latin word 'monare,' to warn," notes Long, "and the difference between a monitor and a consumer loudspeaker is in the design goal. A monitor should allow an engineer to hear bad things in a recording so he can fix them. Since consumers can't do anything about a bad recording, their loudspeakers should make bad recordings sound at least acceptable.

"Fifteen years ago, we introduced the MDM-4 Nearfield Monitor," Long continues, "which allowed mixing decisions to be made in a consistent way by engineers and producers who traveled from one studio control room to another. I think this trend will

JBL Control 10 monitor

Yamaha NS-40M studio monitor speaker

continue."

This market direction has certainly been apparent to Yamaha. Over the past five years, the white cones of its compact NS-10 speakers have become a familiar sight in studios throughout the world. Yamaha's Gerry Tschetter feels "the near-field market will continue to grow," but observes that the close-field speaker phenomenon has changed the work habits of recordists everywhere. "Engineers used to listen on the large, soffit-mounted monitors most of the time and went to the near-fields to check mixes. Today that trend has almost completely reversed to the point where engineers work mostly on the near-field monitors and occasionally go back to the large monitors to check things."

Another factor in the popularity of near-field monitors is the growing home studio recording and MIDI market. According to Tannoy's Bill Calma, "An average person in a home or garage can actually come out with a pretty decent mix these days. People have come to realize that they don't have to monitor at 118 dB, which is a welcome change. Large-format monitors are going to dwindle—there will be less and less of the full-blown 48-track studios as we know them today—so near-field monitoring is going to become more important. In the future, we're going to see more emphasis from the manufacturers on quality near-fields with quality components.

"The possibility of near-field monitors going up somewhat in size is very likely," Calma predicts. "Physics alone dictates that we'll need a few more cubic inches under the 'hood' for more bottom end. For example, the new DMT version of our NFMs gets down to 48 Hz; we're starting to get down there with smaller boxes, but I don't think they will get smaller than, say, a Yamaha NS-10 or our PBM-6.5."

Glenn Phoenix of Westlake Audio has observed an overall demand for higher-quality monitors, regardless of the size. "Westlake's direction," Phoenix explains, "has been a continuation of what we've been into since the beginning of our company: good imaging with low distortion and good power handling. Low-distortion monitors have really become a necessity. With digital recording, there's more of a population of engineers who are tuned into that.

"We believe in total symmetry in the monitor," Phoenix continues, "which creates a totally symmetrical polar pattern. We think that's important. Other designs, like coaxials, approach it slightly differently: while it's probably the most cost-effective way to achieve that totally symmetrical polar pattern, we feel that it has its trade-offs. You can't get that same low distortion that we get with discrete components."

The coaxial design is defended by Larry Doran of Professional Audio Services (PAS), whose TOC (Time Offset Correction) line of monitors includes both single- and double-15 models. "Coaxials are a traditional design in studio monitors, going back to the Altec 604s, Tannoys and UREIs. It's very accepted and offers point-source monitoring that can't be accomplished with multiple components." The top-of-the-line TOC SM-2 has a 2-inch throat, coaxially mounted, compression driver. Can we expect to see more 2-inch drivers in coax monitor designs in the future? "I would think so," answers Doran. "The distortion level in a 2-inch throat is significantly lower than a 1-inch driver, although it's twice as expensive."

The ongoing battle of horn vs. all-cone systems continues, with no clear-cut victor in sight in the near future. "There is a trend right now for all-direct-radiator systems that will play

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A Winning Combination

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The **M500** mono block shares the same package and power supply as its stereo counterpart, but is designed to be used in pairs with larger monitors such as Tannoy's LGM12 and SGM10B. Slightly warmer, and fatter on the bottom end, with tremendous reserve power, the **M500** is also the perfect choice when subwoofers are added in the near-field environment.

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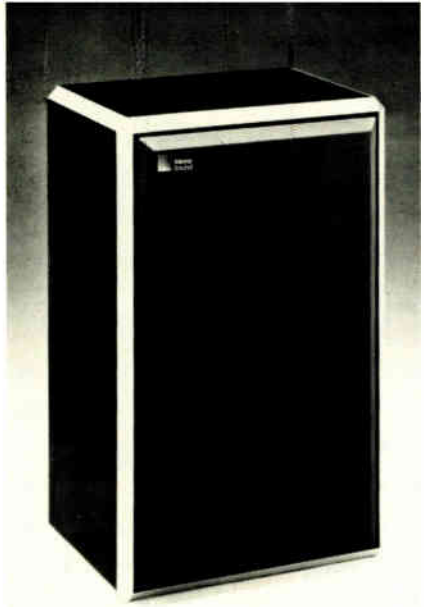
loud," observes Mark Gander of JBL, manufacturers of horn-loaded systems in its BiRadial series (JBL also distributes UREI Time Align coaxial horn systems), as well as all-cone monitors in its 4400 and Control series. "Unfortunately," Gander continues, "a direct-radiator system can't play as loud as a horn system, so that trend won't dominate the market. The all-direct-radiator systems are limited in that application by the constraints of that technology. If you put in enough power to make them play as loud as horns, you run into thermal compression problems."

Claude Fortier of State of the Art Electronik, a Canadian manufacturer of electronically controlled, direct-radiating monitors, has noticed "a lot of studios changing away from horn-type loudspeakers, although they're still very popular in California. In Toronto, almost all the major studios are taking out their horn-based systems and replacing them with either ours or other systems, for vastly improved frequency response, smoothness and much lower distortion. Of course, horn systems can play much louder at this point in time, but with future improvements in direct-radiator technology, any argument for using a horn for its sound power output may be eliminated."

The race for high-performance sound at ever-increasing sound pressure levels can lead to some adverse effects, adds Fortier. "In the large rock studios, where the SPL requirements are far above hearing damage levels, I'm not sure that the problem can be solved by better loudspeakers. At those volumes, the ear becomes very nonlinear due to muscles compressing on the bones in the ear."

Electro-Voice's Ivan Schwartz observes an increasing interest in true, accurate, sub-bass reproduction in many of the larger studio installations. "What I like to call 'mondo' monitors are coming back in vogue, ranging from things like the Puk studio system with four 30-inch woofers [featured on the October 1987 *Mix* cover] to anything else. Some of these make a lot of sense, but some of the large studio systems are silly, because you have to be so far away for the sound to be coherent. I've seen a few good installations, but in the future, true LF reproduction from single subwoofers will become the trend."

"Monitors capable of high acoustical output will be much smaller," foresees Ed Long, "because technology such as our ELF™ (Extended Low Frequency) system will allow the size of bass enclosures to be considerably reduced. Our custom, Time-Align CRM series of monitors use 18-inch bass drivers in separate, 2-cubic-foot enclosures to achieve flat response to 32 Hz. Monitors like this will be more versatile since they can fit into tighter situations. If more bass output level is needed, more bass enclosures and amplifiers can be added."



Meyer Sound 833 studio monitor

The future may also bring more self-powered systems, with internal amplification tailored to the specific drivers. According to Meyer Sound Laboratories' Mark Johnson, whose company is currently developing its first near-field monitors (although not necessarily a self-powered system), "the concept is very logical. At one time I was cruising some studios, talking to engineers who brought in their own reference monitors. I asked them what kind of amplifiers they used, and they said 'Oh, whatever's here.' That didn't seem worthwhile to me, because all amplifiers do sound differently, and the whole idea of a near-field reference is to have something to refer back to. Having an amplifier built into the speaker creates a larger package, but taking away a lot of the variables would be a welcome addition."

As a leading proponent in electronically controlled loudspeakers for sound reinforcement and studio monitoring, the Meyer near-field speakers will also be designed to work in conjunction with an external processor. Johnson feels the trend toward processed systems will become more widespread among other manufacturers in the next decade, because "electronics make the whole thing more controllable. Once you start matching electronics to the individual boxes or the individual components, you have much more control over the outcome of the product. Everything we make will have control electronics, because there are so many parameters involved in the processing, including phase response alignment, frequency response alignment and protection of the system, which is very important in recording as well as sound reinforcement."

This vision of processor-controlled systems is also shared by Yamaha's Tschetter. "In speakers, the revolutions and breakthroughs are less frequent than in some other product areas," he notes. "In the future, we may see processor-controlled systems, where the use of digitally controlled equalization could allow engineers to individually tailor their monitors. Our DEQ7 digital equalizer could start to approach these things; each engineer could tune a preferred EQ curve and store it for later recall."

"There seems to be a market for—not *processor*-controlled—but *electronically* controlled speaker systems that allow operation at up to the theoretical limits of the drivers," observes E-V's Schwartz. He continues, with this caveat: "It's kind of a dangerous thing. In one sense, people in the recording studio want it as loud as possible, yet they don't want anything artificially reducing their dynamic range. There's a lot more to be said about having more electronically integrated driver systems."

State of the Art Electronik's Fortier feels the idea of electronic monitoring control could evolve much further in the 1990s. "The main direction we're going is into active soundfield control—the ability to control both the spatial characteristics of the sound and the overall quality of the sound—improving frequency response and removing detrimental room effects. We're also doing psychoacoustical testing to see if some sounds can mask other sounds. Applying time-delayed sounds in various spectral shapes can correct for room acoustics, too much echo or other problems. This can be brought about by the advent of cheap DSP chips. Our intention is to make adaptive systems, where the electronics 'learn' the room under some computer algorithm and adapt the monitors to the room. The

system could set itself to what we consider ideal for the room, or make the room sound smaller or larger."

Some big surprises in speaker technology may be in store for the next ten years, according to Bill Calma of Tannoy. "The Japanese don't build the world's best loudspeakers, but in terms of R&D, they're really on to some hip things. The flat-plane speakers from Technics and Sony didn't sound real good, but their approach to technology is correct. They may be a major force to reckon with in the coming decade. In the 1990s I think we'll actually see some *new* technology in loudspeakers—not just new versions of moving coils or electrostats, but new technology for re-creating audio. Most of what we're dealing with now goes back to the 1920s and 1930s, so future developments should be very exciting."

JBL's Mark Gander doesn't see any major breakthroughs in studio monitors in the next few years: "We'll see a continuing *evolution* of materials and techniques," Gander postulates, "with better materials, better integration of components within a system and perhaps more integration of electronics into systems. On the far horizon, there may be radical changes, like superconductivity. Usually, major breakthroughs come from military or other research, rather than from the audio industry itself. For instance, our ability to use titanium diaphragms came from aerospace applications. It's the same thing with magnet materials, like neodymium. Superconductivity was a dormant area, but perhaps we could take advantage of this in voice coil wires. Or it might become economical to cryogenically cool a magnet structure to yield super-efficient transducers. We all have to be open-minded in applying new technologies from major research areas to the problems of acoustic transduction." ■

Westlake Audio SM-1F monitor

Well-known to thousands as the voice of the American taxi driver on "U.S. Clip," the monthly Japanese news magazine program, Mix *products editor George Petersen also occasionally finds time to write music and produce records.*

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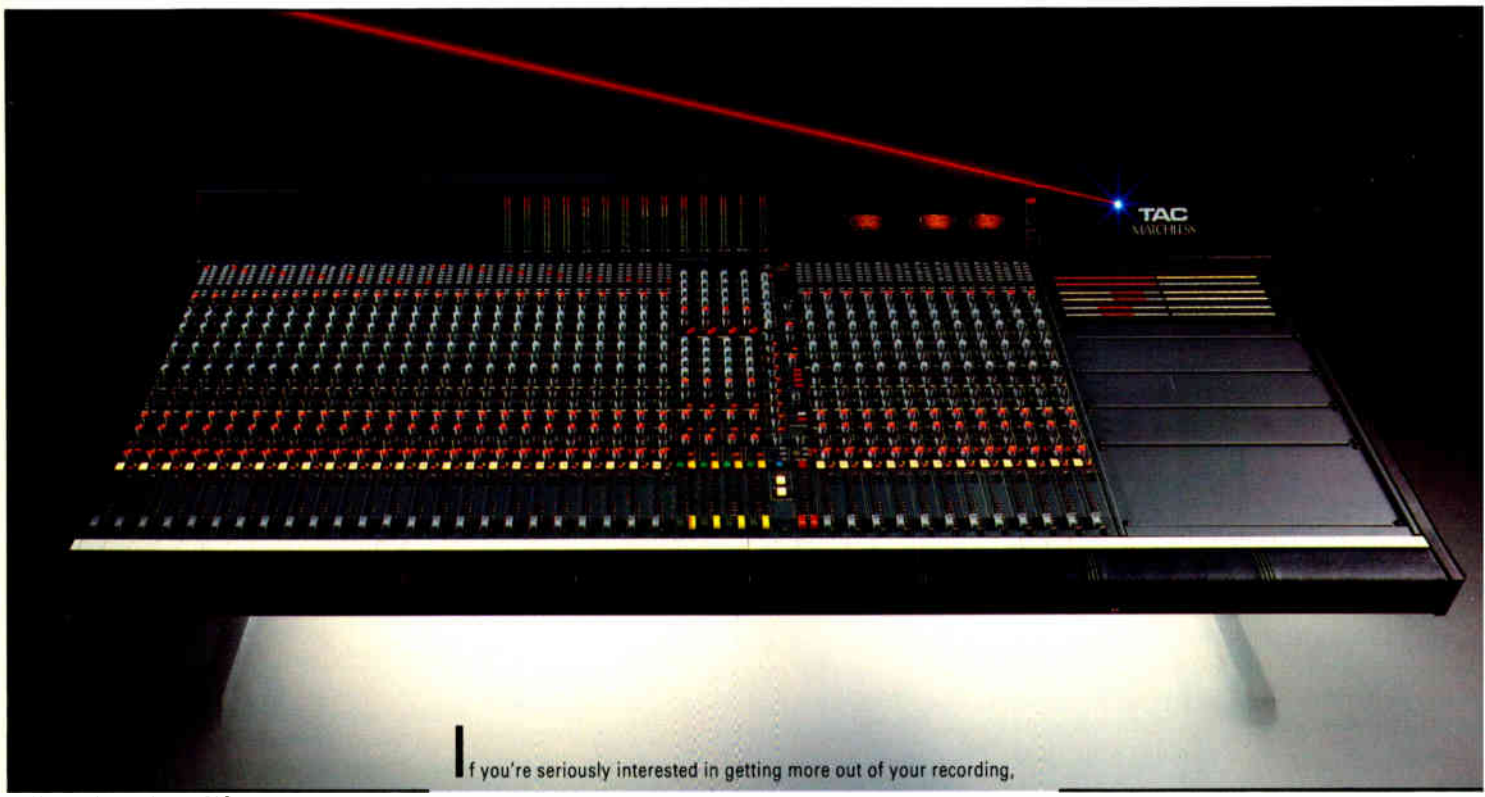

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—FROM PAGE 46, DIGITAL

points out, "because people are using computer screens and doing work other than watching VU meters and performers."

Finally, with all the computer-based systems in the rooms, the designer grapples with another matter: cabling, specifically removable cabling. It must be removable, because "you can't pull this stuff through conduit with connectors on the end," says Gizzi. "And you may need to change large cable harnesses frequently. So good access to cable trenches or conduit is more important now, and something we design into every control room."

DOES DESIGNING FOR DIGITAL COST MORE?

Yup. "Building is more expensive, because isolation is expensive," says Lakeside's Carl Yanchar. Nevertheless, the more a studio owner knows what he or she wants to do with the facility, the better equipped the designer or contractor will be, and the more that can be saved on design and construction costs.

Bob Todrank likes to see people build an NC15-level studio, but laments, "That's an expensive thing to do, and most people won't pay the money. It costs a lot more to build a room [for digital]. For example, the Boxer's very expensive, probably $25,000 to $30,000 for the entire control room system, complete and installed with amps and everything. People spend $400,000 on a console and $180,000 on a digital tape machine, and balk at $1,500 for a speaker. You have to consider your monitoring system on an equal level with your console and digital tape recorder. As studios get more expensive [to design and build], so do the monitoring systems."

When studio owners ask Dave Schwind about the price of designing a digital-quality studio, he says, "It's like asking someone how much a car costs: are we talking about a Ferrari or a Volkswagen? Yes, reducing a [room's] noise level from NC30 to NC10, which might be reasonable for an ADR facility, will cost more. Not 100 percent more. There are economical solutions. If you hope to conform to a budget, you need to have written, functional requirements that can be translated by someone like ourselves or an architect into numerical criteria. These requirements include what kind of lighting you need in the room, what you want for background noise, for reverberation. The whole litany. Write it all down and go very early [in the design process] to a contractor or a cost estimator for a budget estimate."

FINAL WORDS

Before breaking ground or examining blueprints, remember the advice of Chips Davis: "If you're going to make money in your new studio, you must turn over clients quickly. The ability to do so goes back to being able to monitor correctly, so you can make absolute judgments without saying, 'We should see how it'll sound on those other speakers or in that other room.' Not artistically speaking, but technically. This speeds up the whole process and makes the client's work more cost-effective, because the job is done much quicker and you turn out a better product. And then you bring in the next client, and the next." ■

When not reuniting split infinitives as Mix *assistant editor, Linda Jacobson runs Wordswork, a San Francisco-based technical writing/editing/publishing service for companies involved in audio and video.*

—FROM PAGE 46, BASICS

the smaller the angle of diffraction. Furthermore, the higher the barrier, the greater is its overall effect. In practical terms, this means that as a complex waveform passes over the edge of a barrier surface, the low-frequency components bend around the barrier while the high-frequency components do not. The result is a falling high-frequency response.

Although it's just about impossible to isolate any one of these effects from the others, it is worth keeping in mind that the sound reaching a microphone is a complex mix of these elements summarized here. It's a good idea to keep these cumulative effects in mind whenever an acoustic barrier, or "gobo," is considered as a means to cut down on sound transmission. The desired attenuation may be more than offset by the frequency distortions introduced by the gobo. ■

NEWS
FROM AROUND THE WORLD

INDEPENDENT SPIRIT SPURS GROWTH OF RECORDING INDUSTRY IN SOUTHERN AFRICA

The long-dormant recording industry in southern Africa—surviving only in South Africa until recently—has been bolstered by the advent of independence in that region.

Drawing inspiration from the tradition of freedom songs, as well as from tastes acquired by residents returning from Western countries, the industry is now moving at an unprecedented pace. In the Southern African Development Coordination Conference (SADCC) region (Zimbabwe, Zambia, Malawi, Angola, Mozambique, Botswana, Lesotho, Swaziland and Tanzania), Zimbabwe has the upper hand in recording. Musicians generally come to record at one of three major studios in that country's capital city, Harare. All three—Shed, Frontline and Baptist Church—offer the latest in recording technology.

Shed Studios upgraded recently from 16-track to 24-track and purchased a new Soundcraft Series 2400 console. According to studio manager Steve Roskilly, "Everything we have now is of Rolls Royce quality. We are providing as good quality recording as can be achieved on analog equipment."

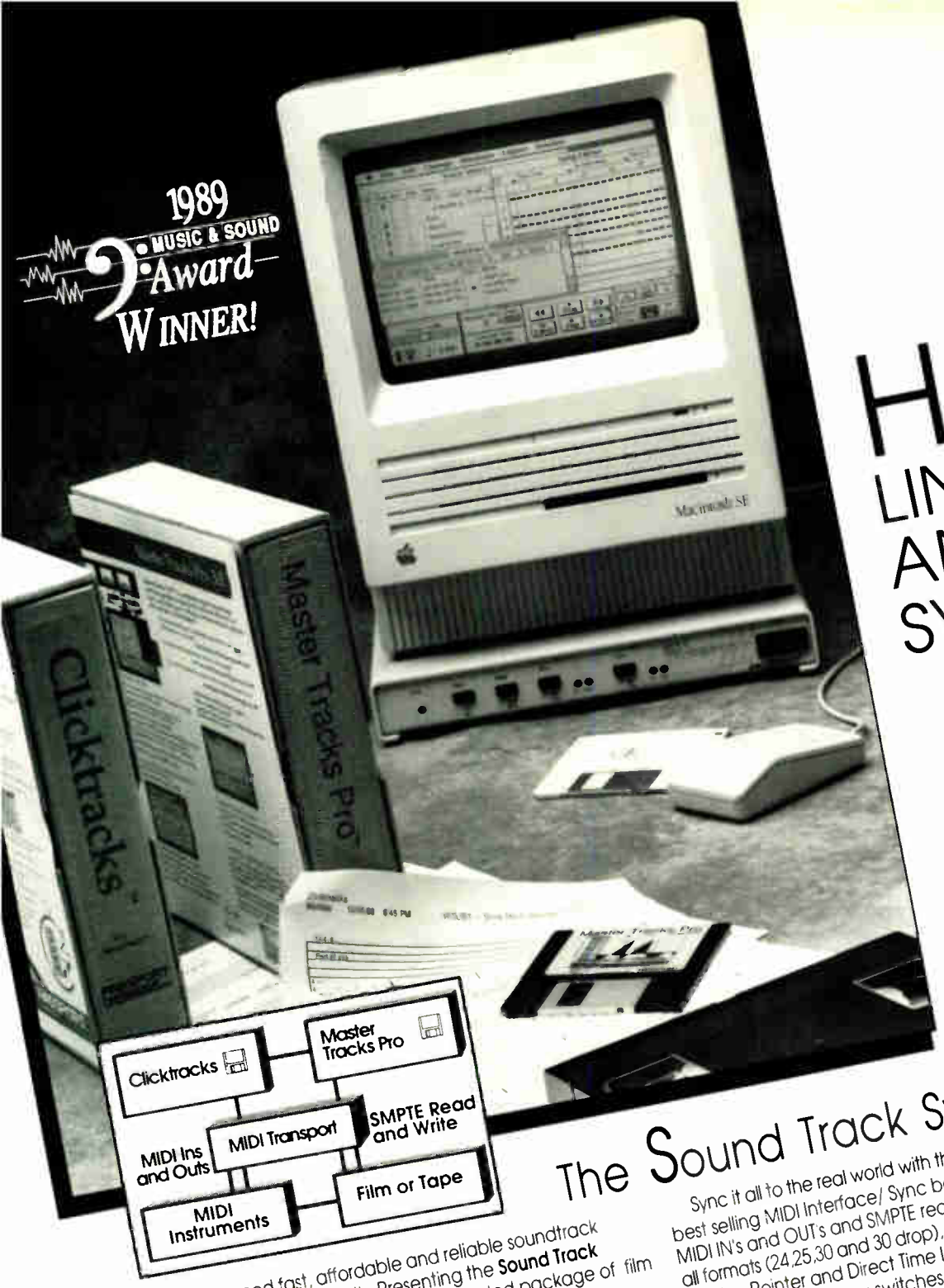
Roskilly comments on one of the biggest problems facing African musicians: they are no longer able to live off the proceeds of their records. "Five years ago, only a handful of artists were making discs. Now record companies are pulling many more artists into the studio in an effort to make locally recorded music available to

Studio Spotlight

London's Nomis Complex Announces Opening of Digital Studio

A longtime favorite rehearsal facility for top artists such as Lenny Henry and George Michael, London's Nomis Complex has added a state-of-the-art recording room to its six-studio complex. The addition of the recording studio is part of a plan to offer the music industry a complete one-stop service, which will also include the provision of a music production company, an equipment rental company and a demo/programming facility.

Nomis is the first UK studio to utilize the Tom Hidley "20 Hz" design, which features Kinoshita 20Hz monitors, and the first room to install a Mitsubishi X-880 32-track digital recorder alongside an 8-track NED Direct-To-Disk™ system. Both machines will run in conjunction with a custom 64-track SSL G Series console and an extensive range of outboard gear as part of an in-house equipment package.



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more people. So the public is spending its limited funds on more varied discs, and therefore, monetary income to each individual group decreases."

The studio has introduced a new record label for the overseas market to present artists who compose in English. The label is intended for European distribution, but also will be distributed locally. Previous efforts by Shed to break into the European market were unsuccessful, but the studio is now aiming to produce a form of music that will appeal to Europeans while retaining an African flavor. Roskilly says, "There are 2 million Africans now living in France alone, most of whom are able to buy records. This is a very good market. We hope that Africans currently living in Europe will be interested in buying records that have the flavor of their heritage as well as current musical trends."

—T.T. Chigodo

FAIRLIGHT BACK UP AND RUNNING

Two days before Christmas 1988, Australian-based Fairlight Instruments lost an expected injection of funding. In January, the company fell into the hands of its receivers. And in March, the company's assets were put up for auction.

Then in April, Fairlight co-founder Kim Ryrie and one of Australia's largest pro audio groups combined to purchase all of Fairlight's intellectual property—trademarks, designs, patents, software, copyrights—as well as current stock, work-in-process and plant equipment. Ryrie will head the new company, Electric Sound and Picture (ESP).

All the core R&D team in Sydney have been contracted full-time. There are no immediate plans for establishing foreign subsidiaries, but ESP intends to continue supporting Fairlight's existing worldwide dealerships and servicing networks. Normal trading is expected to resume this month.

Electric Sound and Picture's new 14,000-sq.ft. complex is located at 30 Bay Street, Ultima, NSW 2007, Australia. Telephone and FAX lines were being installed at presstime.

—Andrew Symaniz, Australia

A WINNING COMBINATION FROM DOWN UNDER

The Australian Recording Industry Association's 1988 ARIA Awards were presented recently in Sydney, and two major winners were Producer of the Year Ross Fraser and Engineer of the Year Doug Brady.

Brady, staff recording engineer with Metropolis Audio in Melbourne, combined talents with Fraser on two of the most successful Australian albums of all time, *Whispering Jack* and *Age of Reason*, both for Australian recording artist John Farnham.

ARTISTS UNITE IN GREENPEACE EFFORT

Australia's John Farnham recently joined U2's Bono, Chrissie Hynde of the Pretenders and Annie Lennox of the Eurythmics in the Soviet Union to promote a new Greenpeace LP. Each artist contributed a song to the album, entitled *Greenpeace Breakthrough*. Royalties will go toward Greenpeace's global drive to save the environment. The Soviet Union, sympathetic to the Greenpeace movement, invited the artists to kick off their tour in that country.

AMPEX REPORTS STRONG START IN NEW ZEALAND

Ampex's Auckland, New Zealand, sales office moved into its second successful year as New Zealand's only sales facility devoted solely to professional audio and video products. The sales office's biggest customer is Television New Zealand, the country's two-station TV network. (A third, independent station is beginning operation this year.) Other customers include Perspective Video and Vidcom, Ltd., members of New Zealand's thriving television production/post-production community, as well as a number of professional audio recording studios.

"With the Auckland branch joining our two offices in Melbourne and Sydney, Ampex is developing an unrivaled presence in the region," remarks Rollin Stanford, regional manager of Ampex Australia Pty. With more than 30 sales and service outlets throughout the world, Ampex now derives approximately half its revenues from outside the United States.

MITSUBISHI PRO AUDIO MOVES HEADQUARTERS TO UK

Mitsubishi Pro Audio Group is moving its headquarters to the UK, following the announcement that Rupert Neve Inc. will be responsible for distributing the PCM line of products in the U.S. Staff and facilities will be based in Mitsubishi Electric's new premises in Hatfield, Herts.

The relocation is the direct result of the success of Mitsubishi Pro Audio's UK and European sales operation, which has expanded at an unprecedented rate over the last two years.

"In Europe we have consolidated our strong presence in France and Italy, and we are now opening up new market opportunities in countries which in the past have been the strongholds of our competitors," comments Adrian Bailey, sales and marketing director of Mitsubishi Pro Audio UK.

The new landscaped site covers five acres and includes a 50,000-sq.ft., glass-clad office building and 100,000 square feet of warehousing. In addition to a specially designed lecture theater, full facilities are available for technical demonstrations and seminars.

INTERNATIONAL STUDIO NEWS

AMS reports an order for AMS/Calrec consoles from the **BBC Radio Capital Projects Department**. The order

for seven consoles includes the fitting and installation of four remote broadcast vehicles and three consoles for permanent installation at major London concert halls. One more board is destined for BBC Elstree Studios... Toronto's **Shag Sound Studio** has expanded to 16 tracks with the addition of a Tascam MSR ½-inch recorder, Fostex 1840 mixer, Sony TCD 1000 DAT recorder and Tannoy PBM-8 monitors... London's **Audio FX** is the first British rental company to offer a DAR SoundStation II, a 4-channel digital audio recording, editing and production system... Neve has announced initial shipments of its Flying Faders console automation system to **King Records** in Japan and **Metropolis Studios** and **Rockfield Studios** in the UK... In news from Ireland, Dublin's Ringsend saw the recent opening of a new world-class recording studio called **Ringsend Road Music Group**... Sales of Soundtracs consoles worldwide continue to be brisk, with IL 3632 installations at **Grapevine Studios** in Adelaide, Australia; **While You're Down There Studios** in Sydney, Australia; **Golden Sunshine Studios** in Styria, Austria; **International Video & Audio Communications** in Gemonde, Holland; and **Echo House Studio** in Roppongi, Japan... Two Montreal facilities, **Radio Canada**, the French language programming arm of the CBC, and **Studio Marko**, both acquired Lexicon Opus digital audio production systems recently. Installed in late March, the Radio Canada Opus system was designed into a recently built audio post-production suite at the headquarters of the CBC/Radio Canada French Production Center in Montreal. Studio Marko, which is known to handle as much as 70% of all the French language commercial sound in Montreal, opened a fifth room to accommodate its Opus system... AMS has received an order from **BBC Television Outside Broadcast** for a 140-channel Virtual Console System for its Color Mobile Control Room. The console will be the largest so far supplied by AMS and is believed to be the largest console in the world installed in a remote vehicle... The studios at **PWL** of London have been reconstructed, rewired and equipped with FM Acoustics FM 1000 Precision Ultra-High Power Amplifiers. ■

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by Paul Potyen

DESIGNING & EQUIPPING A COMMERCIAL STUDIO

TWO STORIES FROM CHICAGO

Chicago has long played host to a thriving commercial production community: Chicago Recording Company, Chicago Trax, Streeterville Studios and Tone Zone Recording are just a few of the many Chicago-area production houses doing work in one or more of the commercial markets. This month in "Studio View" we looked at two facilities that specialize in different parts of that production process from the standpoint of studio design.

TERRY FRYER MUSIC AND SOUND PRODUCTION

Terry Fryer, owner of Terry Fryer Music and Sound Production, has made a significant mark on the recording industry over the years, not only as a commercial music producer (six Gold Lions at the Cannes Film Festival, "a bunch of Clios, Addys and stuff like that"), but as a songwriter (*Dirty Dancing*, Whitney Houston) and earlier as a session musician (Blues Brothers, Natalie Cole). His production company has completed more

PHOTO: MIKE LAKE

The digital room at Audio Recording Unlimited features a Lexicon Opus Digital Audio Production System.

PHOTO: KELVIN PALMER

The pre-production studio at Terry Fryer Music and Sound Production in Chicago.

The Studiomaster Mixdown consoles are specifically for today's smaller studios, studios which are using more and more sequenced instruments, and need many inputs for them.

The 16.4.8 and 16.8.16 Mixdown consoles have 26 and 34 inputs at stereo mixdown, respectively. Put into perspective, other similarly priced 16.4.2 and 16.8.2 consoles would need to be in 24.4.2 or 32.8.2 formats before they could match this capability.

The main benefits of this are that re patching during a session is considerably reduced, if not eliminated, and a smaller multitrack tape machine can be used. This is because only the 'live' instruments need to go on tape, since MIDI sequenced drum machines, keyboards and effects can simply be monitored during the recording, then added at the stereo mixdown.

Few consoles rival the Mixdown's features, and fewer still match specifications like a T.E.I.N. of −129dB and cross talk between subgroups (at 1kHz) of −88dB. And with these features and specifications, none can match the price.

Key features of Mixdown include balanced inputs, 3-band sweep EQ, 6 auxiliaries, 'auxiliary line inputs' (8 on 16.4.8, 16 on 16.8.16), upper AL inputs have 2 band EQ, DIRECT OUTS, 48V Phantom Power, effects AND foldback sends on subgroups/AL inputs, fader reverse, stereo aux return, 100mm faders, expandable inputs to 40.

The Studiomaster Session Mix stereo consoles are ideal for P.A., club installations and keyboard and drum machine submixing. They are available in THREE formats: 8.2, 16.2 and 12.2R.

Though not expensive, the Session Mix range does offer features you may only expect on more costly alternatives. All models have electronically balanced inputs, 3-band EQ, 4 auxiliaries, 2 auxiliary returns, 5-pin DIN Record/Playback socket and 12 segment LED output meters. 12.2R and 16.2 versions have stereo returns. The 16.2 has in addition to the features above, a sweep on the Midrange EQ, EQ on the outputs (switchable to aux returns), pre-fade SOLO, 100mm faders, post-fade DIRECT OUT sockets on inputs and channel mute buttons.

The 8.2 can be rack mounted (in 2 positions) occupying 10U, stood flat or wall mounted due to its special endcheeks. It can also be expanded to a 16.2. The 16.2 can be expanded to 24.2. The 12.2R is rack mount only and occupies 10U.

Note New Address
For detailed color literature, contact Jim Giordano, Paul Reeve or Tony Allen at STUDIOMASTER, INC., 3941 East Miraloma, Anaheim, CA 92807 Tel (714) 524-2227 FAX (714) 524-5096

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than 2,400 projects over the last eight-and-one-half years.

Mix: How would you describe the recording environment you use for pre-production?

Fryer: In my role as commercial music producer, I own two 24-track rooms: one room is a basic digital, sampling kind of room located in an old house. It provides lots of different recording environments, like 40-foot-long hallways with wood all over the place, tiled bathrooms with nonparallel walls, three-story dumbwaiter shafts, some very large rooms with cathedral ceilings, and normal dead, isolated rooms. The advantage of having this kind of setup in a house is that you have access to things that are hard to find in a technical recording environment. A kitchen can provide a wealth of sounds that would be hard to assemble in a normal environment. Or a basement woodshop can yield some pretty strange stuff, too.

Mix: Do you have a studio design philosophy?

Fryer: Part of my design philosophy is to not buy software with a lot of bells and whistles on it that are unreliable or are difficult to use. Another part of that design philosophy is that we don't use multitasking. I have two Mac IIs running all the time, each with large-screen monitors, as well as two video monitors, so I can see the Fairlight screen and the video. It's possible to sit in one position and be surrounded by screens.

Mix: How do you customize a room for commercial production?

Fryer: Everything is always hooked up; everything is always accessible; every possible input/output interconnection is connected to minimize setup time. We [Fryer, Kelvin Palmer and computer hardware consultant Gary Gand of Gand Music and Sound] spent a lot of time thinking out the ergonomic layout of the studio. The goal is to have the studio become a very transparent thing. I know that in the record work I've done there tends to be a big focus on the technique and mechanics of it. That impedes the creative process of the musicians, the writer and the producer. Basically we've selected equipment that *works*. We've paid special attention to getting equipment that interconnects so the recording process becomes transparent.

Mix: Do you use different techniques when doing commercial work, as opposed to record production?

Fryer: The techniques between songwriting, record production and commercial music production are basically the same. There's a difference in length, so in commercial music production things get extremely microscopic; you get totally anal about this three seconds of something. Think about it; the budget for a 30-second TV commercial can be $500,000 to $1 million. Multiply that by four or five and you have a budget for a 90-minute film.

Mix: I understand you did the lion's share of the music for United Airlines' current ad campaign. Can you describe the steps that took place in that production?

Fryer: A lot of the work I do is synthesized, and a lot, like the United commercials, involve large, 40- to 60-piece symphonic orchestras. In the case of an orchestral piece like United's, in advance of the actual recording I make a rough sketch using all the different timings to create a template; the client will look at it, make recommendations about tempos and things like that, and approve it.

In the pre-production stage of the United commercial I sat down in my studio and created a template that used Gershwin's *Rhapsody in Blue*. I have an array of computers and customized programs written by myself and my technician, Kelvin Palmer. I also use a variety of synchronization equipment, sequencers and things that run SMPTE code, like the [Roland] SBX-80, which allows me to slave to a SMPTE stripe and easily do variable tempos. The commercial talks about the sounds of Chicago, so we sampled subway trains, commuter trains, airplanes, trucks and buses. Different cities have different sounds. There's a certain squeal that the elevated trains make that's totally recognizable by a Chicagoan. My job was to find those quintessential sounds. So we constructed a rhythm track of those sounds: 'clackety-clack, clackety-clack, clackety-clack' against the template and the timings I had laid out.

That basic template, which in this case was put on analog 24-track, was taken to Chicago Recording Company's facility to record the orchestra. There was a lot of consulting done when that room was built, and a lot of

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things were done to meet my needs. That room and my room both differ from what may be a record-type of place in that there are many isolation rooms. When we worked on the United spot, we used one very large room for all the strings, another very large room for all the brass, another large room for woodwinds, another room for the rhythm section and two other small isolation rooms for the percussion. With this kind of facility, we are able to get a very good recording, have the advantage of musicians playing together and get an extremely musical performance out of it, which you can't do with either a very small room or a single room without that type of isolation. Then we went back to my place and in a sort of post-production phase flew in other strange sounds with the Fairlight. We gave all those to Mike [King] at Audio Recording Unlimited, who assembled the control tower, subway, commuter train and narrator voices with the music.

AUDIO RECORDING UNLIMITED

Mike King's Audio Recording Unlimited opened its doors on November 21, 1988. King started out in radio production in the mid-'50s with KYW in Cleveland and with Vlad Maleckar, owner of the original Audio Recording in Cleveland. Don Arbuckle, ARU's production engineer, has been in the business for about 15 years. Before working with King on the design of that facility, he built River North Recorders, where he stayed on as technical director and production engineer. One of the more notable features of the new facility is its Lexicon Opus Digital Audio Production System.

Mix: Describe the facility at Audio Recording Unlimited.

Arbuckle: We have two rooms: I run the Opus room and Mike's room is predominantly analog. He has a Sony MXP-3000 automated console, a Sony/MCI 24-track, three ¼-inch machines and a selection of effects. We do comparable things.

Mix: How did you arrive at the decision to buy the Opus?

Arbuckle: We didn't decide to buy the Opus because it was digital. Digital is a state of mind. I can appreciate that something is totally digital from beginning to end. But the reality of life in the production world today is it's probably not going to happen that way, because a lot of the elements that make up a commercial come to you on analog tape. The fact that you have a digital machine doesn't mean squat in terms of noise. If it was recorded right, it's not going to be a problem. We bought the Opus because it's a workstation that handles audio in a way unlike any other. You can do things with the Opus that you simply cannot do on tape.

We also bought the Opus because we preferred its engineer interface over that of the other digital workstations. It's very user-friendly. For us that's incredibly important, because a major part of what we do is provide a creative tool that people who work with us use in their palette of creative toys.

Mix: How would you describe what goes on at Audio Recording Unlimited?

Arbuckle: Most of my work is session work. I record an announcer in the morning, I edit and mix the spot, and the client leaves here with the finished spot in the afternoon. I use the Opus just like a multitrack tape recorder, plus, it does editing.

Mix: How does your studio differ from the more traditional recording

facility in its design and function?

Arbuckle: Mike and I feel that most of the recording studios built today have been built primarily out of a desire by their owners, who were engineers and/or musicians, to fulfill a need to have a studio to do their own projects. Ninety percent are *music* studios. They're designed for music. You go in there and the lights are real low because everybody works at night. No one really ever designed a studio for the business person—the person who works in an office all day who is just as creative as a musician, but who is creating a different thing: a corporate drama or a radio commercial or whatever.

The first thing Mike and I addressed [along with Doug Jones of Electro-Acoustical Systems Inc. in Chicago] was the physical way our studios are designed and built. There is nothing dark about them. They are all white walls with pastel colors. We have windows, both in the studios and in the control room. We're on the 19th floor of the Wrigley Building, and we have a beautiful view. Our client areas are open spaces with tables and chairs, and pictures on the walls. While the engineers are doing their work, the clients can be sitting at a table doing *their* work. Most music studios are very comfortable places with big, overstuffed chairs and couches, but they're not very conducive to doing paper work if you need to. Our places are basically designed as workplaces.

> You need to be able to operate a console and not have to worry about the signal path, because you want to concentrate on whether the spot *works.*

We spend a lot of time in our rooms—probably 45 to 50 hours per week. If it's a dungeon and you hate going in there, you can't hope to be creative. So it's light and bright and we have toys in there that *we* like.

Mix: What about the equipment?

Arbuckle: Our choice of equipment was different from that of a music studio in that the people who come to us are not very educated as to what piece of equipment is what. It's not like dealing with a music producer who, before he ever gets to the studio, specifies that there be certain equipment available. All our people know is that they have a concept in their mind that they want to hear coming out of the speakers before they go home. We can't spend three hours getting a drum sound up. So our selection of equipment was based on two things: one, we, as engineers, wanted stuff that could best do the jobs we needed to get done at maximum value for the money; and two, the equipment had to be as transparent as possible in the creative process. If you have a box that requires you to entirely shift gears, take yourself out of the creative mode and get into the techno mode, and sit there and crank on it for five minutes, it screws up your train of thought.

You need to be able to operate a console and not have to worry about

the signal path, because you want to concentrate on whether the spot you're working on *works*. We went for technology with good, usable presets that you don't have to screw around with. And it has to be clean and relatively state-of-the-art.

Mix: Do you use any special techniques with commercial clients?

Arbuckle: Regarding minimizing setup times, the decision we usually have to make is, "I need some thunder and rain." Well, there are 25 permutations on thunder and rain, and it's only your experience with your libraries, your stock effects and various things you can do to those stock effects to make them unique that gives you the speed. Depending on the situation, sometimes you just go to your quick-and-dirty sources.

We're currently putting together a six-hour radio drama commemorating the bicentennial of the French Revolution for the University of Chicago, which will be aired nationally on NPR. It's averaging 16 hours per 30-minute episode just to design the sound effects and put them together with the previously recorded actors and music. In that project we found that the most successful effects are created when, for instance, one of the producers goes in the studio with a stool with a wooden leg on it, raps it on the floor, and that's a guy walking with a peg leg. Or you go in there with a melon, a meat cleaver and a basket, and that's a guy getting his head cut off.

We also go out on the street with our DAT recorders for traffic noise, or to our back yards for bird sounds. You create unique scenes that way, too. We try to do that as much as possible.

Mix: Can you describe your involvement in the United spots?

Arbuckle: The way it evolved is the agency, the Leo Burnett Company, went to United with concepts; they then went to Fryer to decide what kind of feel they were going for in the music. After Burnett approved it, they recorded it, did a final mix and sent it over to us. Then Burnett came in here with the script, we recorded Gene Hackman and edited him to get his best words. Then we added to that the sound effects we created for the spot, put all that together with the music, and mixed the complete spot. ■

Paul Potyen is associate editor of Mix.

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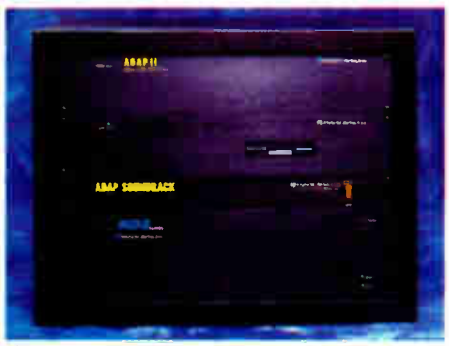
MAJOR BREAKTHROUGH IN MUSIC TECHNOLOGY

Los Angeles, CA - Hybrid Arts, a leader in music computer technology, has again made history with the introduction of ADAP II...the direct to hard disk digital audio recorder/editor. ADAP is the acronym



for Analog to Digital Audio Processor. In short, ADAP is a digital mastering device and audio work station, a 16 bit stereo sampler, a visual non-destructive sound editor with sample precise accuracy, a MIDI module, a SMPTE trigger, full EDL (Edit Decision List), a cue system and much more.

ADAP delivers all the advantages of digital audio recording at a very affordable price. Among the extensive list of outstanding features, ADAP offers the user the ability to edit, manipulate and process sound without any loss of fidelity. And, by storing your original tracks in memory, you can perform multiple edits, add new sounds or sweeten...completely non-destructively.

ADAP has more speed, power and versatility than any tape-based system or even other digital recorders saving you valuable time, energy and money. For example, matching audio to visual hits via SMPTE can be performed instantly because ADAP responds in real time.

These features can be fully realized when performing editing functions. ADAP offers independent left and right channel editing. Multiple edit windows allow you to transfer sounds between files where they can be combined and manipulated in a variety of ways without clicks, glitchs or other unwanted noises. One feature that you're sure to appreciate is being able to see the X-cursor which displays its exact position in real-time or SMPTE code during record or playback. ADAP gives you the ability to drop and name markers at any point. These markers are your edit points and can be referenced quickly and accurately with autolocate for editing or playback of specific ranges. The zoom feature allows you to 'zoom-in' on any part of the sound file wave form or amplitude display for precise editing. This close-up view of the sound enables you to move your markers with microsecond precision. The cut, copy, paste, and insert time are valuable editing functions that give you complete control.

ADAP's optional AES/EBU digital interface and direct to disk capability makes it one of the few systems available for R-DAT editing (48 kHz sample rate) where the audio is kept completely in the digital domain. When compared with devices costing many times the price, ADAP stands up as one of the most flexible, capable and advanced systems available.

Here are just a few of the possible applications: For film/video post-production...ADAP is unsurpassed in speed and ease for effects editing, background looping, dialog, dialog fill or electronic foley. For recording studios...it's used as a one shot sampler to fly in vocals, retune sections of music or create extended mixes. For musicians & sound designers...it's a high quality MIDI performance sampler and digital synthesizer. For radio stations...it's the ultimate commercial spot production system.

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NEW PRODUCTS

SOUNDFIELD COLUMN ATTENUATOR

A new type of gradient-pressure attenuator, the Column Attenuator from Soundfield Acoustic Systems (Edmonton, Alberta, Cananda) is a sculptured, low-frequency absorber designed to reduce the effects of low-frequency colorations, such as muddy or boomy bass. According to the manufacturer, the 6-ft. × 14-inch diameter Column Attenuator packs a high degree of LF absorption into a small package. TEF measurements of the column are available. The attenuators are available in over 20 colors. The company also offers other absorbent and diffusive acoustical treatment products.

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APT APT-X 100 AUDIO COMPRESSOR

Solid State Logic's new subsidiary, Audio Processing Technology (Begbroke, Oxford, UK), offers the new apt-X 100. This digital audio compression system uses sub-band Adaptive Differential Pulse Code Modulation (ADPCM) techniques to accomplish real-time audio compression and retrieval (with no subjective loss of quality, despite a low sample word rate and narrow coding bandwidth). The system accepts mono or stereo analog signals, converts them to 16-bit digital audio and compresses to four bits per sample for transmission or storage. Audio bandwidth can be 7, 15, 20 or 22 kHz.

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J.L. COOPER FADERMASTER

New for the MIDI studio is the FaderMaster from J.L. Cooper Electronics (Marina Del Rey, CA). This tabletop remote unit works with MIDI instruments, sequencers and effects processors. Its eight user-programmable faders can be used simultaneously in real time to: edit the volume of sequenced tracks; control the parameters of effects processors; delay MIDI Note or Clock data by up to 15 ms; program, edit or manipulate synth parameters; or transmit MIDI data and merge functions. The unit comes preprogrammed with 25 "banks" containing setups for many popular synthesizers, effects devices and sequencers. Retail price is $299; optional software programs ($29.95 each) provide the Macintosh or Atari user with offline programming capability and disk storage of setups.

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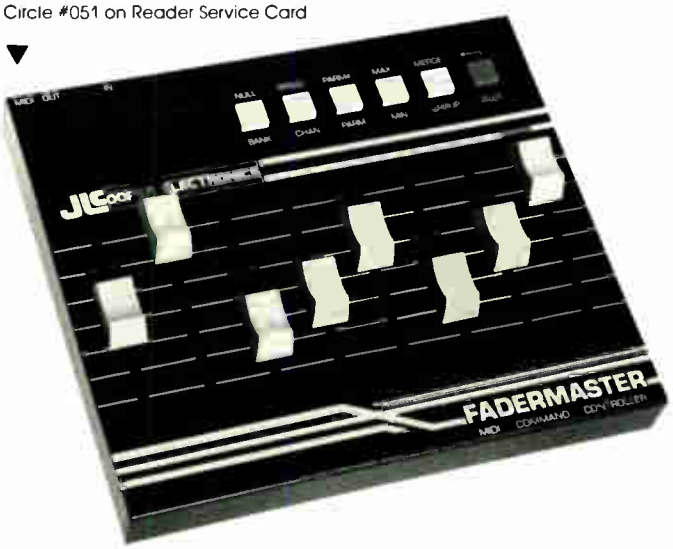
▼



BELDEN MULTI-PAIR SNAKE CABLE ▶

Protect your work from signal loss with the new multi-pair audio snake cable, with individually jacketed and shielded pairs, from Belden Wire & Cable (Richmond, IN). The cable is available in eight different pair constructions, from 4- to 32-conductor pairs, in 100-, 250-, 500- or 1,000-foot rolls. Jacketed with PVC and insulated with polypropylene, this series features 22 AWG stranded, tinned copper conductors, in flexible, nonreflective, black tubing. Inner jacketed pairs are numbered for easy ID.

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ARIEL SYSID ACOUSTIC MEASUREMENT SYSTEM

Having signed a licensing agreement with AT&T Bell Labs, Ariel Corp. (Highland Park, NJ) now offers SYSid, a complete, easy-to-use acoustic measurement system for the IBM PC and compatibles. SYSid combines 16-bit data acquisition and synthesis (at 50 kHz) and high-speed DSP capabilities. It stimulates the system under test; records, averages and analyzes the response; and displays the system's attributes, including transfer function, distortion, impulse response, noise floor, etc. It can measure two independent channels simultaneously, enabling impedance and ratiometric measurements. Results can be saved on disk or output on a printer. SYSid consists of an Ariel DSP-16 single-card data acquisition processor and SYSid software, and lists for $2,995.

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MAXELL DIGITAL TAPES

Maxell Corp. (Fairlawn, NJ) joins the DAT crowd with the introduction of its R-120DM digital audio tape cassette, which features superior sound quality and the strength to withstand quick searches at high speed. Also debuting is Maxell's new digital audio mastering tape, available in ¼-inch, ½-inch and 1-inch widths. This tape uses a high-performance, highly durable linking binder system with a conductive coating.

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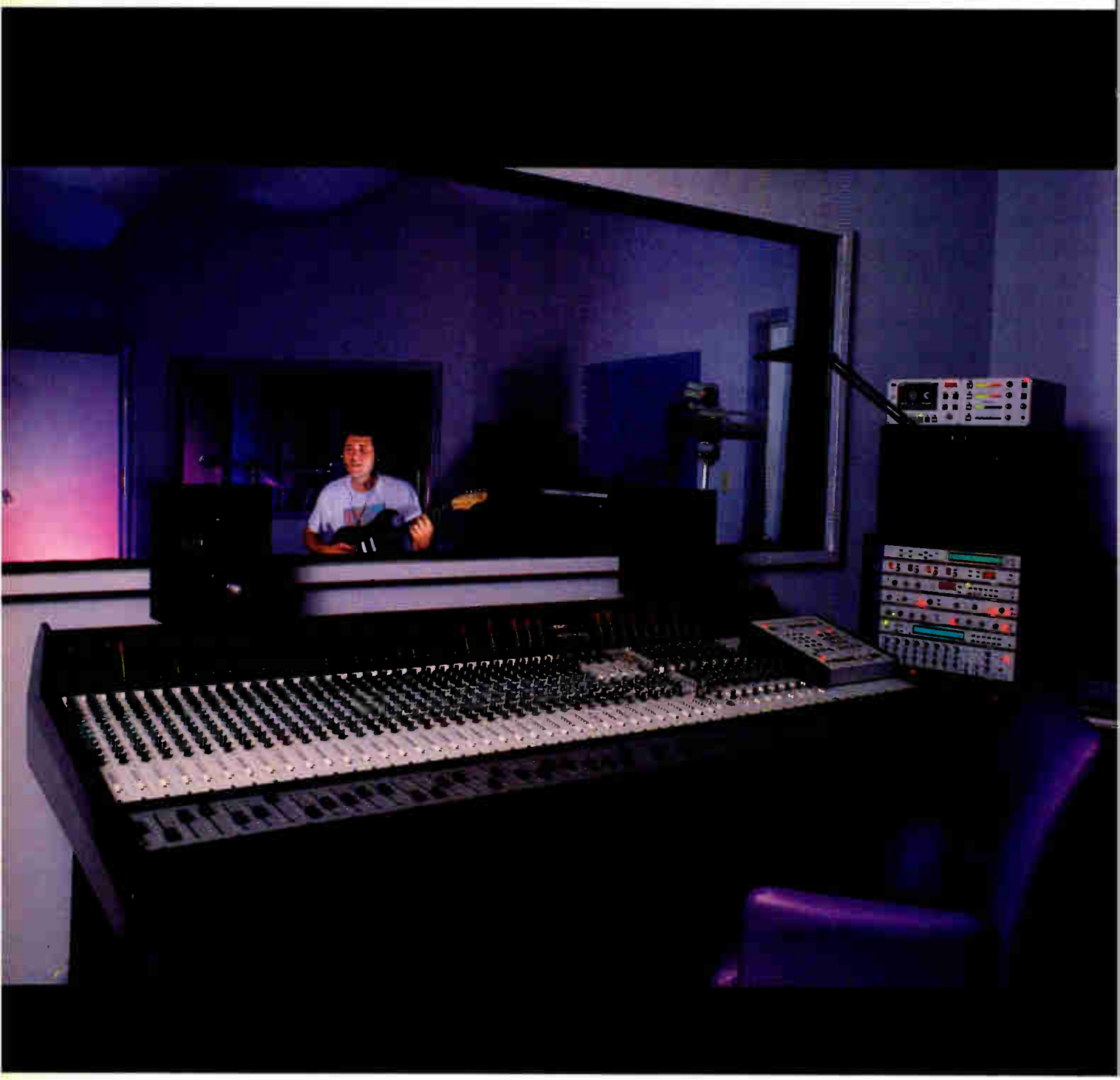

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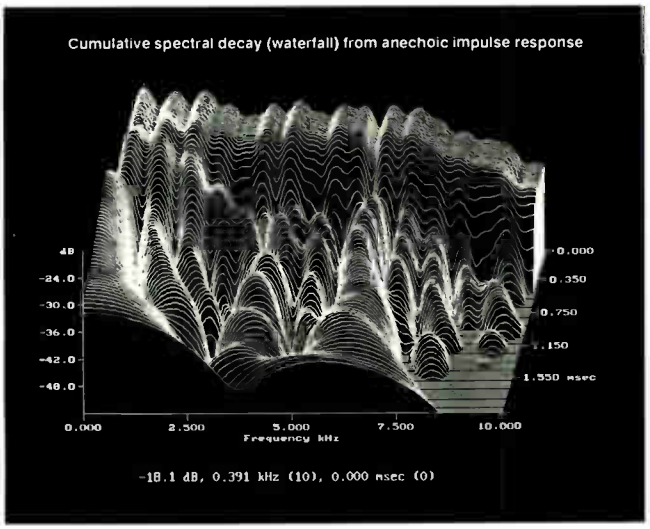

DRA MLSSA ACOUSTICAL MEASUREMENT SYSTEM ▲
The MLSSA system from DRA Labs (Sterling, VA) is a linear-system analyzer that works with IBM XT/AT and compatibles to perform a wide variety of loudspeaker measurements (impulse and step response, impedance, phase, etc.) and acoustical measurements (reverb decay and time, speech intelligibility, energy-time curve, etc.). The analyzer is based on a method that uses a kind of pseudorandom noise to provide high noise immunity and fast measurement times. It requires a PC with 640K memory; runs in color or B&W; and signals can be zoomed, panned, scrolled and output on a standard printer. Retail price is $2,495, including a 200-page manual and a set of low-level drivers for writing custom programs.
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CUTTING WEDGE ACOUSTICAL TILE
This flexible, foam-contoured panel from Thomas Chaffee Music Associates (Beachwood, NJ) offers an economical method of reducing a room's reverb and standing waves. Each panel measures 1-square-foot × 2-, 3-, 4- or 6-inches thick. According to the manufacturer, the patented anechoic Cutting Wedge achieves a higher noise reduction coefficient rating than other acoustical foam panels due to its size and wedges that run the tile's full length. Inexpensive adhesive silicon—not special glue—is required for installation. ▼
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QEI CAT/LINK STL
Class-A telco lines got you down? If you operate a remote transmitter over a hard-wired STL, check out the new CAT/Link from QEI (Williamstown, NJ). It provides a high-performance, two-way, multipurpose connection between a studio and transmitter, using the phone company's reliable and inexpensive T1 data lines (or twisted-pair or fiber optic cable). CAT/Link sends a composite signal to the transmitter and can send or receive various other signals (SCAs, control channels, voice communication, RS-232 data, etc.) simultaneously with a composite baseband. CAT/Link consists of two rackmount units and is easy to install and use.
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HOT OFF THE SHELF

Powersound's *Lazor-Cuts Edition Two* joins the company's CD-based production library and offers almost 200 digitally recorded radio resources such as IDs, bumpers and commercial beds; for a demo tape, call (415) 454-2939... **Sweetwater Sound's SW800 Soundblock** ($995) for the Kurzweil K250, Expander and RMX includes 55 new keyboard setups including Wurlitzer piano and harmonica; (219) 432-8176... **Micro-Circuit's 4c3a Upgrade** aerosol spray eliminates and prevents the intermittent connections that cause almost all electronic problems; (616) 469-2744... **Promusic's *Emil Ascher Library*** contains 65 CDs in many musical styles and over 150 classical selections on DAT, ¼-inch or cassette; for a demo, call (305) 776-2070... **Benchmark Media Systems' IFA Interface Amplifier** series accommodates a wide range of interface needs with eight modular devices, including a stereo balanced-to-unbalanced interface, dual balanced-in/single balanced-out mix amplifier, and more; call (800) 262-4675 or (315) 452-0400... **Yamaha's RTC1 Remote Control** is a MIDI-based unit that adds new features (such as rotary controls assignable to any parameter) to the DMP7, DMP7D and DMP11 digital mixing processors; (714) 522-9011... **Ron Schmitt & Associates' Stedi-Volt** electrical surge suppressor protects a facility's complete power supply from high-voltage surges; (312) 897-7707... **Lexicon's Opus Version 2** includes such enhancements as a 1.2 gigabyte hard disk, which expands system capacity to over 14 hours of online storage; (617) 891-6790... **Payphone Technology's TY-006 Coin Telephone** (starting at $199) prevents unauthorized use of studio phones, generates big profits on outgoing calls and is FCC-approved; call (800) 282-0128 or (213) 546-3686.

by George Petersen

PRODUCT
CRITIQUES AND COMMENTS

SUMMIT AUDIO EQP-200 DUAL PROGRAM EQUALIZER

What's new is what's old: vacuum-tube signal processing is back and gaining in popularity every day. While tube power amplifiers have long found favor among audiophiles and studio connoisseurs, don't hold your breath waiting for the all-tube PCM processor or digital reverb. Simpler audio circuits, such as the recent unveilings of equalizers, preamps and compressors from manufacturers like Summit Audio and Tube-Tech, have provided hand-crafted audio processors that cater to the tastes of discriminating engineers.

Let me start out by admitting that I generally disdain the use of equalizers, unless absolutely necessary. I've got a couple graphics, a terrific notch filter set in my outboard rack and 32 channels of really nice EQ on the board, but I rarely use them on a *music* session, except for a bit of parametric kick-drum shaping or perhaps some HF hiss shelving on instrument amps or noisy effects. On other sessions—audio-for-video, radio production, audio archiving/restoration and the like—I'm a lot more liberal about the use of equalization, whether for notching out a 60Hz hum, cleaning up tracks or tailoring dialog for telephone effects.

The Summit EQP-200 is a dual-channel program EQ whose hybrid design includes electronically balanced input stages followed by passive equalizers. Since the latter impart a gain loss of approximately 20 dB, the EQ sections are followed by a hybrid amplifier combining 12AX7A vacuum tubes with 990 op amps (a transformer-coupled output section is optional).

The EQP-200 can be thought of as having three independent EQ sections: LF shelving (up to ±16 dB cut or boost) at 20/30/60/100 Hz; variable bandwidth MF/HF boost (up to +16 dB) at 3/4/5/8/10/12/16 kHz; and -16 dB HF shelving cut at 5/10/20 kHz. Individual bypass switches for each channel are provided; I greatly appreciated these noiseless EQ in/out toggles. Not all equalizers on the market are so equipped, and an audible click when switching the device in or out of the audio pathway can be problematic in many situations.

While the operation of the unit is extremely simple, the ergonomics of the equalizer could be improved somewhat by differentiating the controls of the various bands. This could easily be achieved by color-coding the knobs or faceplate, as the controls are spaced equidistantly, and function is not immediately obvious at a glance. Speaking of improvements, a couple of LED input-clipping indicators would be a nice addition to this $1,800 box. Perhaps Summit could consider incorporating these changes into future models.

Operationally, the unit was easy

Summit Audio EQP-200 Dual Program Equalizer

and fast to use, and is capable of extremely subtle equalization changes. In fact, it is difficult to hear *any* apparent changes in the rotary controls until they are turned past 10 o'clock; after this point, changes become far more apparent. Of some interest is the fact that the LF boost and cut operate interactively. If both controls are used simultaneously, the result is a low boost and a mid cut. At the 20Hz setting, this provides a 7dB cut at about 125 Hz; with the switch at 100 Hz, a 7dB cut at 1,000 Hz is the result.

The EQP-200 is designed as a *program* equalizer. This means the unit is best-suited for the overall shaping and tailoring of entire mixes, especially in disc mastering and the preparation of masters for CD and tape replication. This is not to say that it wouldn't be at home in a studio's outboard rack, doing some subtle shaping on a vocal track, but the EQP-200 really shines as a program EQ.

I was most impressed with the EQP-200's performance on a variety of studio tasks over a month-long period, ranging from tweaking some mixes for cassette duplication masters to resurrecting and digitally archiving some early-'60s music broadcasts from transcription masters. On the latter, the EQ did a splendid job, including: reducing the hiss (max HF shelving cut at 20 kHz); rebalancing the kick and lower bass fundamentals (LF boost at 60 Hz); and restoring some "zing" in the hi-hat and cymbals (narrow-band HF boost at 12 kHz).

The blending of tubes and passive equalizers is not new, but the Summit EQP-200 has pulled it off in grand fashion, proving to be an excellent studio performer, combining ultra-clean audio specs and smooth, subtle equalization with the sweet, even-harmonic accentuation of a tube design. The EQP-200's main drawback is that its use can be addictive—and remember, I'm a guy who disdains EQ.

Summit Audio Inc., Box 1678, Los Gatos, CA 95031, (408) 395-2448.

ARSONIC SIGMA 1.2 LEVEL CONTROL UNIT

The ARSonic Sigma 1.2 is a unique device that offers a useful collection of high-quality studio tools in a single package. This German-made, dual-channel processor provides a flexible bag of tricks (including intelligent level controllers, digital peak meters, automated faders and Dynafex® single-ended noise reduction), all of which can be tweaked and programmed into memory for immediate recall. The latter would be particularly helpful in mastering applications, where different settings could be instantly selected to suit different source materials.

The Sigma 1.2 is an extremely complex unit and somewhat cumbersome to use due to its awkward user interface. The numeric keypad buttons are shared with function keys, and the up/down scrolling of parameter values is rather slow. Fortunately, operation speeds up markedly after the user becomes accustomed to the unit. Once some frequently used setups are entered into the unit's 100 memory locations, the user interface becomes much less of a problem.

The documentation offers little help. Nearly half the manual is devoted to explaining topics such as Theory of Level Control, History of Levels, Level Measurement Techniques and Choosing an Appropriate Level. Because the unit is designed for the high-end studio and disc mastering market, these tutorials are of little use to most of the Sigma 1.2's potential customers. I have nothing against the idea of providing primer-level material in a manual, but the unit's documentation omits basic requirements such as system setup, practical applications notes and schematics. The good news is that ARSonic's U.S. distributor (Current Music Technology) has completely rewritten the manual, which should be available soon.

One of the Sigma 1.2's most impressive and useful features is its ability to control output levels without the "squashed" feel of hard limiting. Its intelligent master faders (selectable as stereo or dual-mono) detect and display level peaks and offer switchable detection times of 1 ms or 10 ms. The latter is more suited for analog work, the former for digital recording.

The action of the gain control VCAs is extremely fast and accurate, keeping peaks under 0 dB without the "pumping" and "breathing" artifacts common to many other gain controlling devices. One of the engineer's main concerns, particularly with analog recording and/or mastering, is constantly trying to maintain that fine line between tape saturation and over-

load, in order to achieve an optimum signal-to-noise ratio. In practice, the Sigma 1.2 lives up to its promise of removing much of this worry by allowing you to concentrate on the mix, rather than on the levels.

I seem to spend a lot of time making analog copies of digital mixes after sessions, and I'm constantly riding levels, trying to keep the dynamic range intact while avoiding analog tape overload. The Sigma 1.2 is well-suited to this task: the dupes were clear, with punchy dynamics, while I was able to avoid hours of "finger" leveling.

One of the nice by-products of having a couple of microprocessor-controlled VCAs inside the Sigma 1.2 is demonstrated by the unit's "fade" feature. This allows the user to set up precise, accurate fade-ins or outs that can last up to one minute in length (adjustable in one-second increments). These fades follow a smooth, logarithmic curve (linear curves can also be selected) and are a terrific addition to the unit, particularly for anyone who has ever tried to manually do a steady, 45-second fade, even with long-throw faders. The fade function also spotlights the Sigma 1.2's impressive audio transparency. I never had any reservations about running an entire mix through the unit, even if I was only doing so for the convenience of adding an automated fade to the end of a tune.

Another of the Sigma 1.2's useful features is internal Dynafex single-ended noise reduction, providing up to 30 dB of quieting through the action of a dynamic, lowpass filter (VCF) and a downward expander (VCA). Like the other functions, the noise reduction parameters can be stored in user memory locations. One bit of noise that could not be removed was the Sigma 1.2's small but efficient cooling fan, which was noticeable in the control room. Since the unit offers no means of external control (such as MIDI or RS-232), ARSonic should look into passive cooling systems (heat sinks, larger vents), or perhaps offer an optional remote control on future versions.

The Sigma 1.2's "fade" feature allows the user to set up precise, accurate fade-ins or -outs that can last up to one minute in length.

The ARSonic Sigma 1.2 Level Control Unit is quite a versatile tool for the studio or mastering suite. Priced at $3,499, the unit is not inexpensive, but well worthy of consideration by the high-end user.

Current Music Technology, 146 Paoli Pike, Malvern, PA 19355, (215) 647-9426.

ARSonic Sigma 1.2 Level Control Unit

RECORDING DEMO TAPES AT HOME, BY BRUCE BARTLETT

Here it is at last: *Recording Demo Tapes at Home* (published by Howard Sams & Co.), a much needed, thorough and up-to-date treatment of all the basics you need to put together some great-sounding home demos. Author Bruce Bartlett (whose name should be familiar to many of you from his articles in this and just about every other recording or music mag on the planet) covers just about everything, from selecting the right 4- and 8-track equipment to describing miking and mixing techniques.

A great deal of the book focuses on microphone selection, techniques and placement. Here, Bartlett provides an excellent overview of theoretical basics and down-to-earth, practical tips, calling on his extensive background as a technical writer and project engineer for Crown International.

Emphasis is also placed on techniques for interfacing and connecting equipment. In fact, a schematic for constructing a simple -12dB pad for matching balanced, +4dBm pro gear to unbalanced, -10dBV semipro/consumer inputs is repeated twice in the text. This subject still causes much confusion among amateur recordists (along with a fair number of pros), and Bartlett does an exemplary job on this and numerous other topics—"splitting" mic signals, recording from a sound reinforcement system, multitrack recording techniques, session procedures and location recording, to name a few.

In comparison, the MIDI recording chapter is somewhat weak, but to be fair, an entire series of books could be written on the subject. The segment on synchronizing a MIDI sequencer to a 4- or 8-track deck could have gone into more detail, as this is a neat method of making great demos on a shoestring budget, especially with the availability of affordable MIDI-to-tape synchronizers, such as the J.L. Cooper PPS-1.

The chapter on Judging Sound Quality seemed fairly dispensable at first, but ends with two excellent sections (Training Your Hearing and Troubleshooting) that focus on many of the problems facing the aspiring home demo producer.

At $19.95, *Recording Demo Tapes at Home* is a well-written, complete and understandable guide that should keep the recording novice on-track throughout the entire demo process.

Available at technical bookstores or through the Mix Bookshelf, 6400 Hollis St. #12, Emeryville, CA 94608, (800) 233-9604 or (415) 653-3307. ■

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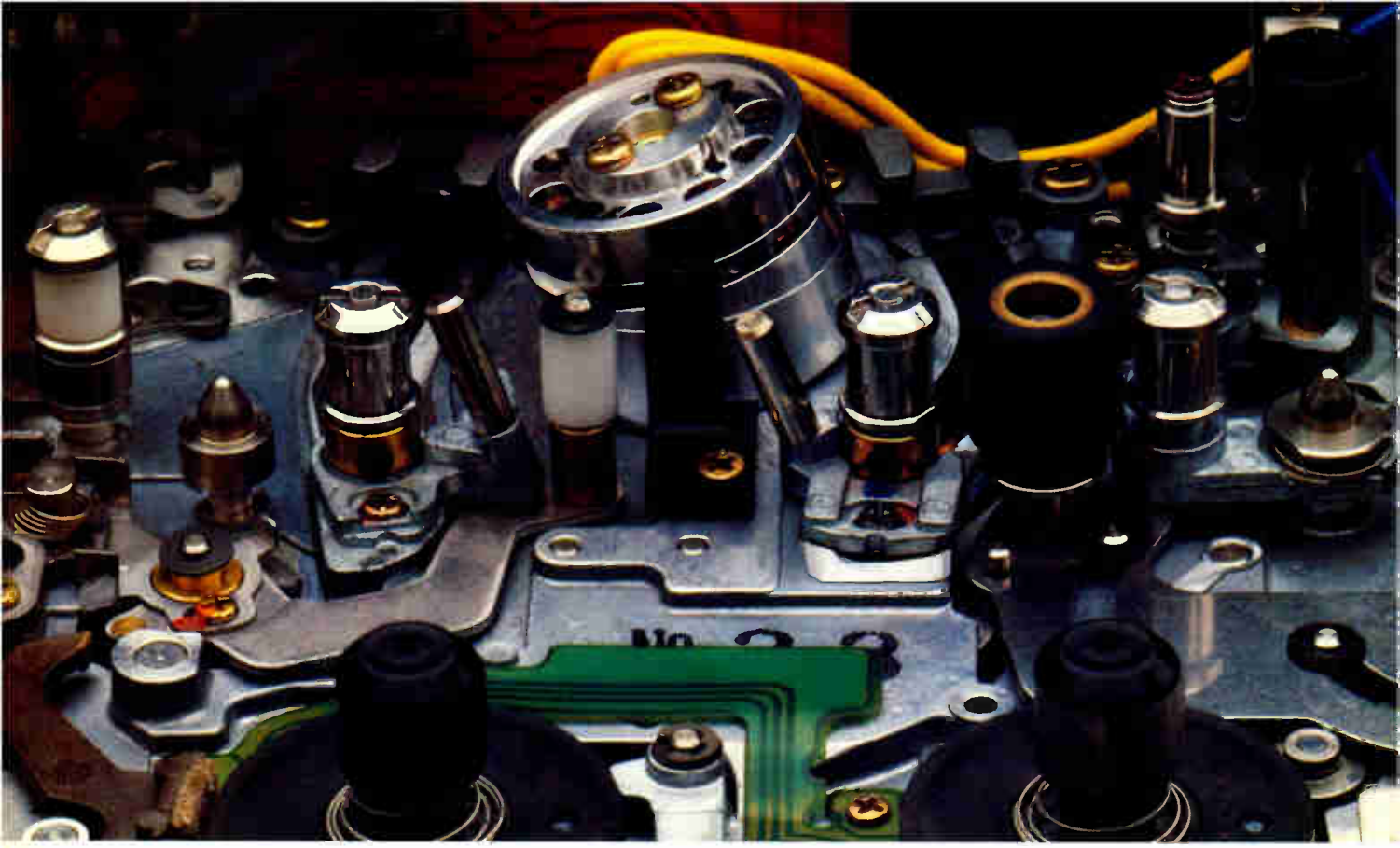

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Panasonic
Professional Audio Systems

by Mark Herman

SOUND REINFORCEMENT NEWS

Clair turns Japanese!...The Land of the Rising Sun is now host to **Clair Brothers Japan**. This new company, formed in association with **Sunplant Ltd.**, will use Clair Brothers equipment, technology and experience to service the expanding Japanese sound reinforcement market. The equipment will be the same type found in the U.S. and Europe. Inventory includes 128 S-4 Series II cabinets, Harrison and Yamaha consoles, Clair-modified Carver amplifiers and two complete monitor systems. The ability to use an established American sound reinforcement company in Japan will no doubt prove popular with globe-hopping acts.

The S-4 and more...The S-4 Series II, the latest version of the famous S-4 box, is now made up of two types of cabinets. The S-4F is a near-field, medium-throw box, while the S-4P has a long-throw design to reach the back of arenas and stadiums. The Series II has been in use for almost a year now. Clair Brothers has a large, ten-member R&D department that is beginning to produce some interesting results. The latest development is the Series II crossover processor, which is designed to "time align the system and optimize the frequency response and power handling of the S-4 Series II." Another product coming out soon is an automated remote control head for monitor equalization.

The Clair client list includes this summer's mega tour with the reunited **Who**...**Paul Simon** (see "On The Road")...and **Anderson, Buford and Howe** (former Yes men).

Rock'n'Road Audio, located in Tucker, GA (near Atlanta), was

PHOTO: MARK HERMAN

Rock 'n' Road Audio's 36-cabinet OAP setup for Hank Williams Jr. at the Starwood Amphitheatre near Nashville.

PHOTO: MARK HERMAN

Sixteen OAP DP1810 boxes supplied by FBN Audio provide coverage for the lawn area at the Starwood Amphitheatre.

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formed ten years ago and is owned by **Lloyd Kinkade** and **Kirk Marks**. They have one P.A. system that is used primarily as a touring rig for **Hank Williams Jr.** (see "On The Road"), who has been a regular client for six years, while another system covers corporate and concert clients. Williams tours often and keeps the larger system busy. Last fall the company did a tour with **Morris Day**. Rock'n'Road brings in its share of local national one-offs and corporate work throughout the Southeast.

R'n'R designed its main P.A.—OAP DP1810 (dense pack) cabinets—but had them built by **OAP Audio Products**. The three-way, one-box system has a total of 36 cabinets, each loaded with an 18-inch and 10-inch JBL driver, and a 2-inch TAD on a constant-directivity horn. Twenty-four K4 boxes make up Rock'n'Road's other main P.A. rig. The K4 cabinet is a larger version of the OAP DP1810, with a four-way box loaded with an 18-inch, two 15-inch, two 2-inch and two 1-inch horns.

Monitor sidefills are proprietary, three-way, horn-loaded boxes with JBL components. Stage wedges use a double 12-inch with a JBL 2425, or two 15-inch drivers and a JBL 2445. Amplifiers throughout the systems are QSC Models 3800, 3500, 1400, MX1500 and MX2000. House consoles are a Soundcraft Series 4 40×16×2 and a Yamaha PM3000 40C. Monitor consoles are a short-loaded Soundcraft Series 4 32×16×2 and a 40-channel Soundcraft 500M.

OAP Audio Products has been building enclosures for more than 12 years and has done custom work for sound companies in the Southeast. Located 25 miles from Atlanta in Buford, GA, OAP is a pro audio product dealer, manufacturer and sometime sound company. The DP1810 enclosure is its pro touring model, while the new Composite Series is designed for smaller applications. OAP makes monitor enclosures as well.

ON THE ROAD

SOUND COMPANIES, EQUIPMENT, ARTISTS & PERSONNEL ON TOUR

Artist Sound Company Tour Dates Region	House Console #1 House Console #2 Monitor Console #1 Monitor Console #2 House Crossover	Main Speakers Main Speakers Subwoofers Monitor Speakers Monitor Speakers	Main Amplifiers Main Amplifiers Sub Amplifiers Monitor Amplifiers Monitor Amplifiers	Engineers: (B) = band eng. (H) = house eng. (M) = monitor eng. (T) = technician (a) = assistant
Bob Dylan Ultra Sound East May - June Europe July - October U.S.	Gamble HC 40x16x2 - Gamble SC 32x16 -	(32) Meyer MSL-3 - (16) Meyer 650R2 Meyer UM-1, UPA-1	Crest 8001, 4001 - Crest 8001 Crest 3001	Ed Wynn (B, H) Keith Dircks (M) Dave Taylor (aH) Fuzzy Fraizer (aM)
David Sanborn Schubert Systems Group June - August North America	Gamble HC 40x16x2 - Gamble 32x16 - SSG	(32) Steradian - (16) Steradian Subwoofer SSG 1x15, 2x12, 2x15 Steradian side fill	Crest 8001, 7001 - Crest 8001 Crest 7001	Paul Daylen (B, H) Kevin Korecky (M) John Oster
Paul Simon Clair Brothers June - July Europe	Yamaha PM3000 40x8x2 Yamaha PM3000 40x8x2 Harrison SM-5 32x16 - Clair Custom	(64) Clair S4 - - Clair Custom, 12AM	Carver/Clair 2.0 - - Carver/Clair 2.0	David Morgan (B, H) Randy Weitzel (M) Mike Wolf
Steel Pulse Reggae Sunsplash'89 Sutter Audio North America	Yamaha PM3000 40x8x2 - Soundcraft 500M 40x12 - BSS FDS 360	(24) OAP - (12) OAP 218 OAP 215, 212, 1x15	QSC 3800, 3500 - QSC 3800 QSC 3800, 3500	Robert Stuart (B,H) - Steve Vandervort (aH) Jim Stevens (aM)
Stevie Ray Vaughan United Sound Associates May Northwest & Western Canada	Yamaha PM3000 40x8x2 - Audio Arts M-16 32x16 - BSS FDS 360	(16) United MS-1 - (6) United MS-2 United MSW-1, MSW-2	Crest 8001, 4001, 3000 - Crest 8001 Hafler P-500	Mark Rutledge (B,H) - Andy Evans (T, aH) Michael Johnson (aM)
Hank Williams Jr. Rock'n'Road Audio January - October North America	Soundcraft Series 4 40x16x2 - Soundcraft Series 4 32x16 - BSS FDS 360	(36) OAP DP1810 - (8) OAP 218 RNR Custom	QSC 3800, 3500 - QSC 3800 QSC 3500, 1400	Jim O'Brien (H) Kirk Marks (M) Lynn Barbee

Cabinets come loaded primarily with JBL components and/or TAD HF drivers.

Gamble and Crest!. . .High-end mixing console manufacturer **Jim Gamble Associates** and amplifier manufacturer **Crest Audio** have reached an agreement allowing Crest to manufacture, sell and distribute the Gamble Series EX 56-channel house and 48-channel monitor console line worldwide. Division manager **Craig Hannabury**, who will be handling the sales of the consoles, said, "The pro price will be targeted in the mid-$70,000s, and short-loaded consoles will be available for those with a lower budget." I expect the reduced price will draw considerable interest from high-end console users looking to upgrade their mixing situation. Console production will move from the Lake Tahoe area to Crest's headquarters in Hawthorne, NJ. **Jim Gamble** will continue with design work and consulting. The first production models of the Crest-manufactured Gamble Series EX are scheduled for release later this month. "We are very excited by this project and think it will make a big impact worldwide. There is strong interest in the Orient as well as here in the States," Hannabury said.

The console report continues . . .**Harrison Systems Inc.** was purchased by **GLW Enterprises**. An investor group headed by former Harrison president **Bill Owen** acquired the assets of the Nashville recording and sound reinforcement console manufacturer. According to **Brad Harrison**, the change of ownership will make the Harrison line stronger due to an improved financial situation. "Essentially, we will be able to continue future product development and offer better customer service. The Harrison name will remain on the consoles. We will still take orders for the HM-5, HM-4 and SM-5 sound reinforcement consoles." Almost all key personnel were retained in the acquisition. According to Harrison, the first order for GLW was a 52-input SM-5 stage console that

will be going into the new **Mirage Hotel** in Las Vegas.

More console news... New console manufacturer **Audio Teknology Inc.** is scheduled to release its first Paragon 40-channel console in midsummer. Parts delays held up the spring debut.

Snow Sound is located in Middlefield, CT, between New York City and Boston. This mid-sized regional sound reinforcement company works with symphonies, national artists working one-offs, festivals and corporate clients. It is also the sound contractor for the New Haven, Springfield, Bridgeport and Hartford symphonies. Owner **Brad Snow** said, "We do a lot of symphonic work in our area and a fair amount of national one-offs. At this time we don't do much touring, but with our new P.A. and the possibility of acquiring a more well-known house console, look for us to be in the touring market soon." Late June brought work at the **Rose Arts Festival** in Norwich, CT, with many national acts, while early July was filled with numerous symphony dates, plus the **Hartford Riverfest**, which featured a live TV show with **Blood Sweat & Tears**. Snow also handles an event that attracts 50,000 people to the town of Bloomfield, CT, featuring many national acts.

Snow Sound purchased 16 Canadian-made **Adamson Acoustic Design** main P.A. cabinets recently and just ordered eight more. Snow is pleased with the purchase: "We bought the Adamson two-box system after demoing other name brand speakers. They ate the competition for breakfast! The Adamson cabinets seem to run very flat; little EQ is necessary. You can plug them in, turn them on and go. It's the sound system we've always wanted—a cut above anything we're used to seeing in terms of waveform control. It is a very cost-effective and manageable package. It is lightweight, human-oriented and sounds great. The money invested in R&D definitely shows in the end result. We ordered more B-218 low-end cabinets because there is so much headroom in the upper MH-225 box."

Besides the new Adamson system, Snow has a proprietary, 28-box main P.A. system. Its Eagle system uses a trapezoidal, one-box concept along with four Intersonic SDL-5 subwoofers for the low end. For the stage, proprietary bi-amped monitor wedges are loaded with JBL components. McCauley wedges are in the inventory as well. Snow has three (48, 40 and 32 channels) Wheatstone 1080 house consoles. "We've only used Wheatstone consoles in the past. They work well for us. But due to popular demand, we are now looking at buying either a Yamaha PM3000 or a higher level console like the Gamble EX-56," Snow said.

At presstime **Showco** (Dallas, TX) continued touring in Europe with the **Bee Gees**. **M.L. Procise** mixed house until turning the duties over to longtime Australian engineer **Howard Page**, who recently joined Showco. Page was one of the original engineers for the Australian sound reinforcement company **JANDS** (JANDS was purchased by **Samuelsons Concert Productions**). He's worked with almost every major band that's traveled Down Under and has a fine reputation as a knowledgeable house engineer and technician.

Showco's recent American tours include **Beach Boys/Chicago**, **Little Feat** and sporadic dates with **Barbara Mandrell**... Recently the company finished touring with **Tim Finn**, whose band is composed of Peter Gabriel's backup players... Showco provided P.A. equipment for **Projects West**—a production company that takes portable P.A. systems out on major league baseball fields for concerts—and worked the grand opening of the **Parkfest** outdoor natural amphitheater. Showco's **Wil Sharpe** stated, "It's been a busy summer; we've had to turn down several major tours."

Gemini Stage Lighting and Equipment Co. (Dallas, TX), owned by **Dell Cain** and his two brothers, handles mostly

—CONTINUED ON PAGE 113

COMPANY PROFILE:

Crest Audio Inc.
150 Florence Ave.
Hawthorne, NJ 07506

Crest Audio began operations in California and introduced its first amplifier products—the P2500 and P3500—in 1979. In 1980 the company moved to its current location in Hawthorne, New Jersey, with manufacturing, engineering, R&D and sales all based in the same building. The 5000, introduced in '82, was the company's first large-scale amplifier capable of delivering 1,000 watts

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Oberheim

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into 2 ohms per channel. In '83 the 3000 and 4000 (and the meterless 3001 and 4001) were released simultaneously and became mainstays of Crest for several years. The 4000 became its top seller due to its popularity with many touring sound companies. Power output specifications for the 4000 are 340 watts into 8 ohms, 600 watts into 4 ohms and 900 watts into 2 ohms. The 3000 puts out 260 watts into 8 ohms, 475 watts into 4 ohms and 720 watts into 2 ohms. In '84 Crest introduced its Powerline Series amps designed for retail sales.

Crest's current new Professional Series line—geared toward the pro sound reinforcement industry—was launched in mid-1987 with the introduction of the powerful 8001 unit. The 8001 incorporated a completely new design featuring a fully discrete front end, custom power supply components (transformers and filter capacitors) and a modified Class H power supply. Company spokesman Craig Hannabury explains: "We have a dual-voltage rail design. As the signal comes up to the top of the low rail, the high rail kicks in, and instead of simply turning full on it actually modulates with the envelope of the input signal. One of the most important characteristics when driving loudspeakers is the amplifier's peak power capability. The 8001 will swing up to 91 volts RMS per channel, which translates into peak power approaching 4,000 watts. The 8001 is designed to handle transients to prevent peak clipping. The modified class H power supply helps here. Crest's design philosophy is to optimize the amplifier to drive loudspeakers with a transient source. And we've always stressed 2-ohm capability with our Professional Series, beginning with the model 5000. In order to drive a 2-ohm load, you need a lot of safe operating area with the output section. More output transistors and a larger power supply are necessary. We believe in large power supplies

"The 8001 will swing up to 91 volts RMS per channel, which translates into peak power approaching 4,000 watts.

and 2-ohm capability. If you run at 2 ohms you can reduce the number of amplifiers needed as well as size and weight. The majority of current 8001 Models are run at 2 ohms in real-world applications."

The 8001 was followed by the 7001 (July '88), 6001 (May '89) and the 4801 (May '89). Models 6001 and 4801—designed primarily for monitor and high-end main P.A. applications—will replace the 4000 and 3000 models. These four Professional Series models share identical technology, circuitry, sound quality, features and cosmetics, and only vary—except for rack space, weight and size of power supply—in output power. Some of the features of the Professional Series models include an IGM impedance-sensing circuit that reduces the gain of the amplifier if the load goes below 2 ohms, and a clip limiter circuit that allows musical transients to clip the amplifier without generating square waves.

There are two other lines available through Crest. One is the FA Series, designed for cost-effective retail applications. The first model came out last year and four models will make their debut this summer. The first of four CC Series models designed for the contracting market are due to be released this month. They are all convection-cooled units designed for fixed installations, including recording studios.

—Mark Herman

—FROM PAGE 109, SOUND REINFORCEMENT

corporate-oriented work, with occasional short concert stints around the Dallas area. The company has a 700k lighting rig and two sound systems. Cain said they get out more with industrials: "We've done some traveling throughout the U.S. for corporate convention tours, but we try to stay in the Dallas market as much as we can. Our profit margin is higher if we don't travel. Dallas is a good-sized convention market." Asked about the effect of the poor economic situation in Texas, Cain said, "Our shows have steadily increased over the years, but the installation market is definitely way down." Recent corporate clients include Texas Instruments, Nabisco, AVW and Northern Telecom. In June, Gemini worked a tour with the **Tremaine Dancers**, a group of choreographers who teach the instructors at various dance schools. Cain also reported doing sound and lights for **Crystal Gayle**.

Gemini's main P.A. is powered by Crest 4000 and 3000 amplifiers and is comprised of 30 Renkus-Heinz SR1, eight SR2 and 15 LR2 cabinets. The 3000s are bridged-mono for the low-end LR2s. Renkus-Heinz W1 wedges are used for the stage. Gemini's other system has cabinets that were formerly part of a Showco SS system. The company has Soundcraft 8000 and 800 consoles for the house and a Soundcraft 500M and 400 for the stage. ■

THE NETWORK HEARD 'ROUND THE WORLD

We'd like to acknowledge the growing worldwide network of Turbosound TMS-3 users who now form the largest loudspeaker system rental user group* in the history of our industry: *TurboLink*.

Using TMS-3s to provide entertainers with consistent equipment coverage around the globe, TurboLink companies are able to pool resources to assemble extraordinary systems like the one pictured above for "Monsters of Rock" at Castle Donnington in the U.K. last year. The 304 TMS-3s and 60 TSW-124 subwoofers (over 500 Kilowatts!) were recently certified by the Guinness Book of Records as the World Record for the largest single source sound system ever.

Touring the world? If so, contact one of the U.S. TurboLink TMS-3 rental companies listed below, or write or call the U.S. Turbosound office for more information about our international TurboLink Network in Europe, the Far East and Australia.

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*Turbosound has sold over 3,000 TMS-3s worldwide.

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SOUND REINFORCEMENT PRODUCT NEWS

CROWN IQ SYSTEM 2000

Unveiled at this year's NSCA Show in Nashville, the IQ System 2000 from Crown (Elkhart, IN) allows the remote control and monitoring of up to 2,000 amplifiers in touring sound or permanent installations. The software-driven system includes ten major monitoring functions, including power on/off status for each amp channel, input attenuation level, each amplifier's input/output signals, signal inversion, IOC and OPEP signals, rail voltage, aux control lines and data signal presence indicator (DSPI) status. Among the system's control functions are the ability to turn any channel's high-voltage supplies on/off, vary input levels (in 1dB steps), invert the signal polarity, mute the audio or operate the DSPI troubleshooting feature.

The IQ System 2000 is comprised of a host computer (Mac software is currently available; custom software for other PCs can be created with the help of the installation guide), an IQ-P.I.P. card (one is needed for each amplifier) and an IQ System Interface. Cable lengths between the three components can be as long as 1,000 feet. The system is compatible with Macro-Tech and Com-Tech amplifiers; owners of Micro-Tech or Power Base amps can have their units modified to accept IQ-P.I.P. cards by Crown's service department.

Circle #110 on Reader Service Card

NEXOCAAD

New from Nexo Distribution of Roissy, France (outside Paris), is NexoCAAD, a powerful computer-aided design software program allowing users to construct three-dimensional models of buildings to assess the acoustic effects of loudspeaker placement. Running on any standard IBM PC/AT or clone, NexoCAAD operates under a fully interactive color graphics environment with mouse control and multiple windows for simultaneously viewing multiple rooms, 2- or 3-D models, etc. The program calculates all necessary parameters needed to design sound installations, and comparisons can be made between different cabinet types, various groupings or cluster shapes and alternative locations within a building.

The user can customize the program to suit specific requirements; for example, criteria for a specific proposal can be entered (average dB throughout the venue, dispersion, etc.), along with other data such as sight lines and overall budget. The package considers a wide variety of acoustic criteria, including power coverage, intelligibility, impulse response, reverb time and primary reflections. The system venue can be of any type: enclosed room, half-enclosed room or open air.

Circle #111 on Reader Service Card

APOGEE CORREQT SYSTEM

Computer Optimized Room Resonance EQualization Technique, a new system devised by Apogee Sound Inc. (Petaluma, CA), helps optimize the integration of Apogee loudspeakers into the performance environment. The system assists proper loudspeaker specification and placement; preparatory analysis, adjustment and balancing; and real-time correlative analysis and correction during performance.

CORREQT uses FFT-based analysis with computer enhancement to identify room response modes, with specific focus given to narrow-band room resonances that adversely affect sound quality. Correction is accomplished through precise equalization at the resonant frequencies, resulting in improved overall response and the perception of a reduced reverberant field. Apogee plans to market a computer-controllable parametric equalizer to complement the system this year, and development of an automated system (for long-running shows, such as Broadway musicals) is under way.

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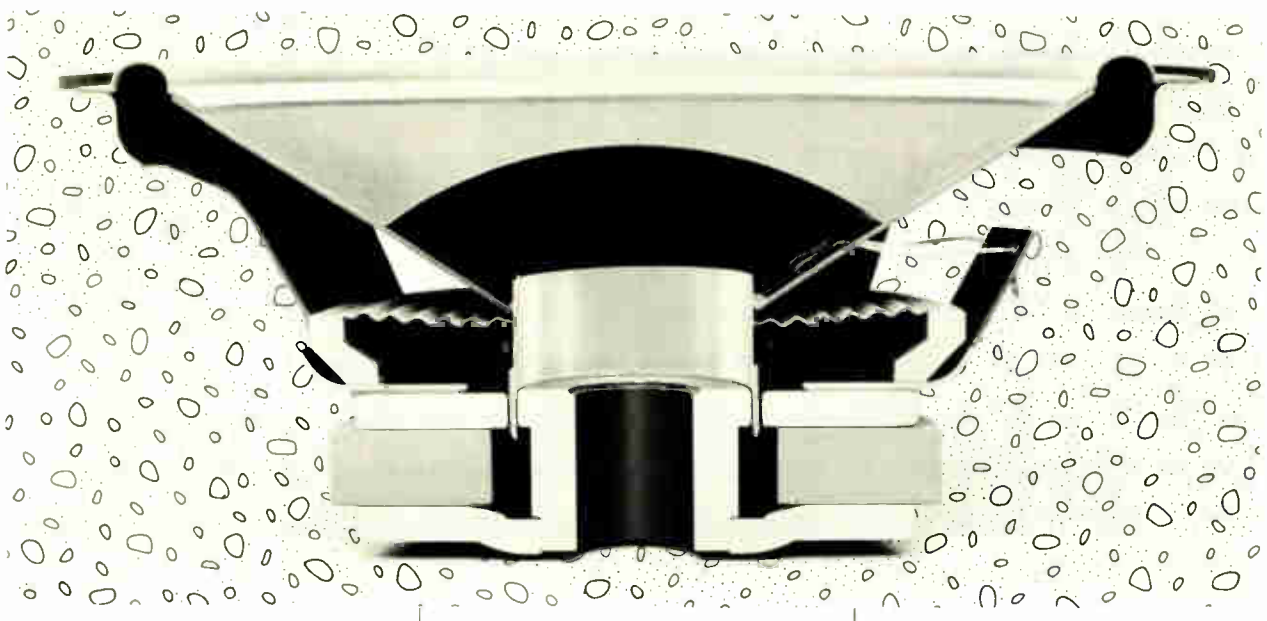
SENNHEISER "BLACK FIRE"

Designed for vocal, instrumental and percussion sound reinforcement is the "Black Fire" MD 518, a new pressure-gradient, cardioid dynamic mic from Sennheiser (Old Lyme, CT). The MD 518's high SPL handling and insensitivity to strong magnetic fields make it ideal for miking onstage speakers, while its lightweight (6.5 oz), nonreflective finish and slightly rising HF presence tailor the mic for vocal applications.

Circle #113 on Reader Service Card

by Mike Joseph

LOUDSPEAKER TECHNOLOGY AND ACOUSTICS



QUESTION: Which is better—a sports car or a pickup truck? They both have four wheels, two seats and go backwards and forwards. The answer, of course, depends on your needs. The roadster would roll over and play dead carrying an old refrigerator to the dump. Yet the truck would be a definite liability when attempting high-G lateral gription through the "S" bends. What it does is what it's good for. In audio as in automotion.

So it is with professional loudspeakers. What you use or install is entirely dependent on the application. Sounds obvious, right? When was the last time you saw the wrong parts doing the wrong job? Last night? Bet it wasn't too long ago.

Special challenges have always existed for those who design and apply sound reinforcement equipment. Unlike a monitoring system in a production studio with close-up, easily definable, ideal listening areas, a sound reinforcement system must exhibit favorable characteristics throughout an often not-so-wonderful acoustic environment, whether closet-sized nightclub or poured-slab stadium. A successful sound reinforcement system must show uniform coverage patterns to a specified floor plan, with no single spot being too hot or cold. Sound pressure levels (SPL) must remain relatively consistent with distance, a criteria the inverse square law loves to shake its Newtonian stick at. Frequency response must be equal throughout the area, in spite of natural low-frequency buildup in corners and near walls or bright, reflective, slappy surfaces and absorptive black holes. Usually these criteria must be accomplished within a tight budget (ah, the rub!).

Let's address these crucial aspects up close for three basic sound reinforcement applications —nightclubs, medium-sized auditoriums and stadium/outdoor concert venues. Then we'll answer a couple of other questions: What are the speaker manufacturers doing to make the wood, paper, aluminum, magnet and wire-coil widgets we love to hate more useful to our work? How does this correlate to system design criteria?

To generalize, sound system installation has fallen historically into two categories: budget and designed. Budget systems, more often than not, are installed by brothers of the clubowner's neighbor's

Face the Truth.

The only sure way to know if a DAT recorder meets your professional needs is to turn it around and see if it has the right connections.

The Fostex D-20 does. It operates just like much more expensive open reel 2-channel recorders with SMPTE/EBU capability.

Synchronize • Monitor Tape • Punch-In/Out • Control Pitch

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

The 20-pin synchronizer port allows interface with our synchronizer system (others as well) and there's an RS-422 port for control which requires serial communication.

Then there's an external sync input for composite video, plus Word Sync Input and Output capability - all standard on the D-20.

In our unique 4-head system, two pairs of heads are positioned around the drum at 91.5° intervals. One pair is for record, the other for reproduce; but it's the revolutionary ability to reverse functions that opens up the format for true professional use.

Thus the D-20 features off-the-tape monitoring - a very important feature considering the DAT's ability to record for two straight hours (no more multiple reels and alignment hassles).

You'll be able to control all transport functions by remote control - including instant punch-in/out. Built-in cross-fade timing gives you seamless punches.

There's even a pitch control complete with digital read-out. It's on our front panel (not shown), along with other professional touches.

The D-20 has been shipping since last year and it's being used daily in audio and video post-production suites. It works.

And it will keep on working as future software is developed, thanks to the built-in flexibility of the DIP switches and an additional 40-pin connector.

Most important of all, the D-20 sounds great. It records and reproduces all the music completely, faithfully, and better than analog alternatives.

So when it comes down to professional *performance*, plug into the digital master recorder that faces the truth, back against the wall.

D-20
Digital Master Recorder
FOSTEX®

Complete technical information is available in the form of reprints of "A Professional R-DAT Recorder", presented at the 85th AES Convention, November 6, 1988. Please send a check or money order in the amount of $2.00 to cover shipping and handling.

Circle #147 on Reader Service Card

guitar-playing buddy (but he got a great deal) using only the best, discount, off-the-shelf Rad Shack hi-fi cabinets and used music-store band gear. Decorative lamp chain and 22AWG zip cord signify the presence of a true budget wizard. Pray the owner's insured.

Larger, more financially flexible applications—designed installations—usually receive a greater amount of forethought, ranging from the seasoned touch of experienced users to scientific, design-by-formula EEs. Devices are chosen for their measured projection characteristics, power handling capabilities, fit to actual required SPL, and system intercompatibility. The active word here is "system," a combination of components designed to blend harmoniously in a specified custom situation; i.e., the parts talk to each other.

A typical design for a small, live or canned music club with a low ceiling is both simple and hard to do right. You want a sound system that: is loud and uniform across the dance floor at ear level; provides controlled spill into seating areas; has negligible harshness or mid-range blare (the range in which the ear is most sensitive); offers lots-o-thump potential; and is of a design as aesthetically invisible as possible (excluding for the moment the "high-tech-wall-of-science" school of interior architecture). Solutions range from simple, full-range MI boxes to separate horns, tweets and cabinets, all hung under the ceiling in dance-floor corners or stacked up, flanking a live stage. Subwoofs can find placement around the floor wherever they fit, which most often seems to be the least acoustically acceptable spot.

Higher power fixes have traditionally leaned toward older horn/driver combos chained (or aircraft-cable/quick-linked) under or beside larger-than-life, reflex or horn-loaded bass enclosures. Although power handling and efficiency (electrical power in vs. acoustic power out) is better than with simple, full-range MI boxes, few classic horn/driver or low-frequency enclosures are optimized for broadband, short-throw coverage or extra-wide frequency response.

Auditoriums, sanctuaries and other medium-sized, high-ceilinged facilities have many criteria similar to small spaces, but differ in that: the sound almost always comes from one direction only; there are separate "performance" and "listening" areas; the audio should track the visuals (point-source image localization); and the distance and coverage SPL uniformity is important over a large area—left-to-right and front-to-back pattern consistency is crucial. In voice-oriented, medium-sized applications, the current popular choice is the overhead central cluster, with ubiquitous side columns available as old standbys.

Longer/deeper facilities often combine near-throw, CD (constant directivity) horns and bass cabinets with radial or long-throw, narrow-beam horns for back rows and balconies. As long as the sound is kept off the walls, minimizing bounce and flutter, a well-designed cluster package is effective but not necessarily capable of full-range musical fidelity.

The drawback to separate horn/enclosure clusters is the mass of

NEW BSS CROSSOVER:

OVERBOARD WITH OVERDESIGN™?

FDS-310 Baffles Industry!

Has Brooke Siren Systems finally crossed over into the fourth dimension of Over-Design™? Many industry experts believe the company's new FDS-310 crossover has gone too far because of what they call an "over the top" hardware-intensive design that actually employs *FOUR* stacked potentiometers on each of the unit's two frequency selectors, instead of the standard one pot setup.

4 Pots Too Many?

Quizzed at a press conference to introduce the new "Sweepable Frequency Dividing System," as the company calls it, BSS Managing Director Chas Brooke deflected all questions from the hysterical audio press with a terse prepared statement.

"There's been a lot of talk about this '4 POTS' thing," he announced to the buzzing throng, "but, typically, you are all missing the point.

"At BSS, we never Over-Design just to pile on the extra hardware," Brooke emphasized.

"In this case, we had to use 4 pots on each band of the FDS-310 because it was the *only* way to insure the precise 24 dB crossover slope at all frequencies for superior audio performance.

"We don't take these things for granted, even if our customers or competitors do. But they thank us in the end when they hear the difference OverDesign can make!"

OverDesign Pays Dividends

Having dispensed with the "controversy," Brooke went on to point out a wealth of other OverDesign features that pay off in the superior performance of the FDS-310.

"Like our top-line, industry standard OverDesign FDS-360, our new economical FDS-310 variable crossover can be tailored to fit your needs," he gloated.

"The system uses a 24 dB/octave Linkwitz-Riley filter. The unit also has the built-in flexibility to be used in two-way stereo or three-way mono operation."

Chas also revealed that internal OverDesign features are, "money in the bank. Like CD Horn EQ, Mono Low Linking and, for the Sub Bass, a special 'divide by 10' network allows a lower range of 18 Hz to 200 Hz.

"For greater user control, each frequency band has its own level control, a Polarity Reverse switch; Mute button; Signal Present LED and Peak Signal Warning LED. The rear panel features both 1/4" and balanced XLR connectors.

"The truly remarkable thing about the FDS-310 is its price," Brooke concluded. "Designed exclusively for the U.S. market, this is indeed a 'medium bucks' crossover that delivers anything but, 'medium sonic performance.'"

TWO BRAKES WEREN'T ENOUGH!

With two powerful disc brakes, Mr. John Mudd of Hapless, New Mexico thought he could stop his car in any situation. This picture of Mudd accidentally leaving the road tells a very different story!

Think Of The Alternatives

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"CARVIN PRO SOUND... I COUNT ON IT."

—David Rosenthal, Robert Palmer Band

As keyboardist for Robert Palmer, David Rosenthal knows that on the road or in the studio, the quality of the equipment makes all the difference. With his sophisticated multi-keyboard setup and heavy touring schedule, David knew he needed pro sound gear that was state-of-the-art in sound quality, flexibility and reliability. That's why he chose Carvin.

From recording consoles to live sound mixers, from power amplifiers to graphic EQs, Carvin is proud to produce a complete line of Professional Sound equipment built to please the most discriminating user. The design and construction reflect our essential commitment—quality without compromise. A commitment you can discover for yourself.

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			$ First day
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OTARI	DTR900	32 track 1" PRO-DIGI recorder	750
PANASONIC	SV250	Portable DAT recorder/48kHz rec./44.1 & 48kHz play	85
PANASONIC	SV3500	Professional DAT recorder/44.1 & 48kHz rec. & play	85
SONY	PCM3348	48 track 0.5" DASH recorder	1200
SONY	PCM3324	24 track 0.5" DASH recorder	750
SONY	PCM1630	2 channel digital processor with RAR/Apogee filters	350
SONY	DMR4000	2 track u-matic digital audio recorder with RAR for use with PCM1630	250
SONY	PCM2500	Professional DAT recorder/44.1 & 48kHz rec. & play	100
SONY	TCD-D10	Portable DAT recorder with stereo mic & remote 48kHz rec./44.1 & 48kHz play	100
STUDER	D820-X	2 track 0.25" DASH recorder	350

ANALOG RECORDING EQUIPMENT

NAKAMICHI	MR1	Professional stereo cassette deck/ + 4dB balanced	35
OTARI	MTR12	0.5" 4 or 2 track/0.25" 2 track with or without CTC	125
OTARI	MX5050 B-II	2 track 0.25" 15ips recorder	50
OTARI	MTR90MKII	24 track 2" 15/30ips recorder	450
STUDER	A80VU	2 track 0.25" or 0.5" 15/30ips	125
STUDER	A827	24 track 2" 15/30ips recorder/computer assisted alignment/identical sound and transport to A820	450
TASCAM	122BMKII	Stereo cassette deck/ + 4dB balanced	30

MONITOR SPEAKERS/ HEADPHONES

AKG	K240M	Stereo headphones	6
AUDIOTECHNIQUES	LRCB	Little Red Cue Box: 4 out h'phone box w/volume controls	10
JBL	CONTROL 1	Pair of mini monitors	10
FOSTEX	T20	Stereo headphones	5
KLARK ACOUSTIC	JADE ONE MKII	Pair 100 watt self-powered linear phase soft-domed monitors	75
QUESTED MONITORING SYSTEMS			Please call for details
TANNOY	LGM	Pair Little Gold monitors	70
TANNOY	PBM 6.5	Pair nearfield monitors	25
YAMAHA	NS10M	Pair nearfield monitors	25
YAMAHA	NS10M STUDIO	Pair nearfield monitors	30

MIXING CONSOLES

FOCUSRITE	SIDECAR	12 x 8 console with SSL logic interface	550

RECORD DECKS, PREAMPS, ETC.

NUMARK	DM1550	Four stereo input turntable mixer/preamp	15
TECHNICS	SL1200MKII	D.J.'s record deck with heavy duty Shure 35C cartridge	20

NOISE REDUCTION

DOLBY	XP24SR	24 channel Spectral Recording unit	250
DOLBY	363-A/SR	2 channel SR and type 'A' unit	70
DOLBY	CAT280	Single channel SR card	20
DOLBY	SP24A	24 channel type 'A' unit	200
DOLBY	CAT22	Single channel type 'A' card	15
DOLBY	361	Rack unit for one CAT280 or CAT22	15

SYNCHRONISERS

ADAMS SMITH	ZETA THREE	2 machine synchroniser with remote/MIDI/2 cables	100
APHEX	STUDIO CLOCK	SMPTE/MIDI converter with audio mapping	30
GARFIELD	MASTER BEAT	SMPTE/MIDI synchroniser/pulse to MIDI converter	40
ROLAND	SBX80	SMPTE/MIDI synchroniser	40
TIMELINE	LYNX	2 synchroniser modules with 2 interface cables	120
UREI	964	Digital metronome	20

AMPLIFIERS

AMPEG	B15N	Portaflex bass combo tube amp	25
BRYSTON	4B-PBX	250 watts/channel stereo amplifier	50
HAFLER	P500	255 watts/channel stereo amplifier	35

EQUALISERS, EXCITERS, ETC.

APHEX	TYPE III	Model 250 aural exciter	30
APHEX	TYPE C	2 channel aural exciter	20
APHEX	TYPE B	2 channel aural exciter	20
API	550B	4 band parametric module	25
API	560B	10 band graphic module	20
BARCUS BERRY	822	Psychoacoustic enhancer	30
BARCUS BERRY	802	Psychoacoustic enhancer	20
DBX	120X-DS	Digital subharmonic synthesiser/"boom box"	20
FOCUSRITE	SIDECAR	12 x 8 console with SSL logic interface	550
FOCUSRITE	ISA115	2 channel "Neve" eq	100
KLARK TEKNIK	DN360	30 band stereo graphic eq	40
KLARK TEKNIK	DN60	Third octave spectrum analyser with microphone	75
KLEIN & HUMMEL	UE100	1 channel universal tube eq	50
LANG	PEQ1	Full range program tube eq	30
LANG	PEQ2	Full range solid state eq	30
MASSENBURG	8200	5 band stereo parametric	50
NEVE	PRISM EQ	4 band parametric eq module	20
NEVE	PRISM RACK	Rack for ten PRISM units	25
NEVE	1081	4 band equaliser/mic preamp module	25
NEVE	1079	3 band equaliser/mic preamp module	20
NEVE	1064	3 band equaliser/mic preamp module	20
PULTEC	EQP1/1A/1S/1R/1A3/1A3S/EQH2	Full range program tube equaliser—All units are one channel	30
PULTEC	EQP1A3SS	Full range program solid state equaliser—one channel	30
PULTEC	MEQ5	Mid range program tube eq	25
PULTEC	HLF3C	High/low pass filter	20
ROLAND	E660	Digital parametric eq/MIDI/digital in & out	60
TRIDENT	A-RANGE	Pair 4 band equaliser/mic preamp modules	50
TUBETECH	PE1B	Full range program tube eq	35
TUBETECH	PE1A	Full range program tube eq	35

DIGITAL DELAYS, REVERBS, EFFECTS, ETC.

AUDIO & DESIGN	PANSCAN	Stereo auto panner	35
ALESIS	QUADRAVERB	Digital reverb/fx/MIDI	20
AMS	SDMX	6.4 second stereo sampler/delay/MIDI	200
AMS	RMX16	Digital reverb	150
EMT	250	The first digital reverb!	200
EVENTIDE	H3000BS	Ultra harmoniser/broadcast version/sound fx/MIDI	75
EVENTIDE	H3000S	Ultra harmoniser/multi fx/MIDI	65
EVENTIDE	H910	Harmoniser	35
EVENTIDE	H949	Super harmoniser	50
FORAT	F16	16 bit multi-channel sampler/variable sample rate/100 micro second triggering/MIDI	175
LEXICON	480L	Digital fx/MIDI	175
LEXICON	480LSME	20 second sampling memory expansion for 480L	25
LEXICON	224XL	Digital reverb/LARC	150
LEXICON	200	Multi-program stereo digital reverb	100
LEXICON	PCM70	Digital fx/MIDI	40
LEXICON	PCM42	Digital delay with meo	35
LEXICON	PRIMETIME II	Model 95 stereo delay	55
LEXICON	LXP1/MRC	Digital reverb/fx/MIDI	30
MARSHALL	5402	Time modulator	50
MXR	126	Flanger/doubler	20
MXR	AUTO FLANGER	Two flanger modules	25
MXR	AUTO PHASER	Two phaser modules	25
PUBLISON	IM90	21 second stereo multi-sampler/fx/MIDI/SMPTE	175
QUANTEC	QRS	Room simulator reverb	150
ROLAND	R880	Digital reverb/fx/MIDI/digital in & out	150
ROLAND	SDD320	Dimension 'D' vocal phaser/chorus unit	35
ROLAND	SBF325	Stereo flanger	30
ROLAND	SRV2000	Digital reverb	30
ROLAND	DEP5	Digital reverb/multi fx	35
ROLAND	SDE3000	Programmable digital delay with sampling/trigger mod	40
SONGBIRD	FS1	Cyclosonic stereo panner	40
SONY	MUR201	Digital reverb/MIDI	40
STUDIO TECH	AN-2	Stereo simulator	35
TCELECTRONICS	2290	Digital sampling delay/64 seconds/all updates/MIDI	100
TC ELECTRONICS	1210	Spatial expander	30
YAMAHA	SPX1000	Digital multi fx/MIDI	35
YAMAHA	SPX90II	Digital multi fx/MIDI	30
YAMAHA	REV5	Digital reverb/effects/MIDI	45
YAMAHA	REV7	Digital reverb/effects/MIDI	35

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APHEX	COMPELLOR	Stereo compressor	50
APHEX	612	Stereo gate/expander	50
AUDIO & DESIGN	F769XR	Vocal stresser/compex limiter	35
OBX	160/161	Compressor/limiter—one channel	20
OBX	165A	Over easy compressor/limiter—one channel	25
OBX	902	Single channel de-esser module with rack	20
ORAWMER	DS201	Dual noise gate	30
ORAWMER	1960	2 channel tube compressor	40
ORAWMER	M500	Programmable dynamic processor/MIDI	45
FAIRCHILD	660	One channel tube compressor/limiter	60
FAIRCHILD	670	Stereo tube compressor/limiter	100
FOCUSRITE	ISA130	'Neve' dynamics module	60
MASSENBURG	DYNAMICS	Available soon	TBA
NEVE	PRISM DYNAMICS	Compressor/limiter/gate/expander module	20
NEVE	PRISM RACK	Rack for ten PRISM modules	25
NEVE	33609	Two channel compressor/limiter	50
NEVE	32264A	Pair of compressor/limiters	50
NEVE	2254E	Pair of compressor/limiters	50
PUBLISON	FULLMOST	Relief enlarger/de-esser	50
SUMMIT	TLA100A	One channel tube compressor	35
TELETRONIX	LA2A	One channel tube limiter	30
TUBETECH	CL1A	One channel tube compressor	35
UREI	LA4	One channel limiter	20
UREI	LA3A	One channel limiter	20
UREI	1176LN	One channel limiting amp	20

MICROPHONE PREAMPS

API	512B	One channel preamp	20
FOCUSRITE	SIDECAR	12 x 8 console with SSL logic interface/phantom	550
FOCUSRITE	ISA115	2 channel 'Neve' equaliser/mic-line preamp	100
MASSENBURG	8300/4	4 channel mic preamp	50
MASSENBURG	8300/2	2 channel mic preamp	35
NEUMANN	N48i-2	2 channel 48 Volt phantom PSU	10
NEVE	PRISM	Oynamics/mic-line input module/48 Volt phantom	20
NEVE	PRISM RACK	Rack for ten PRISM units	25
NEVE	1081	4 band eq/mic pre module	25
NEVE	1079	3 band eq/mic pre module	20
NEVE	1064	3 band eq/mic pre module	20
TRIDENT	A-RANGE	4 band eq/mic pre module	25

MICROPHONES

AKG	C12	Nine pattern tube	100
AKG	C12A	Nuvistor "C414" condenser	40
AKG	C24	Variable pattern stereo tube	100
AKG	C28A	Tube "C451" condenser	30
AKG	C28C	Nuvistor "C451" condenser	30
AKG	C414B-TL	Transformerless variable pattern condenser	30
AKG	THE TUBE	New generation tube	50
BRUEL & KJAER	4007	Omni condenser	25
BRUEL & KJAER	4011	Cardioid condenser	30
CALREC	SOUNDFIELD	Stereo Ambisonic surround sound mic	125
NEUMANN	KM54	Tube condenser	30
NEUMANN	KM86i	Five pattern condenser	20
NEUMANN	M249B	Variable pattern tube	75
NEUMANN	SM2	Stereo tube	100
NEUMANN	TLM170i	Transformerless five pattern condenser	30
NEUMANN	U47	Omni/cardioid/VF-14 tube	100
NEUMANN	U48	Omni/cardioid/fig.8/VF-14	100
NEUMANN	U67	Variable pattern tube	75
NEUMANN	U87Ai	Three pattern condenser	30
NEUMANN	U87 TUBE	Fred Cameron's conversion of a U87Ai	85
RCA	77D/77DX	Ribbon microphone	35
SANKEN	CU41	Bi-directional double condenser	40
SENNHEISER	MD421	Cardioid dynamic	15
SENNHEISER	MKH40 P48	High frequency cardioid condenser	25
SHURE	BETA 58	Unidirectional dynamic	10
SONY	C38B	Condenser	25
TELEFUNKEN	ELAM 251	Variable pattern tube	100

DRUM MACHINES, SEQUENCERS, ETC.

AKAI-LINN	MPC60	Drums/sampler/sequencer/MIDI	100
ALESIS	HR16	16 bit HSR drum machine/MIDI	30
ALESIS	HR16B	16 bit HSR drum machine/MIDI (New sounds-can be linked up with HR16)	35
ATARI	1040ST	Computer/monitor/mouse/MIDI	65
C—LAB	CREATOR	64 track MIDI sequencer software for ATARI 1040ST with UNITOR C SMPTE/EBU synchroniser/MIDI expander	30
ROLAND	R8	"Human" rhythm composer/MIDI	40
ROLAND	TR808 MIDI	Rhythm composer with MIDI	35
WENOELL	JUNIOR	16 bit digital drum trigger/MIDI (Extra sound cartridges available)	40
YAMAHA	RX11	Digital drum machine/MIDI	35

KEYBOARDS, SYNTHESIZERS, SAMPLING/SOUND MODULES, MIDI PATCHBAYS ETC.

360 SYSTEMS	PRO MIDIBASS	Sampled bass guitar sound module/MIDI	35
AKAI	ME30PII	8 way MIDI routing/merging	25
AKAI	S1000	16 bit stereo sampler/2mB expansion/library/MIDI	100
EMU SYSTEMS	EMAX	SE sampling rack unit with hard disk/library/MIDI	75
EMU SYSTEMS	EIII	16 bit sampling keyboard/workstation/MIDI	275
EMU SYSTEMS	PROTEUS	16 bit multi-timbral sound module/MIDI	50
FORAT	F16	16 bit multi-channel sampler/variable sample rate/100 micro second triggering/MIDI	175
KORG	M1	Digital MIDI workstation keyboard	75
KORG	M1R	Digital MIDI workstation module	75
KORG	NEW SG1D	88 key weighted keyboard/digital sampled piano/MIDI	75
KURZWELL	K1000SE	24 voice synthesizer keyboard/MIDI	75
MOOG	MIDIMOOG	Studio Electronics MIDI conversion of a MINIMOOG	50
OBERHEIM	DPX-1	Digital sample player/8 outputs/MIDI/plays disks from S900/MIRAGE/EII/PROPHET 2000/compatible with OPTICAL MEDIA PROCD	65
OPTICAL MEDIA	PROCD	CD ROM player with remote/compatible with EII, EMAX, and OBERHEIM DPX-1	50
OPTICAL MEDIA	CD2	CD ROM sound CD Vol. 2	25
OPTICAL MEDIA	CD3	CD ROM sound CD Vol. 3	25
ROLAND	A80	88 key master MIDI weighted keyboard	75
ROLAND	D50	Linear synthesizer/MIDI	65
ROLAND	D550	Linear synthesizer module/MIDI	65
ROLAND	PG1000	Programmer for D50/D550/MIDI	15
ROLAND	MPU101	4 voice CV to MIDI converter	20
YAMAHA	DX7IID+	16 voice FM synthesizer with disc drive/MIDI	75

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parts often needed to do the job. A properly designed, long and narrow, 800-seat auditorium or sanctuary may use two short-throw CD horns, two long-throw radial horns, four compression drivers and a pair of low-frequency boxes with woofers. Total weight might be close to 800 or 1,000 pounds with rigging hardware.

Outdoor venues fare better in that there is usually room to stack up or hang the number of enclosures needed to do the job. Frequency response and coverage are still important; however, pattern "reach" is the critical factor—how well the system can spread the sound smoothly over a wide area at what distance. For indoor venues, it is ideal to accomplish this and still control the pattern well enough to keep the sound off the walls, limiting ambient excitation (room reverb) and rear-wall slapback.

In all applications, the old technique of heaping mix-and-match horns and cabinets to make up 4- or 5-way systems has given way to the Unified Box Theory of Sound Reinforcement (or UBT—can I coin that?). This ever-growing trend is rapidly replacing the traditional contractor-inspired Naked Component Amalgam (NCA) by greatly simplifying packaging and minimizing the "black magic" or "voodoo" variables. Effectively, full-range enclosures of uniform or complementary pattern and directivity are oriented side by side, allowing the low-frequency sections to couple additively (1 + 1 = 3) and the mid- and high-frequency sections to blend smoothly, coverage pattern edge to pattern edge, with controlled, uniform overlap.

NEW TECHNOLOGIES

Innovations that fit into today's design framework come from many corners. New technologies being developed by component manufacturers scale down the size and weight of raw drivers. End users, of necessity, have wood-shopped smaller, more compact enclosures to fit truck-pack dimensions and on-site labor limitations. The entire industry's trend toward smaller, 2-

way, constant-directivity, trapezoid enclosures, with or without electronic optimization for performance and component protection, is revolutionizing the small- and medium-system installation business. The boxes offer a small, affordable packaging concept that mimics the advantages of UBT (Unified Box Theory) concert systems, made popular by the pattern-steerable Showco Prism, EAW's coaxially mounted KF-850, Meyer's MSL-3 and a host of others.

These new, smaller versions of advanced coherent systems, such as Apogee's much-touted AE-5, Community's "coherent wavefront" RS-880, EAW's KF Series, Renkus-Heinz's Smart System models and the original Meyer UPA/UPM Ultra series, allow higher output and more "sound-per-pound" than ever before for their size and class of components.

In components themselves, at least four American manufacturers are currently building and shipping mic or driver transducers using rare earth neodymium, a supermagnetic alloy material replacing Alnico and ceramic magnets. JBL, with its 2450J compression driver, was the first to design and ship a large-format, 4-inch diaphragm, 2-inch throat motor using neodymium. The 2450J has better performance, smaller size and one-third the weight of the larger 2445! Watch for this singular breakthrough device to start replacing other high-power compression drivers in an effective effort to reduce weight and packaging size in portable and compact applications.

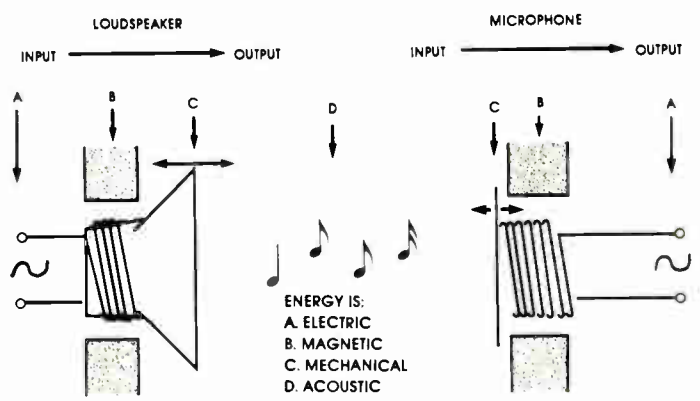
For mounting drivers on horns, the original two-into-one throat adapters are coming back with a vengeance. New designs allow coupling of two or four drivers in perfect low-distortion alignment onto one horn, reducing size and greatly minimizing system horn area for achieving a much higher SPL per horn. Load weight-sensitive facilities such as air-dome stadiums or rooms with height or size limitations can now install clusters in applications where it was previously impossible. Imagine a pair of neodymium drivers coupled on a tailored-pattern horn such as the patented Defined Coverage unit in JBL's 4660 enclosure. This device is capable of projecting a rectangular pattern from an oblique angle,

—CONTINUED ON PAGE 135

JOHN WORAM'S BASICS

MOVING-COIL DRIVER ASSEMBLY IN DYNAMIC LOUDSPEAKERS

The dynamic moving-coil driver consists of a voice coil affixed to a diaphragm (see Fig.1). The voice coil is suspended in a permanent magnetic field; when an audio signal is applied to the voice coil the interaction between the alternating electric and permanent magnetic fields forces the diaphragm to move back and forth. The term "diaphragm" is confined to the dome-shaped membrane, although the speaker cone—if any—is sometimes described as part of the diaphragm system. ■



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by Craig Anderton

COMPUTERS FOR MUSIC

PERCEPTIONS AND PROGRESS

Computers. You can't live without them, and you can't live without them. Yes, computers have become thoroughly enmeshed in the world of music, and at this point there's no turning back. Now seems like a good time to take stock of the current computer scene and make some predictions about where all this is going.

First a pop quiz: Which computer is most popular for musical applications? Many people would say Macintosh, but according to several surveys, including an extensive reader survey conducted recently by *Electronic Musician* magazine, they would be wrong. The IBM PC and its many clones are now the computer of choice for many musical applications. And Yamaha's decision to support the format with the C-1 PC/MIDI-compatible laptop, introduced a year ago, adds to the PC's newfound musical status.

Why this change in perception? First of all, the Macintosh got a head start in the music world. Software developers and end users alike became instantly enamored of the graphic interface, and Apple's David stance against the Goliath of IBM certainly helped endear the Mac to the generally nonconformist artist's community. As a result, a lot of respected high-end developers committed to the Mac soon after it appeared; early players such as Blank Software and Opcode still develop primarily for the Mac.

Then Voyetra changed all that by providing a professional-level sequencer platform, *Sequencer Plus*, for the PC. More and more music software started to appear, as did a new type of musical computer user: the semipro. It seems that a lot of lawyers, accountants, doctors and other "core" PC users are the types of people who maybe played guitar at one point, or had a band in college. When they heard about MIDI and the joys of computerized music-making, it was just a matter of time before they started hooking up interfaces to their PCs and buying a synthesizer or two.

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Music Printer Plus 3.0 **from Temporal Acuity in Bellevue, Wash., is one of a growing number of applications available in an expanding IBM PC music environment.**

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The Neville Brothers (clockwise from front left): Cyril, Charles, Aaron and Art.

PHOTO: CHRISTINE ALICINO

The Nevilles' latest album, *Yellow Moon*, may not ultimately be the one that radio embraces, either, but at least this time out the band has made a record that shows the world what the Nevilles do best. Though it covers an incredible stylistic range, it sounds more cohesive than any previous Nevilles studio album. New Orleans funk like "Wild Injuns" sits comfortably on the same disc as an a cappella version of Dylan's "With God on Our Side." "Sister Rosa," a rap tune that commemorates freedom rider Rosa Parks' refusal to sit in the back of the bus, is musically light years away from the eerie, sax-driven "Healing Chant" near the end of the record, yet both are unmistakably infused with the same sort of spirit. There is a deep social consciousness running throughout *Yellow Moon*; clearly, these are songs that are important to the band, radio be damned.

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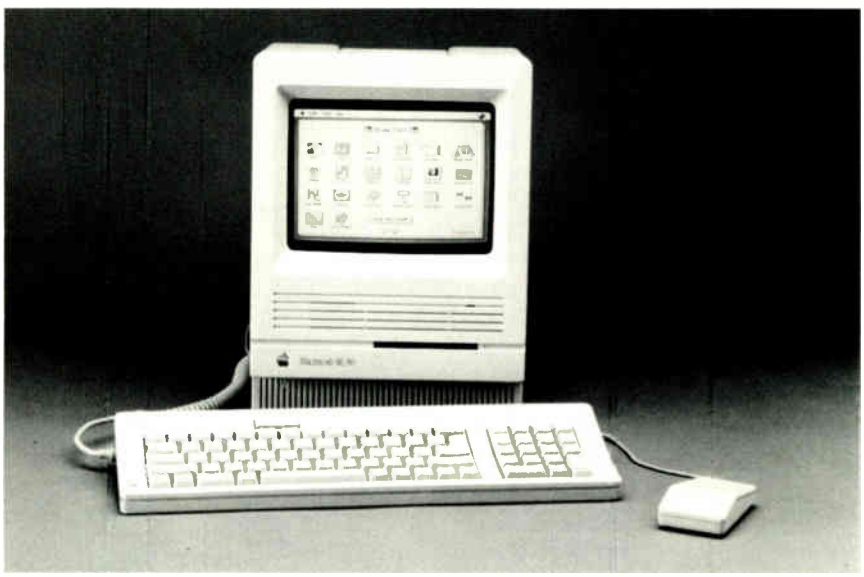
dle business found it easy to move into using PCs for music. And there's also the question of sheer numbers: I've read that there are an estimated 23 million PCs and clones out in the world. So even though a greater percentage of Macintosh users may be into music, the huge number of PCs guarantees a certain base of music-oriented users.

What about Atari? For a long time Atari was the Rodney Dangerfield of the computer business, largely because of the name—pros connected "Atari" with video games. Recently, though, Atari has made some very shrewd moves that could shake up the industry. The new Mega Series of computers keeps everything that was good about the earlier 520 and 1040ST models, corrects virtually all the problems, and if that isn't enough, adds a bunch of enhancements such as extra memory. For the *coup de grace*, while Apple was raising prices to the point where people started to scream, Atari was dropping prices, continuing to make good on its promise of "power without the price."

Atari has always had a virtual monopoly on the musician's market over in Europe, and seems serious about carving out a chunk of the U.S. market as well. There is so much excellent software currently available for the Atari that I took the plunge recently and bought a Mega 4. It's extremely fast and works like a charm; and with four megs of RAM, you can do all sorts of tricks (like pseudo-multitasking) to make the thing fly.

Regarding the Mac, it's pretty obvious that a 1MB Mac Plus just doesn't cut it anymore. Even the appeal of the SE is starting to fade in light of the new SE/30, a 68030-based machine that really pours on the horsepower. It's expensive, but it delivers a tremendous amount of power in the same tiny "footprint" as the Plus. I predict that a lot of musicians who felt boxed in by the Plus, but weren't ready to commit to the more cumbersome Mac II, will make the SE/30 their upgrade of choice.



The SE/30 appears to be the upgrade of choice for those musicians in the Macintosh camp.

Meanwhile, the folks at Commodore seem to have finally stopped shooting themselves in the foot, electing instead to get off some rounds at the competition. The Amiga 2000 and 2500 are aimed squarely at the same market as the high-end Macs but cost substantially less. While music software is still not as plentiful as it is for other machines, there are now enough titles to accomplish what you need to accomplish—sequencing, voice editing, algorithmic composition and so on. The lower-end Amiga 500 has done very well, creating a large market for game, graphic/animation and music programs.

The Amiga is still very much "the artist's computer." Those who are interested solely in music will probably find that other computers address their needs in a more thorough fashion, but if you want to storyboard

videos, combine music and graphics when pitching an ad campaign or, for that matter, integrate graphics and music in any type of application, the Amiga goes to the head of the class. Throw in true multitasking and some excellent public domain software, and it's no wonder that the Amiga, instead of fading away as many predicted, has finally started to receive the recognition it deserves.

As to what's on the horizon, it is clear that faster processors, math coprocessors and more memory are becoming necessities, not luxuries. Many newer programs are memory hogs, requiring faster processors in order to speed up their routines. So if you're going to upgrade, upgrade to something ridiculously powerful if you can afford it. Software developers tend to create software on higher-end computers, and they don't seem to concern themselves with those users who have to muddle through with a 68000 and one meg of RAM. Only a few years ago, the Mac Plus was the high end of the Macintosh line; now it's at the bottom of the heap. Most new Atari software won't even fit in a 520ST, and the Amiga 1000's once-substantial 256K of onboard RAM now seems pitifully small.

It is interesting that we've had the same major computer players for several years now: Apple, Atari, Commodore and IBM. Although all these companies have been rumored to be on the ropes at one time or another, they've all pulled through and taken their share of their market. Concurrently, differences between the various brands of computers are blurring; methods of exchanging files between the different machines are now commonplace, PC programs often come dressed in a "Mac-like" interface, and Mac users are learning about the virtues of ditching the mouse in favor of keyboard equivalents.

Now computer owners are starting to face the same problem as synthesizer players: What do you do with last year's model when you want to upgrade? Although computers can provide a lot of answers to a lot of problems, they haven't yet figured out an answer to that question. ■

Craig Anderton practices what he preaches. His latest CD, Forward Motion *(Sona Gaia #ND-62757, distributed by MCA), is being released this month.*

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ing it cohesive by capturing the spiritual energy that went into the music."

As Charles explains, recording *Yellow Moon* with Lanois was considerably different than the last Nevilles LP, which involved several studios and different producers: "One way Daniel makes a project unique and special is he likes to have a recording environment created solely for that project. So that's what we did here in New Orleans. We found this old, five-story building near our neighborhood [the other brothers and various family members still live in close proximity of each other] and just took it over for a while. I lived on the first floor, Daniel lived on the fifth floor and some of the engineers lived on two other floors. Daniel set up the recording studio on the second floor, and that worked out beautifully. It was set up so we could play live and not have to use headsets if we didn't want to; we had monitors, too. The control room was across the hall from the recording area, and in the back there was a wonderful kitchen and dining room where everyone would eat together. We had some great cajun meals there.

"Before we started recording," he continues, "we just played in there—jamming really—so Daniel could experiment with the placement of mics and baffles and generally get a feeling for the songs. It was very informal; it was like the atmosphere in somebody's living room when you go over to their house to jam. The main purpose, of course, was to make us comfortable so we didn't feel that pressure you feel when you have to get so much done in this amount of time at a regular recording studio. This was more like us just playing our music. We did almost all of it live right there, and it wasn't like the usual, 'Okay, today the drummer and the bass player are in. Tomorrow you come in for a vocal track.' Everyone was there all the time, so everyone's energy went into every part of the record."

A major reason Lanois' experiment worked so well is that he had the foresight to tap into the Nevilles' acute sense of both roots and family—after all, the core of the band is four supremely gifted brothers, all over the age of 40. These guys have been through the musical wars together and remained incredibly close despite their career ups and downs. Lanois understood that letting the Nevilles be the Nevilles is what it's all about.

"He really became a part of the band," Charles says with obvious admiration. "He'd be in there with the musicians moving around, or playing guitar or percussion, and he'd be like a sorcerer, pulling the energy out of the other players—sometimes just with how he'd move—and putting in his own energy at the same time. He helped us make a record I'm really proud of, and that sounds like *us*, man."

Believe it. *Yellow Moon* is the kind of timeless record that gets under your skin and stays there. From the desperation and foreboding in every note of "The Ballad of Hollis Brown" to the absolutely chilling version of "Will the Circle Be Unbroken," this is music from the soul and for the spirit. —*Blair Jackson*

DAVE STEWART: FROM "ROOFTOPS" TO THE CHAPEL

"I've always been the kind of person who likes to do a lot of different things, whether it's producing Eurythmics or other acts, or playing live on stage. And recently, I've been getting more and more into film projects," states Dave Stewart.

The producer is explaining his perhaps unlikely involvement with *Rooftops*, the musical from legendary director Robert Wise, whose credits include such classics as *West Side Story* and *The Sound of Music*. While not a commercial success during its brief run in theaters last spring, *Rooftops* won critical acclaim, and it is precisely this sort of film that fares well on cable and in the rental market.

"The story line centers around a bunch of 'throwaway,' homeless kids who retreat from the mean streets of New York's Lower East Side to the rooftops of various abandoned buildings," Stewart explains. "Up there, they create their own unique living spaces high above the city's squalor, and while it's not a musical in the traditional sense, the film incorporates a lot of musical sequences as well as dance scenes into the plot."

PHOTO: CLAYTON CALL

Dave Stewart with Annie Lennox during a Eurythmics show.

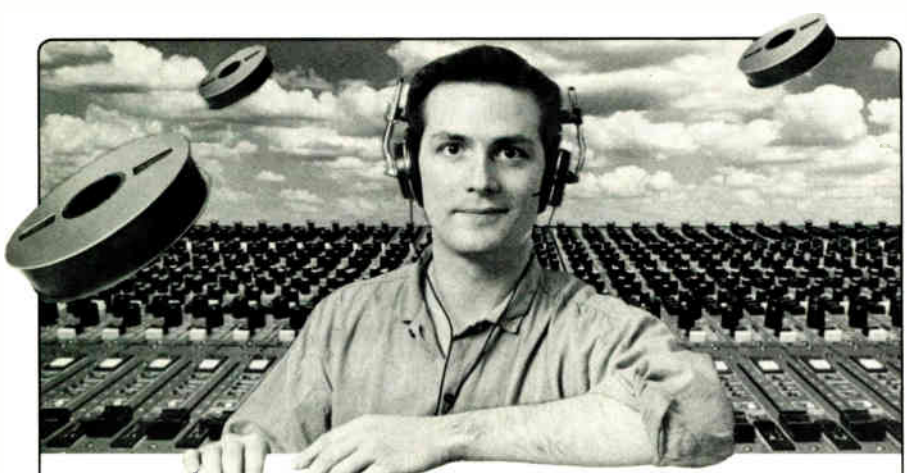
But while *West Side Story* featured the lushly romantic music of Leonard Bernstein, *Rooftops*, in keeping with its harsher, late '80s sensibility, uses a street-wise, pulsating soundtrack produced by Stewart.

The ten-song soundtrack features an all-star lineup including Eurythmics (Stewart's "group"), Grace Jones, Jeffrey Osborne, Trouble Funk and London Beat, in addition to a scorching duet between Stewart and Etta James called "Avenue D."

"It was my first time putting a whole soundtrack together, and I specifically chose artists and songs that would match the visuals," reports Stewart, who also scored the film with Pink Floyd producer/arranger Michael Kamen. "Usually, soundtrack albums sound like they've mixed together any old bunch of songs, whether they fit the film or not."

Stewart started off by spending time at the various New York locations where he met the director and cast and began sketching ideas for the score and soundtrack.

"It was pretty scary," he recalls.



"We were down on Avenue D and all around the Lower East Side, and it's a rough area. I remember watching one scene on the roofs where the star, Jason Gedrick, has a fight with these crack dealers. Then I looked down on the street and saw the real thing happening!"

With enough practical experience to "last me a lifetime," Stewart then set about writing material and choosing artists for the soundtrack. "I was pretty much responsible for everything, as I co-wrote and played on nearly all the tracks," he reports. "And then we did a lot of the recording at either my home studio in L.A., called The Chapel, which is where the Traveling Wilburys made their album, or at Eurythmics' studio in London."

Stewart may casually refer to The Chapel as "the little studio at the bottom of my garden," but the reality is a highly sophisticated operation run by two resident engineers, Robin Laine and Lee Manning. "We've got an SSL G Series console 56-channel with Total Recall™ and a stack of other equipment, including Otari MTR-90 tape machines, Tannoy SRM15X speakers and a set of Electro-Voice Sentry 100s," Stewart states.

The studio is outfitted with a wide selection of mics, including Neumann U87 and KM86 condensers, Shure SM57 and 58 dynamic mics, some Beyer M201Ns and a pair of Realistic PZM pressure zone mics.

Outboard gear includes a Lexicon digital effects processor, a Yamaha REV7 reverb and a Korg DRV-2000, an AMS stereo digital delay, a Klark-Teknik DN780 reverb, and a wide range of compressors, limiters and equalizers.

"I actually started off by cutting a lot of the backing tracks in a garage studio across the road from me," Stewart states. "It belongs to this guy Richard Feldman, and the great thing is that he has the original console that Frank Sinatra recorded 'My Way' on. So I often just go over there to experiment with sounds and try out ideas first, and then build up the tracks from that point.

"The first single, 'Avenue D,' was started there, and then we did the vocals at The Chapel, and I finally added some guitars in London when

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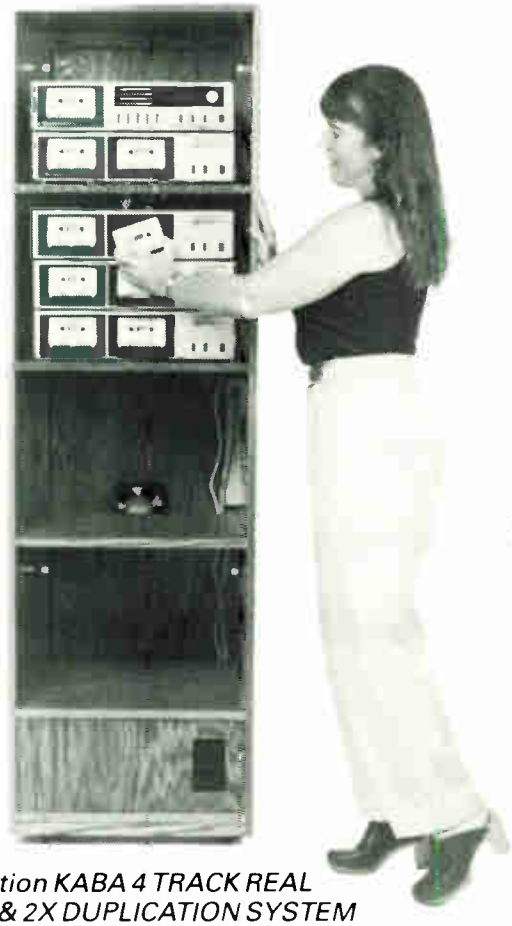

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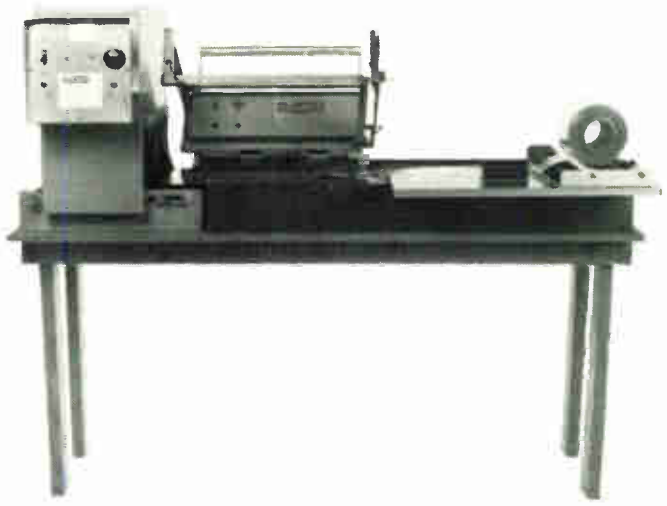

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we mixed," continues Stewart. "It was the same process with the title track, which is performed by Jeffrey Osborne. We put down the track in Richard's garage, and then started cutting Jeffrey's vocals in my studio using the Neumann mics, if I remember correctly."

Two other cuts, "Meltdown" by Joniece Jamieson and "Stretch" by Charlie Wilson, were also recorded at Stewart's home studio, the latter sounding particularly like a Dave Stewart song and production. "Charlie Wilson hung out at my house for quite a while, so I guess my sound kind of rubbed off on him," comments the producer, "although I didn't set out to produce a bunch of tracks that all sounded like me.

"On the other hand, when you're producing ten different artists, all with different sounds, there's the danger that it won't hang together, so I had to also be conscious of that," Stewart adds. "The other main problem was trying to coordinate everyone. Usually when you produce an album, you're working with one artist in one studio. But for this project, I was bouncing back and forth from L.A. to London all the time, which made it that much harder to keep an overall focus."

The London-produced tracks include "Freedom" by Eurythmics keyboardist Pat Seymour, "Drop" by the London Beat, "Loving Number One" by Kisses from the Kremlin, and "Revenge (Part 2)" by Eurythmics.

While producing the soundtrack, Stewart also worked on writing the score with Michael Kamen, who also did the music for *The Adventures of Baron Munchausen*. "He's an old mate, and he's done all the strings on Eurythmics tracks like 'Here Comes the Rain Again,' so it was fun to collaborate again," Stewart comments. "We ended up having to write 72 different cues and pieces of music, and we started off in London working on ideas together. Then we moved back to L.A. and recorded everything at my home studio."

Executive producing all the music were Taylor Hackford and Joel Sill, a team with a strong background in producing hit soundtracks. "Yeah, it was a bit intimidating to think that they've had all these #1 records, from *Flashdance* to *La Bamba*," laughs Stewart, "but basically they just gave me a free hand to get on with it. It was the same thing with Robert Wise. They'd give me their input, but then they'd trust my judgment.

"The whole thing was such a good experience that I'm already doing another film score," Stewart continues. "It's a small Dutch film called *Lilli Was Here*, directed by Ben Verbong, and it's a powerful drama about a Dutch girl who ends up robbing banks."

But Stewart's many Eurythmics fans needn't worry—he hasn't entirely forsaken the world of rock and roll for film. "I'm also just finishing off an album with this singer, Boris Grebenshikov, the first Russian artist to record a rock album outside Russia," he explains. "I went to play with him in Leningrad, which was quite a trip, and musically it's kind of like the Beatles and The Doors meet a Russian folk singer. The record should be out this summer."

As for Eurythmics themselves, Stewart and Annie Lennox have been working on the next record. "And then we'll be back on the road, which I'm really looking forward to," he says. "It's been awhile since we

played live. The main thing for me is to keep doing different projects, whether it's a film score or producing another artist or Eurythmics. I just don't want to get stuck in a rut."

—Iain Blair

ELLINGTON FANS HIT THE JACKPOT

The advent of the CD has seen the release of so much great music that's either never been heard before or long out-of-print, it's sometimes difficult to keep up with it all without spending half your life in record stores. Well, consider this a consumer alert: Saja Records, which is distributed by Atlantic, has released a ten-CD series of Duke Ellington music called *The Private Collection*, most of it previously unreleased.

Arguably the most prodigious composer this country has ever produced, Ellington wrote literally hundreds of pieces, from elaborate conceptual suites to simple big band rave-ups. He also loved the recording studio, and in the last two decades of his life, he made a point of re-recording nearly everything he'd ever written to take advantage of the advances in technology. Ellington's private collection of recordings, known by those around him as "the stockpile," sat untouched for years, but now the Saja series (under the guiding hands of Duke's son Mercer, as well as Mel Furhman, Stanley Dance and Herb Moelis) makes many of the finest of these performances available. In addition to crisp '50s and '60s recordings of many of Ellington's best-known compositions (lovingly produced for compact disc by Harry Hirsch), the collection also includes a bounty of tracks of the Ellington band live, captured on Army bases and the like. The bulk of the studio recordings (produced by Ellington himself) were made at Duke's professed favorite facility—Universal Recording in Chicago. It's safe to say that some of the old chestnuts like "C Jam Blues" and "Mood Indigo" have never sounded quite this vibrant before. Most of the recordings are stereo, but even the mono ones have a sheen to them that allows the immediacy of the performances to shine through.

Aside from the sonic quality of most of these recordings, the sheer volume of material is staggering—it's enough to keep an Ellington collector busy for years. Just to digest such rare gems as the nearly half-hour "Degas Suite," written for a film about the French painter, and Ellington's unreleased musical sketches for a ballet called *The River*, will take *many* listenings to *Volume Five*. And if some of the more complex pieces don't fit the mood, ease into the "Satin Doll" from *Volume One*. There's something for every kind of Ellington fan in this historic collection.

—Blair Jackson

DEON ESTUS: SECOND BANANA IN FIRST PLACE

President Bush has Dan Quayle. Johnny Carson has Ed McMahon. Captain Kangaroo had Mr. Greenjeans. It's not always the greatest job in the world, but someone has to do it. In the world of pop music, Deon Estus may go down in history as one of the most important "second bananas" in the whole bunch.

Since 1986, Estus has been seen

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and heard by millions mainly as the key support musician and "unofficial musical collaborator" for George Michael. Prior to that, he was the "unofficial third member" of Michael's and Andrew Ridgeley's group, Wham!

But with the release of his first solo LP, *Spell* (Mika-Polydor), and "Heaven Help Me," its Top 5 hit, Estus is likely to finally gain some recognition on his own.

"I've always had my own solo career," Estus says, "you just didn't know about it! From the beginning I've always known I had to have my own career. Now, fortunately, I'm really getting a chance to do something about it."

Though *Spell* has become a mainstay on CHR and urban contemporary radio formats, it has really been Estus' work with pop's current Number One hero, George Michael, that has given him access to millions of listeners.

With Michael and engineer Chris Porter, Estus helped put together the acclaimed *Faith* album, one of the most popular records of the decade. In addition to playing on the album, Estus also contributed to the arrangements and the record's overall sound.

As the *Faith* album ate up every chart in sight, including black music charts, Estus was able to get his own music out to millions of fans as he and his own band were given the opportunity to open each date on Michael's world stadium tour. Estus also played bass in Michael's band, being on stage for a total of three-and-one-half hours each night. "It was a lot of hard work, but I had a lot of fun," he says. "Hopefully, we'll be able to do that again.

"The *Faith* album and my album work mainly because of their simplicity," Estus says, adding that the experience of recording Michael's solo album taught him one thing: "less is more." The music on *Spell* avoids much of the production-oriented indulgence that is common on many of today's pop releases. Instead, the songs emphasize strong melodies built over solid, bass-driven grooves.

Much of Estus' album features the same personnel that worked on *Faith*, including engineer Porter. "I was doing my album basically at the same time as we were doing *Faith*," Estus notes. *Spell* was recorded at several studios, including Eel Pie, Maison Rouge, Sarm West in London and Puk Studios in Denmark. Puk, in particular, gets high marks from Estus: "It's incredible. You're away from everything there, and they've got all these little houses and live-in cooks to make you feel at home. A lot of people are going to be recording there. Elton John just finished his new one there."

PHOTO: CHRIS CUFFARO/VISAGES

Deon Estus: "The *Faith* album and my album work because of their simplicity."

Despite all the similarities between the making of both albums, Estus says, there is a lot in his album that sets it apart from *Faith*. "For one," he laughs, "the record has *six* different producers." Among them are Jellybean Benetiz (Madonna), David "Z" (Prince, Jody Watley) and, of course, George Michael.

Spell also employed more players and fewer machines. "All the drums on *Faith* were done with machines, with the exception of 'Kissing The Fool,' " Estus says. "I kind of missed not having real players, and I think it will be different the next time George does an album. I've been through all the things with machines, and I know everyone is doing stuff with Synclaviers, but I still think it's all going to get back to live musicians."

Born in Detroit, Estus grew up with formal training in opera. ("I have never left opera; I still sing it. I just branched out.") He discovered the bass—an instrument his mother played in college orchestras—and then kicked around the U.S. in a slew of R&B bands.

At the age of 18, Marvin Gaye invited him to Europe to join his band. "That was a fantastic experience," Estus says. "I was with Marvin when he was getting back on his feet, just around the time of 'Sexual Healing.' " Shortly after working with Gaye, Estus migrated to Dublin, Ireland, where he began a career as an in-demand studio hired gun.

In the early 1980s Estus began hanging out with producers Steve Lillywhite and Steve Brown. Brown, at the time, was just starting a new pop music project by a duo named Wham! He heard Estus play and suggested he meet with the band.

"When I first met George I knew he was going to be very successful," Estus says. "He had great ideas about music and was very interesting. We talked for about an hour and then I made my decision, and that was it. We've been together ever since."

Though Estus is starting to have his own hits, he says he has no intention of parting ways with Michael. "We give each other support constantly. George and I are so close. We really care about each other. There's no competition; we're not trying to outdo each other.

"In fact, we're writing material for each other's next albums right now," adds Estus, as he takes a long breath. "Along with promoting my album, I think it's going to be a very busy next few months." —*Bruce C. Pilato*

LIVE SOUND

—FROM PAGE 122

allowing customized, maximum performance from one horn in a fraction of the normal space and weight.

Many manufacturers worldwide are using fiberglass and plastic-enclosure construction techniques. Some are experimenting with composite enclosures (resin, balsa wood, cardboard, aluminum) in an attempt to lower the weight and improve the rigidity of cabinets. In the U.S., Community has built fiberglass cabinets with integral horns for more than a decade. Klipsch, known for quality consumer speakers and professional systems, has refined the lightweight, non-wood, modular concept into a workable, concert-scale product, the KP-600, creating a speaker cabinet system that you can alter in load to reflect the pattern and components desired.

It's only a matter of time before the cutting-edge techniques of lightweight enclosures, higher-power/longer-excursion raw components, neodymium motors, multidriver couplers and rack-mount electronic protection are combined to dramatically improve the next generation of loudspeakers—speakers that simplify the science of designing and installing high-criteria sound systems, without compromising the art of performance. ■

Mike Joseph is a San Francisco Bay Area-based audio marketing consultant, sound system designer and all-around rabble-rousing writer, hell-bent on tenderizing the future. Look out.

—FROM PAGE 54, THOUGHTS

all should be done this way." The reason these things are the way they are is due in large part to the economics of efficient electronics layout suggesting a certain fashion to form a module, and then a console, and ultimately a control room. And it evolved in a very Darwinian fashion, exhibiting a definite "survival of the fittest" of form and topology along the way.

As cumbersome and illogical as it is, the standard console scheme in use today, with in-line monitoring, is almost certainly a by-product of the "let's try and get it all on one circuit board and reduce the hand-wiring" design philosophy that drives modern-day console manufacturing. A good analogy to the way in which the recording control room has evolved would be to point to something like the New York City subway system: since there never was an overall design scheme or goal, things came together rather haphazardly.

The result is something that certainly works okay, but is it perfect? Certainly not. How much different would it have been if the first console designers had the benefit of prescience! On the other hand, there are those who would say this illogical development pattern is not necessarily a bad thing. Engineers are used to working a certain way, and frankly, the process of music creation itself is obviously not a linear process; it is not steeped in reason and logic.

But, back to the future. If you look at the development of a relatively modern musical instrument like a saxophone, you will find that although technological advances in terms of things like reeds and pads improved the instrument, they didn't necessarily make it that much easier to learn how to play well.

So, applying this line of thought to the development of the control systems—despite the fact that new technologies will undoubtedly improve the overall quality of consoles, I don't necessarily see them getting that much easier to use—a better console won't make a better engineer; it will just help a better engineer to do his or her job well.

From an ergonomic perspective, I do see sections of the console being moved around to improve ease of use in future designs. However, I'm still a bit unclear about a key issue: If every designer had the ability to put every control on the console exactly where

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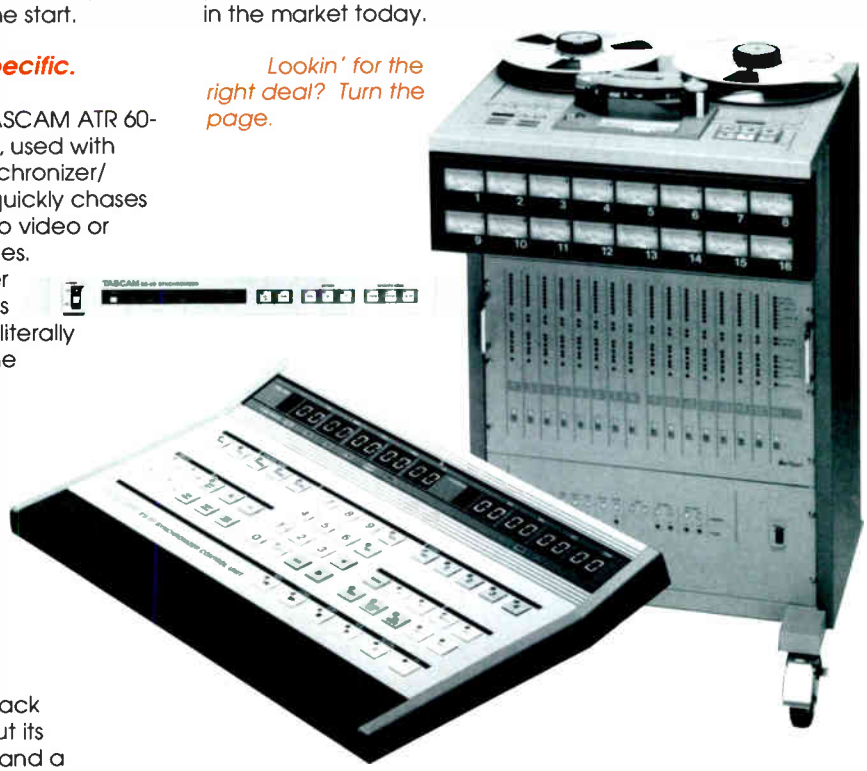

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they wanted for some healthy period of time, and we watched this evolve, where would those controls end up?

But if I were to hypothesize about the form and function of the all-digital console we may be working with 20 years from now, I think that we will certainly see a much smaller number of knobs incorporated into that design, even though this seems to be an anathema to many mixers. There are simply too many bloody controls on boards today. We don't really want a whole lot of knobs in front of us, because, ultimately, it's really inconvenient. Yes, I can get to everything, but not quickly; I can't read them accurately—I can't even see them all. But mostly, they're expensive and physically unalterable. And this alone will eventually eliminate them.

So why the urge to put thousands of knobs where they are? The answer could be that we've just gotten used to it; and that we as engineers have, in fact, made some of our own choices within a broader structure.

But as we move into the future of digital designs, different control styles are possible; some of these, we've already seen in musical instruments. For example, there are several other ways to control console functions like EQ. Many approaches involve assignable knobs, or soft controls and soft legends. There's the glass screen approach, which is now being used by WaveFrame, that exhibits all console controls on a tube, and controls are changed by means of mouse and keystroke. Certainly voice-driven interfaces have gained some foothold in other industries. And truly exotic interfaces might appear—I'm told the most sensitive sense is taste—to tantalize your imagination. Currently, the soft, assignable knob is probably the direction that we at GML would like to go.

GML is actively extending the automation system by designing automation ports and digital control of analog systems, utilizing our current automation kernel. For instance, to automate an equalizer already equipped with some control mechanism, we design a minimum physical interface to our computer and write a small custom device driver which interfaces that control to our standard facilities. But already that's a lot of technology we'll be throwing away in a few years. So we're trying to look at what can be done in the distant future, keeping in mind what is being done extremely well right now (assuming that many processing functions are best, or most economically, accomplished with analog elements). And we're trying to figure out a path, or paths, and a schedule of when and how to implement certain things. As I stated earlier, the answers to many questions will come not so much from in the pro audio industry, but developments in those ultra-high-budget industries where the new technologies are developed, ultimately to trickle down into our little enclave.

Generally, the big suspense in high-end pro audio might be the wait for improvements in technology in two areas: simple and elegant DSP processing power, and resolution in conversion. We're only vaguely aware of when or how fast these improvements will come. Few are betting all their marbles on an explosive change in console design in the immediate future (with the exception of more features being automated). Because of market resistance to change, a big jump in terms of processor power or conversion might better drive the market. Foreseeing the direction of that break, and making our systems more obsolescence-proof, is my day-to-day concern.

Several years ago, I brought automation manufacturers together for discussions on possible means of interchanging data. We know that most manufacturers don't trust each other, so we as product consumers are not going to get an industry standard, data-interchange format anytime soon. And that's counterproductive in the worst way. We at GML are highly committed to developing a standard format. Our system currently reads SSL and Necam, and will soon read Flying Faders data, and it seems proper that any system costing as much as most of these do should be able to handle data from other manufacturers' sources. This appears to be an essential step in the evolution of automation.

Most manufacturers veil their objections by saying they don't know exactly what should be interchanged, or how. Frankly, it seems to us that just the basic stuff would be a great place to start. Wouldn't it be wonderful if everyone's automation system could exchange data like track sheets and cue pages, or even just generate simple text recall data?

The result of this lack of enthusiasm for a universal data-exchange format is that, at the moment, only two companies—GML and Sound Work-

shop—have agreed to work together on what will be the first cooperative data-exchange effort among automation companies. Sound Workshop's market niche may not be the same as ours, but that's okay. They do use the P&G moving fader we helped design, and I find that somehow flattering. We hope this association between our two companies will have an effect on making data interchange more common. I'd certainly like to see it.

As far as the near-future picture for automation, we see video and film post-production as the market with the greatest potential for expansion. It's not only that those people have the money (although that always helps), but more important, they have the need. Generally speaking, film mixes require an enormous number of elements and a whole bunch of tracks. It's so complex that one, two or even the usual three pairs of hands can't always handle all tasks simultaneously—at least not if you want to keep the engineers' brains freed up for some relaxed concentration. Also, video and film mixers shouldn't really have to move their eyes away from the picture, and we've developed a technology that's responsive to that.

We're addressing this market in other ways. We introduced our extended cue page and machine control unit at the last NAB Show, and together they provide an efficient, cost-effective way of talking SMPTE to video and audio tape recorders. Again, these developments have evolved from our talks with engineers working in the field. This is our response.

The development coming from GML will be a high-resolution, front-end graphics package. In the short term, this will provide a "recall" picture of the console in great detail (with clear highlighting of mismatched elements) and allow the engineer to use a trackball controller to pan and zoom in on all the individual elements of the board. Although smooth operation in this detailed mode is not quite there, we expect the necessary performance in the near future. Again, we're waiting for affordable technology.

If the system can't serve to bring things closer to the engineer—putting it right in front, and letting him or her sit back and really listen during the mix—then it's simply not doing its job, and it is not allowing engineers to do their best. ■

by Philip De Lancie

OPTIC LINK

HIGH FIBER FOR THE WELL-CONNECTED

The use of light in audio has been around since the early days of motion picture sound. But while optical soundtracks have never been regarded as high-fidelity, advances in digital audio and the use of lasers have combined in the 1980s to thrust optics to the leading edge of audio technology. So far, most of the effort in this area has been focused on optical storage and retrieval media, like the CD in all its various forms. Optical transmission of sound data, though widely touted by telephone companies as the future of voice communication, has yet to inspire much activity by manufacturers of professional gear for the music or video/film industries. But Wadia Digital, a small company based in Hudson, Wis., has come up with a system that points the way toward 21st-century production facilities in which optical fiber is as commonplace as wire.

The Wadia products are based on the premise that conventional means of transmitting audio signals by wire are ill-suited for conveying high-fidelity program over any distance. Wadia proposes the digitization of sound as close as possible to its source, with fiber optic transmission used to move digital data from place to place. It's an idea that has applications in a variety of professional audio settings, from live recording and sound reinforcement to large, fixed production facilities. Masterfonics, the Nashville mastering and mixing operation headed by Glenn Meadows, has been sufficiently impressed with the concept to install a 100-foot fiber optic link between one of its mastering rooms and a transfer room. Wadia's Digilink 20 provides an AES/EBU (Audio Engineering Society/European Broadcast Union) input and output at each end, which may be converted by the facility's existing gear into other digital formats as needed. All mastering, mixing, editing, transfer and machine rooms are slated for inclusion in the fiber optic network, with signals to be routed via a fiber optic, cross-connect panel. In the following interview, Wadia Digital founder and CEO Don Moses outlines the value and the technique of incorporating fiber optics into professional audio operations.

Mix: How did you become interested in applying transmission technology to professional audio?

Don Moses: It began by looking for an area that is nearly 100 percent analog, which is moving toward being nearly 100 percent digital, where we could use our digital expertise. We were not interested in the telecommunications market, because it's a big

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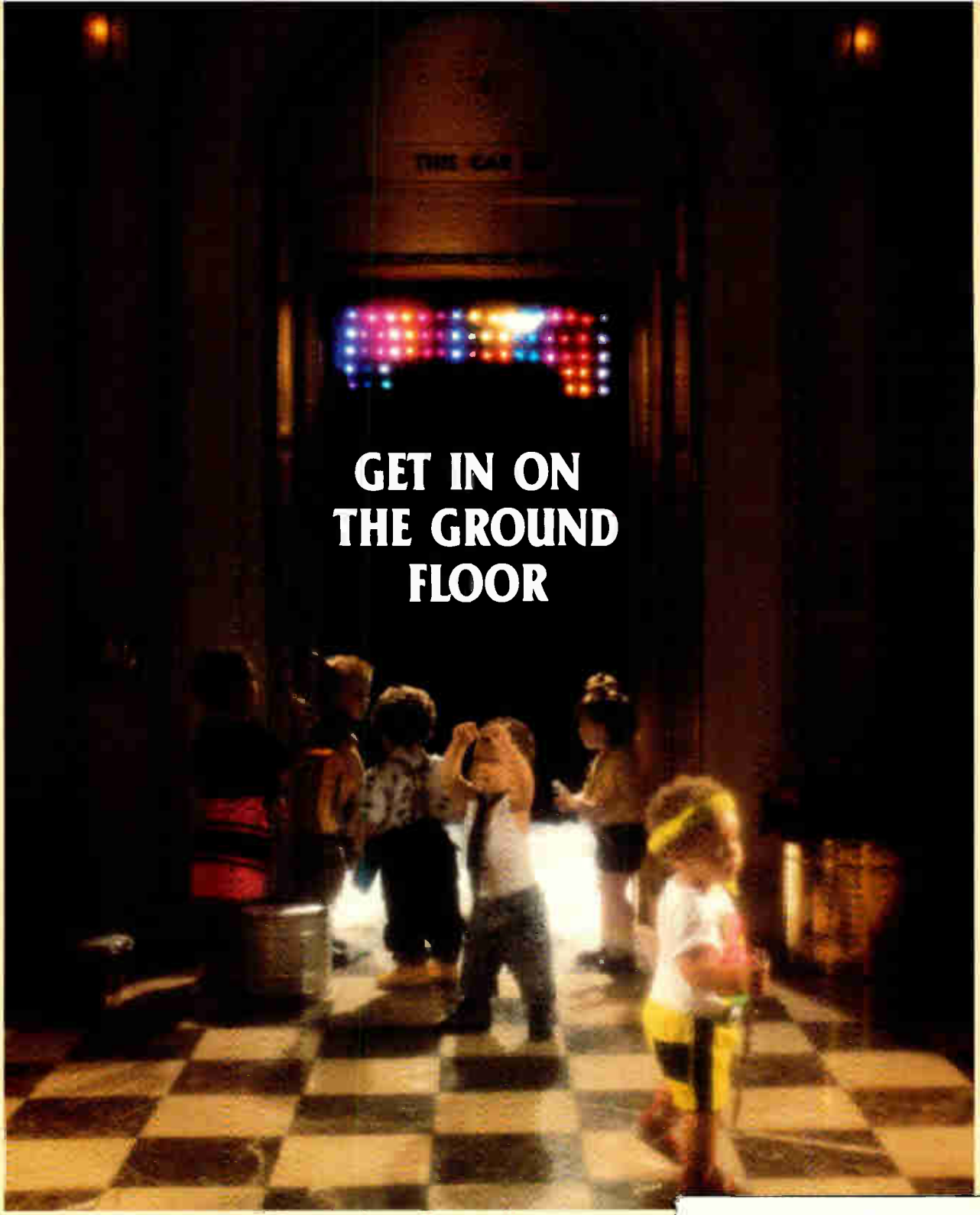

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bureaucracy and the people move so slowly. Audio and video appeared to be moving rapidly in the digital direction. My father, Wadia Moses, whose first love as a hobby for many years has been audiophile sound, pointed out that as audiophiles are pushed from their high-end turntables into the digital world, they are looking for digital systems made with a spirit of care and quality that is different from the mass manufacturing approach of the Japanese. People have spent six or eight thousand dollars for a turntable, tone arm and cartridge to get the most out of their records. Why not look at digital decoders and CD players in terms of what would be optimum, with money no object? We came up with a new digital decoding algorithm, new concepts on D/A conversion and a 72-mips (millions of instructions per second) computer, which we could fit in a little box.

Having developed this new digital audio decoder, we needed to keep the trash and the hash and the noise from the CD or DAT player out of the preamplifier system, and out of the computer. If you hook the components together with a coax cable, then you have tied your grounds together, and the grounds on CD players are very noisy because they've got servo systems and such in there. So we decided to go with a fiber optic link. Not the plastic, consumer kind, but a real glass, multimode, optical fiber link. You plug the digital output of your CD player into a little interface box. It reformats the signal into a transmission-hardy code, something that can be sent over to the computer for decoding into analog. That allows us to put a good distance between the components.

Mix: So the fiber optic link began as sort of an accessory for the company's audiophile digital decoder. Was it a telecommunications background among the principals of the company that gave you the foundation for moving in the fiber optic direction?

Moses: The founders of this company are transmission people. We come mostly from a background with 3M. I joined 3M in 1969 to help found a new division called Telcomm Products. I was there for 11 years, working on the development of "wired city" concepts. It was the dream back then to run optical fiber or coax cable into every home and business. The system we developed and installed for field trial use could take over a whole town and provide telephone, data and digitized video over broadband facilities. The concept was that the phone company was going to throw away all their paired cable and put in the new broadband facilities that could handle both voice and video. The phone company would be the common carrier of all these services, and away we would go into the future.

Toward the end of the '70s, interest rates started approaching 20 percent, and the phone companies could not afford to invest in all new cable because of the cost of money. At the same time, the public appetite for that kind of thing was growing more slowly than predicted. Cable television was supposed to have reached 80 percent penetration by 1980, and that never happened. So the whole idea of rewiring everything just wasn't marketable, because nobody could afford to deploy such a system.

The department at that time was about 30 people, of whom about six stayed together as a group. Those people stayed with me when we left 3M. After some work for Raytheon, which raised some money, we started Applied Spectrum Technologies. We developed "spread spectrum" technology, which means that you can overlay data and digitized information over the telephone lines, right over voice. So you can stay with paired-cable facilities but add other services. AST went public about a year ago, and we founders left to start this new company.

Mix: What inspired you to expand from the link you developed for audiophile use into offering a separate, professional, optical transmission system?

Moses: Once we saw that we had to incorporate a fiber optic link into our D/A converter, it started to make sense for us to include a variety of digital audio formats like SDIF (Sony Digital Interface), SPDIF (Sony/Philips Digital Interface), the JVC format and the AES/EBU format. [See Mel Lambert's "Juxtapositions" in the May 1989 *Mix* for an overview of these digital audio input/output formats.] So we built an interface device that can adjust to any of the standards. It's a gate array, programmed by a ROM, that tells it what format it is dealing with. It converts the incoming format into an optical transmission format and sends it

'absolutely brilliant . . .

Photo by Stanley Blanchard

Craig Dory and Brian Levine, of Dorian Recordings, in the Troy Savings Bank Music Hall, where many of their widely acclaimed recordings are made. Craig Dory uses the Wadia DigiLink fiber optic transmission system in place of long microphone runs for maximum sonic integrity.

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"I've just finished a day of sessions on Dorian's first recording using the **Wadia DigiLink fiber optic system** — the result must simply be experienced to be believed! The solidity, size, depth and sheer realism of the recording is, well scary. Transients and harmonic clarity are stunning! The addition of the fiber optic DigiLink in the recording chain, supplanting even the highest-quality mic/line cable, yields significant sonic benefits.

"As for the Wadia D/A Processor, I can't say enough. Beginning with an absolutely brilliant decoding algorithm, to the quality of construction, through to the bottom line, the unbelievable sound, it's just done right!

"Hearing my recordings for the first time through the Wadia was a revelation — I knew all the information (the space, the room, the low frequency clarity, etc.) was there all the time, fighting to make it through the myriad D/As I had tried. Listening to my recordings through the Wadia is like listening to the input of the recording chain." — *Craig Dory*

. . . enough fiber optic cable to span from Miami to Vancouver . . .

Whether your problem is distance, noise, or "wiring grid-lock," Wadia has a fiber optic system suited to your needs. The Wadia people are digital transmission specialists with multiple patents in such areas as complex *spread spectrum* and *direct sequence* communication codes. Wadia products utilize proprietary digital encoding techniques. Premium Wadia-brand fiber optic cable is designed and manufactured for the special demands of movie lot and studio applications. The systems engineering organization associated with Wadia has engineered and supervised the installation of over 3500 miles of fiber optic cable — enough to span from Miami to Vancouver, and beyond. This includes major routes for US Sprint & AT&T.

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down the optical fiber.

Mix: Was that developed in response to interest from Masterfonics or other potential professional users?

Moses: Masterfonics actually found out about us because of our D/A converter, which had a much better sound than any other they had used. They have a number of rooms there, plus they have some studios down the block. And they had the problem of interconnecting some of these rooms so they wouldn't be rolling their equipment back and forth all the time. They were interested in finding out if the fiber optic link in the D/A converter would be usable for going from room to room. We went down there and took a look at their situation and said that we could actually go for 3,000 feet, eliminating any problems they might have with coax cable.

Mix: Go over some of the problems they might have encountered in trying to move signals over long distances using conventional means.

Moses: Well, with analog there is a big problem because you have many octaves that you are trying to push down a cable, and the frequencies move at different speeds. The difference in speed between 100 Hz and 20 kHz is one-tenth the speed of light compared with eight-tenths. So you have a very serious problem when you push an audio snake too far.

The problem is possibly even worse with digital signals. The digital audio formats were not designed to go very far. They are like the parallel port on a

computer, where you can go to a nearby printer, but you can't really push it much further. That's because the signal has a wide frequency range, and each signal travels through the cable at a different velocity. When the low-frequency information that corrects for the DC offset travels at a different speed than the high-frequency transition information, you get dispersion.

Take, for example, a format like SDIF. That particular format is what they call "non-return to zero." It has a lot of DC information in it. The DC information is trying to track your DC offset, because you have pulses that can be mostly at ground or mostly at a positive voltage. Your DC level at any instant can be anywhere from way up at one rail to down at ground, so you really have to track your DC offset to decode it properly. If you were to draw the spectrum of this digital signal, you would find that you have the highest energy around DC and it drops off rapidly as you go up to higher frequencies, but your important transition energy is all the way up above 1 megahertz. So you are spanning a radical difference in frequencies, and, therefore, velocities and attenuation over distance. If you try to go long-distance and you look at it on a scope, you will find that your slew rates vary and your detection edge becomes a slope instead of a vertical line. So you get jitter in your clock signal, or in your signal versus your clock, and your sound is affected.

Mix: D/A conversion involves feeding batches of signal into a buffer for processing, and then reconstituting a

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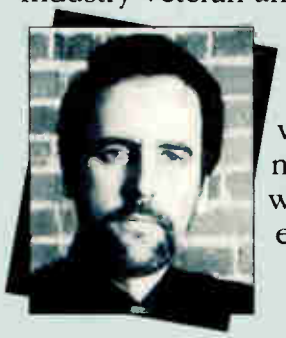

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continuous stream of sound. Does the jitter introduced in a long-distance run over coax compromise the ability of decoding systems to accurately replace in time the various components of a signal?

Moses: Yes. The buffer is clocked by a clock that is derived from the received information. That is where the problem is. When you introduce jitter, the signals are still being clocked through the rest of the system, but at an uneven speed. It's like wow and flutter, but it is operating in the range of the sampling frequency.

Mix: So the samples will not be converted back to analog at exactly the same rate at which they were originally taken.

Moses: That's right.

Mix: Do the same problems found with SDIF occur with the AES/EBU and SPDIF standards?

Moses: They each have their own problems. The problems with SDIF arise because they use too wide a bandwidth for any kind of transmission facility. The AES/EBU format is supposed to be more transmittable. It uses a bi-phase arrangement that takes out the DC information, so you have a narrower band of frequencies to worry about. But you have to worry more about them, because the clock information is embedded in the music data that is being transmitted. As the music goes through different patterns, your clock information changes. It doesn't if you are just going a few feet and all your rise and fall times stay very sharp and straight up and down. But as you go beyond 12 feet, you start to get a slope without clear, crisp transitions, and your instantaneous clocking rate can change quite drastically.

SPDIF is what you see on CD players and DAT machines. That is a very fragile code. It starts out at a very low voltage swing. It is unbalanced, so it is very susceptible to hum, interference and noise from light switches or air conditioning. It's really only meant to go between pieces of equipment in the same rack.

Mix: Give a step-by-step description of the path that a signal takes to get from point A to point B with your system, and the various components involved.

Moses: Let's look at Masterfonics as an example. They are kind of JVC-oriented, so some of their equipment

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would have the JVC DAS interface, which uses a 50-pin connector. That would go into our interface unit, where the first thing it would run into is a 1200-gate, programmable gate array. Right next to that sits a ROM chip, which in this case would say, "this is a JVC signal coming in," allowing the gate array to be matched to that format. Each format has a certain number of channels that have to be transmitted to the other end of the link. For instance, SDIF has three (left, right and word sync), while JVC has five. In our system, these channels are multiplexed together at the same time we scramble the data to break up the kinds of patterns that commonly occur in music. Those patterns, if left in the digital bit stream, could cause the clock to jitter to a certain pattern related to the audio information. Then we put the signal into a transmission format, such as those used in long-distance telephone traffic, which is a bi-phase format with forward error correction. Then it goes to a device that drives the laser transmitter, which in turn sends light down the glass, multimode, optical fiber.

Mix: Is the light being transmitted constantly, with changes in intensity used to convey the code, or is the light representing code by pulsing on and off?

Moses: It actually is pulsing on and off, but not with ones and zeros. The pulsing is at a steady rate, and the information is encoded so that it is carried in the phase of the pulsing. If you pulsed on and off at an unsteady rate, you would have the equivalent of a DC shift, with the average light intensity varying according to the information content. That is what you don't want to happen. You want the average light intensity to remain constant, with the information carried in the phase of that constant energy. That's the key with optical transmission.

Mix: What do you mean when you say the information is "carried in the phase"?

Moses: The transmission is set up in a code such that it gives you a pattern and you clock onto that pattern. Then it will violate that pattern, and it is the violations that carry the information. That way the intensity stays the same, and you are looking for something other than changes in intensity, which could be caused by lots of different things.

Mix: Is it the particular pattern that you set up, and the way in which you violate it, that is proprietary to Wadia Digital and not the same as what the long-distance companies use?

Moses: It is more similar to what a long-distance company would use to go across the country than what digital audio manufacturers use to go from one piece of gear to another. If you don't use our approach, you will run into a lot of the same problems that you have with coax. You won't have the noise problems, because fiber can't pick up electromagnetic interference. But you can run into slope problems and DC offset problems if you are not careful.

Mix: Picking up with our example at the receiving end of the fiber...

Moses: The fiber optic receiver changes the light information into electrical pulses. We use a part manufactured by AT&T, so we don't have any proprietary process for converting the light to voltage. Then the signal has to be unscrambled and the forward error-correction removed. Then we again go into a 1200-gate, programmable gate array where the user can select which format the output will be. And that's pretty much it. It's pretty simple, because all the technology is held in

these little chips that can be configured for whatever the application is.

There are a couple of other possibilities with the system. In a setup like Masterfonics the fibers can all be routed to an equipment room where you would have an optical fiber, cross-connect bay. So you can patch things up on a light basis to wherever they need to go. Also, Masterfonics came up with the idea to make the system in little modules that can fit either in our enclosure or within the chassis of other manufacturers' equipment. That way you can take a recorder, editor or console and put our module right in there. You drill three holes—two for the mounting bracket and one for the fiber optic connection. So in addition to mic and line ins and outs, your equipment could have fiber optic connectors right on the machine. That lowers your cost for going optical, because you don't have to have a separate housing and power supply for the interface unit. And you eliminate the need for a short coax patch from the equipment to the interface.

Mix: What areas in an audio production facility should be given the highest priority for conversion to a fiber optic link?

Moses: Distance is almost the whole thing. It's for situations where you have multiple rooms or soundstages removed from where you have a decent place to set up a mixer. The digital formats were designed such that if you have everything pretty close together you can run on coax without suffering degrading effects. But room-to-room distances are very applicable to fiber optics. And then you have situations like Soundtrack in downtown Manhattan, where you actually have building-to-building distances. Or Master Sound at the Kaufman/Astoria Studios in Queens, where they have 16 acres of film and video and soundstages to interconnect. In Nashville, Masterfonics has the possibility of running links to studios down the street by leasing space on utility poles.

Mix: How does optic link compare with conventional wiring in terms of cost?

Moses: The break-even point over wire on a digital basis seems to be in the area of 300 feet. It costs $500 for the module on each end of the system, including all the interfacing. Then you've got about two dollars per foot for a simple fiber like at Masterfonics—one that can be set up inside, running in conduit or even on the floor. The armored cable that you would use for going outside, over the rooftops, would be five dollars per foot.

Mix: Are there other sectors within the audio industry, such as cassette duplicators or CD replicators, that have expressed interest regarding applications at their plants?

Moses: We have had some requests to take a look at some of these places, and we think that as the word gets out, other areas will open up for us. The product is just being introduced, and we haven't yet rolled out our marketing plan. We still have to do advertising, promotion and all those types of things. Right now we are trying to get units out to a half-dozen locations for our beta testing. So far, the testing we have done has gone very well, with no reliability or interfacing problems. But we still want to get it out there and get some feedback. Then we can turn up the heat once we know we've got it right. ■

Phil De Lancie, a mastering engineer at Fantasy Studios in Berkeley, California, is our resident voice on formats, trends and technologies in the world of prerecorded music mastering and manufacturing.

What LA's Largest Pro Audio Dealer Can Do For You

With over 200 different brands of pro audio/video equipment, we offer you the best selection in the west. And we carry a much larger inventory so chances are we have what you need in stock.

We'll keep you abreast of new developments, new options, and updates for your equipment so you're always current and usually ahead of the rest of the industry.

New Demonstration Rooms

Since we moved to larger quarters here in Burbank we've opened *two* new fully equipped showrooms. In the Pro Room are three complete, operating production systems—consoles, monitors, tape machines (including 32 track digital), and signal processing/effects gear. Our second room has three more complete production systems set up to hear and compare. This room caters to the audio/video needs of musicians and production studios.

Just the Facts, Ma'am

Things change quickly in pro audio. To make sure everyone here knows all the facts about the latest equipment, we've added a Product Specialist to our staff. His *only* job is researching equipment—reading brochures and tech manuals, going to trade shows, talking with manufacturers—and sharing that knowledge with our customers.

New Central Location

We're easy to get to from Hollywood, LA, and the valleys. And with more room, we've enlarged our technical and parts departments for even better service and support.

Come by and visit us in our new building. Turn some knobs in the demo rooms. Or just call and we'll be happy to discuss your pro audio needs.

Office Staff (l to r): Niki Simpson *(Accounts Payable)*, Carol Gumbel *(Controller)*, Shanah Metzelaar *(Receptionist)*, Darrin Miller *(Purchasing)*, Michele Schwartz *(Accounts Receivable)*, Jim Kropf *(Delivery)*, *Front:* Brian Cornfield *(President)*

Sales Staff (l to r): Nat Hecht, Paul Freudenberg, Paul Svenson *(Sales Manager)*, Karyn Thomas *(Sales Assistant)*, Philip Celia, Mark Lever, Vanessa Perea *(Tape and Accessories)*, Garth Hedin, Robert Corn, Ben Ing *(Product Specialist)*, Constantino Psorakis

Our Pro Demo Room: Three different fully operating production systems, plus a vast array of outboard gear

Technical Staff (l to r): Steve Smulian *(Service Manager)*, Paul Hulse *(Senior Technician)*, Rik Shannon *(P.O.M.P.)*, Greg Dougan *(Parts Manager)*, *(Not Pictured:* Nello Torri)

Sales/Service/Design

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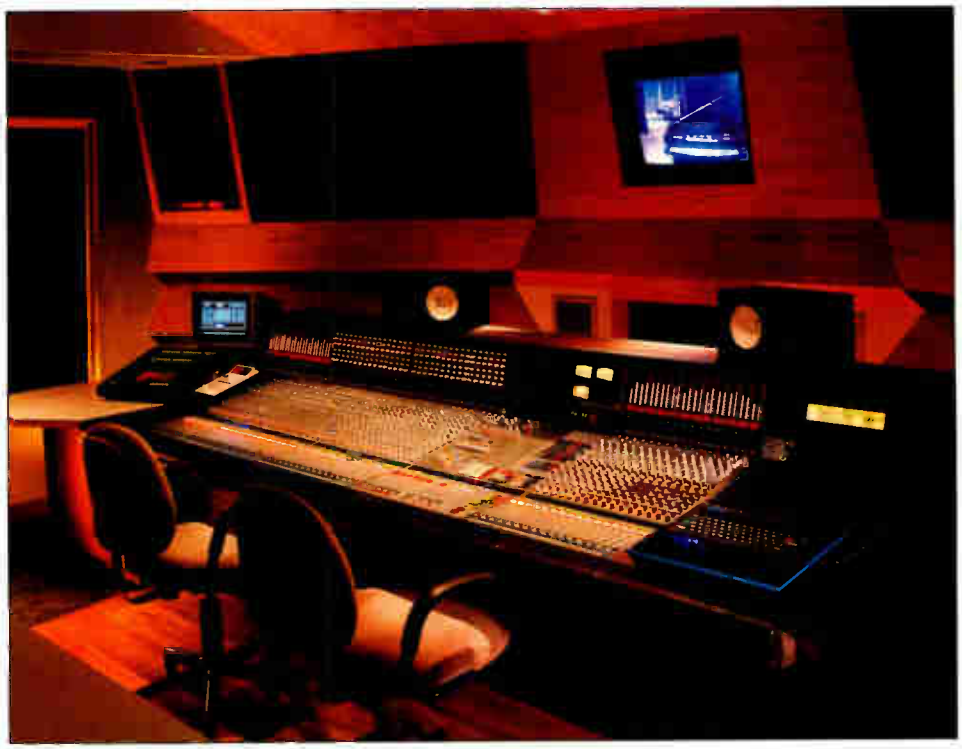
& DESIGNERS

Information in the following directory section is based on questionnaires 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.



Redesign of control room 1 at Manta Sound in Toronto was completed this year. The room features a custom 60-input Amek APC 1000 with a GML Moving Fader system. Mitsubishi X-850 and Studer A827 ATRs are in a machine room. Although designed as a primary mixing room, it is next to a large recording space with variable acoustics via movable wall panels. Acoustic design by Waterland Group of Hollywood. Photo: Jean Desjardins.

LEGEND: **SD:** Studio Designer; **AC:** Acoustical Consulting; **SES:** Studio Equipment Supply; **EI:** Equipment Installation; **MR:** Maintenance/Repair Services; **ER:** Equipment Rentals.

CONTENTS

Mix listings procedure: every month, *Mix* mails questionnaires 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 an Extended Listing (equipment, credits, specialization and photo or logo). If you would like to be listed in a *Mix* Directory, write or call the *Mix* Directories Department, 6400 Hollis Street #12, Emeryville, CA 94608; toll free 800-344-LIST!

Upcoming Directory Deadlines:
North Central U.S./Canadian Studios: **August 18, 1989**
Mastering, Pressing & Tape Duplication Facilities: **September 18, 1989**
Northwest Studios: **October 17, 1989**

LOS ANGELES RECORDING WORKSHOP

12288-X Ventura Blvd.
Studio City, CA 91604
(818) 763-7400

ARM, MIDI , SR, SDS

The Los Angeles Recording Workshop offers daytime and evening, full-time and part-time schedules. Hands-on training in small groups of six to eight students. Housing available in two dormitories, and transportation available from Burbank Airport. Job placement assistance and internship assistance available to all graduates. Our graduates are working with major artists, in major studios, all around the world. We are approved for job training by the California Department of Education and are fully accredited by ACCET. Financial aid is available to those who qualify. Call or write for our brochure and demonstration soundsheet.

The Los Angeles Recording Workshop is L.A.'s premier intensive hands-on training school for recording engineering. Our students train in six different recording studios, on six different consoles. Our training includes 24-track session procedures in four 24-track recording studios, MIDI and synthesizer techniques in our SMPTE-MIDI lockup recording studio, microphone theory and application, studio maintenance and session troubleshooting, standard and elevated tape alignment, live sound engineering techniques, analog and digital recording techniques, music business for engineers, tape editing techniques, outboard equipment techniques and intensive ear-training and critical listening. No experience required. Just come ready to learn!

JOHN M. STORYK, INC.

31 Union Square West, New York, NY 10003 (212) 675-1166

From *Jimi Hendrix*'s Electric Ladyland to *Whitney Houston*'s home recording studio — to the nation's leading recording arts school, *Full Sail Center for the Recording Arts*, **John Storyk**'s designs have set the quality and design standards for 20 years.

Special thanks to our clients of recent months for bringing us a run of very exciting projects.

Def-Jam Records, New York, NY, ***Full Sail Center for the Recording Arts***, Winter Park, FL, ***Whitney Houston*** (photo shown), Mendham, NJ, ***The L.A. Studios***, Los Angeles, CA, ***MJI Broadcasting***, New York, NY, ***Oasis Music***, New York, NY, ***Howard Schwartz Recording***, New York, NY, ***West Virginia Public Broadcasting***, Charleston, WV, ***Sid Woloshin Recording***, New York, NY.

BusinessPages! Services Key

BusinessPages! half-page ads feature a box with letter abbreviations for the types of services the advertiser offers. The key to these business services is as follows:

ARM	Audio Recording, Music	***MIDI***	MIDI Production
APPV	Audio Post-Production for Video	***APPF***	Audio Post-Production for Film
VP	Video Production	***SDS***	Studio Design/Supply
TD	Tape Duplicating	***CDP***	Record/CD Pressing
CDM	Record/CD Mastering	***RLR***	Remote/Location Recording
SR	Sound Reinforcement		

BusinessPages! ads are available in both 1/4- and 1/2-page units; all production costs for ad preparation are included in the low ad rates (including color separations from supplied photo or logo). For complete information on how your facility can have a low-cost, four-color **BusinessPages!** ad, contact *Mix* Directories toll-free **(800) 344-LIST** All space reservations and materials are required by the **seventh** of the **month**, two months prior to publication.

NORTHEAST

& DESIGNERS

Connecticut, Delaware, Maine, Maryland Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Washington DC

ACOUSTILOG, INC.; *SD, AC, SES, EI, MR, ER*; 19 Mercer St.; New York, NY 10013; (212) 925-1365. Contact: Greg Guarino.

ADVANCE MUSIC CENTER; *SD, AC, SES, EI, MR, ER*; 61 Main St.; Burlington, VT 05401; (802) 863-8652. Contact: Peter B. Wilder, Henry Huston.

ALACTRONICS, INC.; *SD, AC, EI, MR*; 192 Worcester St.; Wellesley, MA 02181; (617) 239-0000. Contact: Bob Alach. Services/Specialization: Providing a full complement of audio services for recording, production and broadcast facilities: walk-in and field service for all professional equipment. High-performance modifications and equipment updates. System design and installation. Acoustical analysis, design and construction.

SAM ASH PROFESSIONAL
New York, NY

SAM ASH PROFESSIONAL; *SD, AC, SES, EI, MR*; 723 7th Ave., Third Floor; New York, NY 10019; (212) 719-2640. Contact: D. Dino Virella, director. Services/Specialization: Consultation, sales, service of professional audio/music/computer equipment. Midtown Manhattan location features fully functional 24-track demonstration studio as well as several types of workstations demonstrating SMPTE/MIDI applications. Also featured, NYC's best selection of microphones as well as a fantastic array of parts and accessories. On-site consultation and service also available.

AUDIO VIDEO RESEARCH GROUP
Watertown, MA

AUDIO VIDEO RESEARCH GROUP; *SD, AC, SES, EI, MR*; 106 Main St.; Watertown, MA 02172; (617) 924-0660; FAX: (617) 924-0497. Contact: Octavio Brito, Tim Ingles. Services/Specialization: Accurate qualification of the needs and resources of the audio/video professional is the difference between staying in business or not. Whether you own an 8-track demo room or a 24-track multimedia facility, AVR will support your venture. We offer design, sales and installations coupled with an extensive technical maintenance program. Our optional 24-hour plans and warrantied used equipment listings enhance your final project without crippling your bank account. Our staff has "hands-on" experience in audio/video engineering and production, giving AVR a wider perspective than most. This results in a personalized and thorough approach to all clients, no matter the size. When you need vintage equipment, expert design and technical service, the best in new gear or audio/video consultations, you will find a positive alternative in AVR. Our business is keeping you in business.

AUDIOTECHNIQUES INC.; *SD, SES, EI, MR*; 1619 Broadway; New York, NY 10019; (212) 586-5989; FAX: (212) 489-4936. Contact: Bob Berliner.

AUTERI ASSOCIATES, INC.; *MR*; 53 Foreston Cir.; Manorville, NY 11949; (516) 878-6421. Contact: Nannette D'Angelo. Services/Specialization: Auteri Associates are specialists in complete reconditioning of all professional magnetic heads and assemblies. These services include precision head recontouring, tape guide repair and optical alignment. A comprehensive lab report is included. Since 1970, Bob Auteri has been involved in the design and manufacture of all types of magnetic heads and has worked both at the plant and at the customers' facilities as an applications engineer. We have available new replacement heads for most tape recorders as well as a complete line of "Longer-Life" film heads for all major film recorders and dubbers. Our main ingredient for success is customer service. Our clients can depend on us for first quality workmanship and quick turnaround. We offer free evaluation of your heads and assemblies. All work is guaranteed. For more information, contact Nannette.

BENCHMARK/DOWNTOWN DESIGN
New York, NY

BENCHMARK/DOWNTOWN DESIGN; *SD, AC*; 425 E. 63rd St.; New York, NY 10021; (212) 688-6262. Contact: Vin Gizzi. Services/Specialization: Architectural and acoustic design, construction management. Preparation of design drawings, construction drawings and all specifications, coordination of all engineering work—mechanical, electrical and electronic equipment (client's option), room acoustic design, including computer-assisted optimization of room geometry and proportions, isolation systems, diffusers and absorbers, monitor alignment, interior design and furnishings. Typical projects: recording studios and control rooms, audio-for-video facilities; video production stages and control rooms; video editing facilities; radio and television studios.

BURLINGTON AUDIO/VIDEO TAPES, INC.; *SES*; 106 Mott St.; Oceanside, NY 11572; (800) 331-3191; (516) 678-4414. Contact: Jan Schwartz, Ray Colon.

CLARK RESEARCH CO./AUDIO CONTROL SYSTEMS; *SD, EI, MR*; 300-46 Gorge Rd.; Cliffside Park, NJ 07010; (201) 945-0411. Contact: Gordon L. Clark.

CARL CORNELL AUDIO; *SD, EI, MR*; 669 Beahan Rd.; Rochester, NY 14624; (716) 328-1152. Contact: Carl Cornell.

CYLINDER SYSTEMS, INC.; *SD, AC, SES, EI, MR*; 160 West End Ave., Ste. 17N; New York, NY 10023; (212) 877-4843. Contact: Ira H. Kemp.

db ENGINEERING/SALES; 214 Lincoln St., Ste. 103C; Boston, MA 02134; (617) 782-4838 (sales); (617) 782-0648 (service); FAX: (617) 782-4935. Services/Specialization: db Engineering, the best way to buy and sell pro audio and video! Why? db is staffed with experienced professionals in music production, live sound reinforcement and MIDI engineering. We begin by discussing your needs, budget and objectives. db is a full-line dealer. A selection of our lines includes: Soundcraft, Aries, D&R, Seck and Studio Master consoles, Adams-Smith audio-for-video and time code products, Aphex, Ashly, Eventide, Klark-Teknik and TC Electronic signal processing, Tannoy, Klipsch and Auratone monitors, AKG, Beyer, Countryman and Sennheiser microphones, plus many more! db is a broker, enabling us to find you gear. Our network is also a marketplace to help you find a buyer for equipment you want to sell. We also provide a service contract or warranty for our used gear. db specializes in 24-track recorders. We can provide R-DATs and Sony PCMs. Find out why db is in the forefront of pro audio and video. Some of our recent projects include: Studer A80 24-track at Horizon Recording and Sear Sound in New York; Sony MCI JH-24 at Studio Works, complete stage setup for New Kids on the Block national tour, adding a computerized Soundtracs CM4400 console at Star Trax. Our roster of clients include: Cinemagraphics/Video One, Garden Gate Records, Goin' Mobile, Island Music (NY), Jay Rose's Attic Studio, Musitech, New England Sound, Oakgrove Studio and more.

db ENGINEERING SERVICE
Boston, MA

db ENGINEERING/SERVICE; 214 Lincoln St., Ste 103C; Boston, MA 02134; (617) 782-0648 (service); (617) 782-4838 (sales); FAX: (617) 782-4935. Services/Specialization: db Engineering is the only design consulting and service group in New England staffed entirely by experienced professionals. Our chief engineer not only designs acoustics and wiring systems for studios, he has produced and engineered major record albums, film scores and commercials, and he has operated his own facilities for 20 years. The staff all have worked as musicians or engineers in production or in live sound reinforcement. db is the only New England factory-authorized and trained Otari service center, we also work on Tascam, MCI/Sony, Studer and all other pro recorders, consoles and outboards. Consider us your experts for all SMPTE interface problems. We now offer the Otari TC-50 center-track time code upgrade kits for most 2-tracks. db is the best price source for ADC and Switchcraft patch bays and plugs. Mogami, Canare, Monster and Gepco cable. Recent projects include: total studio design and installation for producer Maurice Starr (New Kids on the Block, Stylistics) w/ Tannoy monitors, mix-to-pix room at Post Road Productions, room design and SMPTE upgrade for Verite Productions, new Otari 24-track at Video One, and the complete new electronic music studio at Boston University. Our roster of clients includes: Newbury Sound, Tandem Recorders, Wendell Studios, Inner City Recording, Mission Control, Normandy Sound, Euphoria Sound, Northeast Sound, Megaphone and New England Sound.

dBm TECHNICAL SERVICES
New York, NY

—CONTINUED ON NEXT PAGE

NORTHEAST

& DESIGNERS

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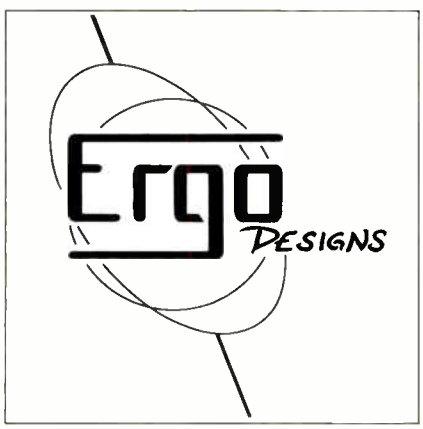
dBm TECHNICAL SERVICES; *MR*; 124 W. 19 St., 7th Floor; New York, NY 10011; (212) 645-2626. Contact: Joseph Weitekamp. Services/Specialization: Factory-authorized service on Akai Professional, E-mu, Ensoniq, Kawai, Korg, Oberheim, Optical Media, Roland, Simmons, Yamaha, Fostex, Otari, Studer Revox, Teac, Carver, Gallien-Krueger, JBL/UREI, QSC and HME. Nonwarranty service on all popular brands of pro audio, electronic music and wireless mic equipment. Home of the Memorymoog MIDI update. Custom MIDI hardware and software development. Factory-trained HME wireless mic service. Shielded RF clean room on premises. Priority rush service available.

DREAMHIRE
New York, NY

DREAMHIRE; *ER*; 137-139 West 25th St.; New York, NY 10001; (212) 691-5544; FAX: (212) 989-6603. Contact: Chris Dunn, Ken Thornhill. Services/Specialization: Dreamhire in New York City commenced operations during May 1989 and represents a major international move by the well-established London, England, pro audio rental company. Having already set up an office in Nashville, TN, Dreamhire founder Chris Dunn based himself in New York alongside the soon to be opened, three-room Battery Studios complex. With assistance from new team members Ken Thornhill and Brian Macaluso, Chris has purchased a very substantial amount of equipment, both new and vintage, and assures us that every unit has all available updates. The inventory includes digital and analog recorders, digital effects, amplifiers, monitors, synchronizers, samplers, sequencers, keyboards, noise reduction, tube and solid-state equalizers and compressor/limiters, tube microphones, the Calrec Soundfield microphone and a 12-channel Focusrite Sidecar desk with SSL Logic interface. A 24-hour, year-round service is offered with full technical support.

E.A.R.S., INC.
Boston, MA

E.A.R.S., INC., 90 Windom St.; Boston, MA 02134; (617) 783-5229. Contact: Rob Rosati, Michael Corbett. Services/Specialization: E A R S. is a full-service audio engineering company, serving the recording and sound reinforcement fields. A firm of experienced professionals, we specialize in designing control rooms, studios, post-production facilities, theaters and sound reinforcement systems. The electronics division offers maintenance, modification and equipment installation, power and grounding schemes, patch bay wiring, interface panels and custom electronic devices. Our acoustics division uses computer-aided design and engineering techniques to provide accurate, innovative designs, complete facility planning and modifications. E.A.R.S., Inc. manufactures variable acoustic wall systems (VARA-WALL™), acoustical panels, a control room monitoring system and audio switching systems. We also carry many lines of pro audio equipment and acoustical materials. Credits: Aerosmith, Archer Studios, Bon Jovi, Boston, Boston Ballet Company, Boston Beach Club, Christian Science Monitor, Courtlen Recording, Crystal Palace Productions, Digital ADR & Cine-Post, Downtown Recorders, EPCOT Center, Full Sail Center for the Recording Arts, Harbor Light Stage, Judas Priest, Kurzweil Music, Millipore Corp., Motley Crue, Musitech Productions, Needham Sheraton, Newbury Sound, North Shore Music Theater, Reality Studios, Ryansongs, Soundscape, Sound Techniques, Starke Lake Studios, Star Trak, Syncro Sound, Top of the Hub, Tropical Records, U.S. Air Force, U.S. Navy, University of Maine, Video One, WBOS, Walt Disney World.



ERGO DESIGNS
Brooklyn, NY

ERGO DESIGNS; *SD, EI*; 219 Dekalb Ave.; Brooklyn, NY 11205; (718) 522-0671; (718) 727-6286. Contact: Alex Noyes, Mark Ramsay. Services/Specialization: Ergo Designs is a full-service audio and MIDI design company providing everything from consultation and system design to purchasing and installation contracting. Design services are available for audio recording studios, sound installations, video/film post-production, personal studios and performance systems. Specialties include upgrading existing facilities and designing complete integrated synchronization systems for SFX and ADR. All work is delivered with a complete customer support package, including a staff training program, allowing for seamless expansion and continued operational efficiency. We are not distributors, so we provide independent, unbiased equipment selection. Ergo Designs offers expanding services from consultation to installation of full turnkey systems, within budget, on time and ready for use.

CHRIS GATELY AUDIO SERVICES; *EI, MR, ER*; PO Box 526; Bryn Mawr, PA 19010; (215) 525-3605. Contact: Chris Gately.

PETER GEORGE ASSOCIATES, INC.; *SD, AC*; 40 Prince St.; New York, NY 10012; (212) 334-9700. Contact: Troy Jensen.

HOT HOUSE PROFESSIONAL AUDIO
Highland, NY

HOT HOUSE PROFESSIONAL AUDIO; *SD, AC, SES, EI, ER*; RD. 1, Box 362A; Highland, NY 12528; (914) 691-6077, 11 a.m.-6p.m. Services/Specialization: We are a small organization built on close personal client relations. In addition to the broad range of products offered, we provide complete turnkey system design, installation and maintenance. Our recording studio/demonstration facilities are available for equipment evaluation by appointment only. We specialize in custom state-of-the-art studio monitor systems featuring Tannoy dual concentric and PAS loudspeakers, Hartley 16 hertz subwoofers, braided Teflon and silver Kimber Kable, Perreaux, Australian Monitor and Hot House MOSFET power amps, and Anechoa and Sorbothane absorbers. Another primary focus is world-class FX packages including the computer-driven Quantec XL, Marshall 5402 Time Modulator and AR300 Tape Eliminator, AKG ADR68k reverb-sampler, Eventide 3000, TC 2290 DDL-sampler, 1210 analog delay and 1128 automated SMPTE equalizer/analyzer, Klark-Teknik DN780 reverb and 500 Series dynamic processors, Drew Y-expressor and Genesis DSP. We are also the exclusive Northeast representative for the DAR digital workstation and the Symetrix DPR100 Macintosh-based system, and offer the AKG DSE-7000 workstation. Adams-Smith, Alesis, Aphex, Audio Logic, BBE, Beyer, Biamp, Brooke-Siren, CAD, Casio DAT, J.L. Cooper, Crown, dbx, DDA, Digitech, EAW, Emilar, Fane, Fostex, Goldline, Hill, JBL, Lexicon, LoftTech, Milab, Nakamichi, Neumann, Orban, Otari, Rane, SCS, Sennheiser, Soundcraft, Soundtracks, Studer Revox, Studiomaster, Thorens, Trident, Turbosound and UREI.

JEM-FAB CORP., *SD, AC, EI*; 574 Sunrise Hwy.; Baldwin, NY 11510; (516) 867-8510. Contact: Franklyn R. Beemish, Bradley D. Oswald.

LOGICAL AUDIO SOLUTIONS; *SES, EI, MR, ER*; 325 Saude Ave.; Essington, PA 19029; (215) 521-2933. Contact: Lee Hoover.

MARTIN AUDIO VIDEO CORPORATION
New York, NY

MARTIN AUDIO VIDEO CORPORATION; *SES, EI, MR, ER*; 423 W. 55th St.; New York, NY 10019-4490; (212) 541-5900; (212) 489-4750 (parts); FAX: (212) 541-9128. Services/Specialization: As New York's leading pro audio dealer, Martin Audio has more than 25 years experience in the sales, installation and servicing of audio equipment for recording, broadcasting and post-production. In addition to over 100 major lines of equipment, Martin is the exclusive New York-area source for Amek, GLW (Harrison), Neotek and Sound Workshop consoles, Otari's MTR and DTR lines of analog and digital tape recorders, Lexicon Advanced Products signal processors, Sanken microphones, the Lexicon Opus digital workstation, Soundmaster synchronizing systems and Dolby SR (Spectral Recording) multitrack processors. Martin also offers our customers the latest MIDI synthesizer and digital sampling hardware and software with extensive applications expertise in our Martin Music Technologies division. Among the musical product lines available are Akai, Digidesign, Dyaxis, E-mu, Korg, Kurzweil, Mark of the Unicorn, Opcode, Optical Media and Sycologic, most of which are on display in a complete, working MIDI studio/demo room. Martin Audio also features the largest pro audio parts department in New York and a fully equipped rental division.

MARTIN RENTALS CORP.; *ER*; 423 W. 55th St.; New York, NY 10019-4490; (212) 265-4646; FAX: (212) 541-9128. Contact: Joey Helguera. Services/Specialization: Martin Rentals features an extensive selection of well-maintained rental equipment. We rent Otari MTR-90 multitrack and MTR-12 and MTR-20 2/4-track analog recorders; Sony PCM-3324 digital multitracks, PCM-1630 2-track digital processors and PCM-3202 DASH 2-track recorders; TimeLine Lynx synchronizers; Dolby and dbx noise reduction; digital delays and reverbs by AMS, EMT, Eventide, Lexicon, Quantec and Yamaha; a wide assortment of microphones including B&K, Sanken and both vintage and modern models from AKG and Neumann; wire-

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How to choose an audio dealer

What you should know before buying your equipment

by Doug Mitchell
Professional audio consultant and sales representative

So you've finally decided what equipment you want, or perhaps you're still trying to make some objective, intelligent decisions from over-hyped sales messages from a myriad of manufacturers. Well your next step, choosing an audio dealer, can be just as exhausting. *But deciding from whom to buy is as important as deciding what you buy.*

SEEK OBJECTIVITY

Easy to say, hard to find

Just as each manufacturer will pledge that his products are the cure-all and its competitors' are useless, the audio dealers will swear by their own name but at their competition.

Objectivity is hard to find—but possible.

1. Look at how the company markets itself in its advertising. If it's price or product oriented, the dealer is telling you that its major objective is to push product—at the cost of not really understanding your situation, selling you inadequate or unnecessary equipment, and not supporting you after the sale.

2. Find out how many competing lines of equipment the dealer carries. If a dealer exclusively carries one manufacturer, guess whose products they'll push when you call?

3. Stay away from the dealer who says he will get any product for you. Some dealers will sell equipment that they're not authorized to sell or will deal in the gray market (importing products through a non-authorized channel). In either case, when you need future service on that product, you're out on your own.

LOOK AT PRICE

But don't stare at it

It's easy to shop and compare dealers by price, but such a narrow focus is risky. Don't assume all dealers are the same.

Look for a knowledgeable, full-service dealer with whom you can establish a partnership, one who will serve all your audio needs and be in your corner if a crisis arises. The little money you save by dealer-hopping you'll spend on after-sales service and aspirin.

Price is an important consideration but don't be blinded by it. When a dealer promises the absolute cheapest price on a product or that he'll sell it at cost, be assured that when you need service, answers to questions, or follow-through, you'll either be ignored or you'll pay dearly for it.

You've already decided to make a major investment; take the time to shop for a dealer. You want to team up with someone you can trust. The peace of mind is worth the effort.

FIND A FRIEND

Find a dealer who will sit down with you, discuss your situation, and spend the time to discover your needs, your direction, and your requirements. A professional, objective assessment will uncover some important aspects that you may have overlooked.

At AudioLine we want you to be satisfied. Whether you're putting together a small studio, needing audio accessories, or assembling a million dollar post-production facility, we take a personal interest in your project.

We represent over 120 competing manufacturers, offer competent advisement, give extended warranties, provide you with a certified service center, and deliver the after-sales follow-through that instills peace of mind.

You can reach us in Milwaukee (414) 785-9166, Chicago (312) 274-0330, and Kansas City (816) 931-9166. Give us a call before you buy.

Circle #019 on Reader Service Card

Circle #020 on Reader Service Card

NORTHEAST DESIGNERS & CONSULTANTS

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less mic systems by HME, Sennheiser and Sony, and a complete range of compressors, de-essers, equalizers, limiters and signal enhancers, including some select, vintage tube units. We also offer a wide range of keyboards, rack-mount samplers, synthesizers and other MIDI products.

NEW YORK TECHNICAL SUPPORT, LTD.; *SD, EI, MR*; 35 Hardscrabble Hill; Chappaqua, NY 10514; (914) 238-4171. Contact: Greg Hanks, Rose LoPresti. Services/Specialization: New York Technical Support, Ltd. is a full-service maintenance firm that caters to the technical needs of the recording, film and broadcast industries. We provide design, consultation, installation and repair services. Our specialties include custom design and fabrication, computer modeling and simulation of control room ergonomic design, installation and wiring services, tape machine care and repair, power and ground distribution, analysis and fault finding, EMT tuning, modification and refurbishment, and scheduled contract maintenance service. We are factory trained, equipped and recommended to service Ampex, MCI, 3M, Neve, Otari, Sony, Studer, Trident, SSL. For more information, please call Greg Hanks at (914) 238-4171.

NORTH STAR AUDIO; *SD, AC, SES, EI*; 1367 High Ridge Rd.; Stamford, CT 06903; (203) 968-2323; FAX: (203) 322-4993. Contact: Tom Lanik. Services/Specialization: North Star Audio is your North Eastern U.S. representative for Bruel & Kjaer (B&K) studio microphones. For sales and rental information, or to arrange for a demo please call our special toll-free phone number: (800) 336-4656. We are also fully authorized dealers for JBL Pro, Otari, Tascam, Neumann, Crown, Beyer, Lexicon, Aphex, AKG, Eventide, Orban, MRL test tapes, dbx, ART, Symetrix, UREI, Soundcraft, Shure, White, Ashly Audio and many other professional audio items. We stock most common audio connectors, Ampex and TDK tape, Connectronics cable and Stable Cables. We have buyers for your unwanted audio equipment—please call for details.

NORTHEASTERN COMMUNICATIONS CONCEPTS, INC.
New York, NY

NORTHEASTERN COMMUNICATIONS CONCEPTS, INC.; *SD, AC*; PO Box 1853, Grand Central Station; New York, NY 10163; (212) 972-1320. Services/Specialization: Inspire the creativity of your clients, engineers and producers with something your competition cannot buy—a fully integrated electronic, acoustic and visual environment—custom-designed for the way you work by New York's most prestigious studio designers. Only NCC offers you the choice of standard, modular and CGA™ acoustical packages to match the performance of your equipment and your budget. NCC's proprietary Controlled Geometry Acoustics™ frees you from the restrictions of obsolete live-end/dead-end technology, while eliminating early reflections. And with our total systems approach, NCC custom equipment and cabinetry will enhance your productivity and you'll never again fumble with audio, video or MIDI cords on the back of your outboard or keyboard gear. We'll even design the electrical power and environmental systems to keep you and your equipment comfortable and static free. Benefit from our experience with successful projects exceeding $10,000,000. Buy your equipment from a distributor, but plan for your competitive edge with NCC.

PANDEMONIUM AUDIO; *SD, AC, SES, EI*; 16 Dorchester Dr.; Manhasset, NY 11030; (516) 365-7810. Contact: C P Pores.

PERSONAL RECORDING ENVIRONMENTS, INC.; *SD, AC, SES, EI*; 14 Atlas Ct.; Garden City, NY 11040; Box 391, Black Horse Pike; Hammonton, NJ 08037; (516) 741-1965 (in NY); (609) 561-8109 (in NJ). Contact: Daniel Vitalo, Jr.

POWER PLAY RECORDS, INC.; *SD, AC, EI, ER*; 223-225 Washington St.; Newark, NJ 07101; (201) 642-5747. Contact: Greg Furguson.

DANIEL QUEEN ASSOCIATES; *AC*; 239 W. 23rd St.; New York, NY 10011; (212) 243-6661. Services/Specialization: Daniel Queen Associates is an acoustical consulting firm founded in 1970 in Chicago. It moved its main office and laboratory to New York City in 1983. A member of the National Council of Acoustical Consultants, the firm maintains a laboratory and mainframe computer for electroacoustic, acoustic, audio and video measurement and analysis. Mr. Queen is a fellow of the Audio Engineering Society and its Technical Council Chairman. The firm specializes in solutions to difficult acoustical, audio and noise control problems, such as duplicating in small rooms the acoustics of large performance spaces, matching monitoring facilities, and exorcising acoustical gremlins. Clients include architects, manufacturers, studios and other consultants.

ROR AUDIO RESEARCH; *SD, AC, SES, EI, MR, ER*; 161-14 Union Turnpike; Flushing, NY 11366; (718) 969-3660; (718) 969-3792. Contact: Shimon Ron. Services/Specialization: ROR has been designing, manufacturing and servicing multitrack consoles, parametric EQs, monitor systems and other electronic and acoustic innovations since 1972. A representative list of professional users and clients includes: recording studios—(international) Fonovision Internacional, Bogota, Colombia; Hljodriti Studios, Reykjavik, Iceland, Studio Katy, Brussels, Belgium, Pink Floyd's Britannia Row, London, England; Marcus Musik, London, England, Le Studio, Montreal, Canada; Noah, Tokyo, Japan. (New York) Record Plant, A&R, Bearsville, Power Station, Electric Lady, Editel, Sorcerer Sound, RPM, Sigma, MSP, Blue Rock, Celestial Sound, Skyline, Howard Schwartz, Regent, Don Casale, Mike Mantler's and Carla Bley's Watt Works, Staten Sound (Los Angeles); Record Plant (Connecticut); Ace Frehley (Kiss) Studio Mastering rooms: (New York) Sterling Sound, Frankford Wayne Clubs and restaurants. (New York) The Sporting Club, World Yacht's Dinner Cruise Ships, America, Pig Heaven, Jerry's, Water Club, River Cafe, Central Falls, Cafe Pacifico, Be-Bop Cafe, Fiorucci (clothing store), John Dellaria (beauty salon), etc.

TED ROTHSTEIN; *SD, AC, SES, EI, MR*; 280 Park Ave. S.; New York, NY 10010; (212) 475-5064; FAX: (212) 475-4877. Contact: Ted, Eric or Addy. Services/Specialization: Ted Rothstein (former owner of ROR Audio) has been designing, manufacturing and servicing multitrack consoles, parametric equalizers, monitor systems and other electronic and acoustic innovations since 1970. A representative list of clients and professional users of Ted Rothstein's designs includes: recording studios—Orlando, FL, Full Sail; London, England, Roger Water's studio, Pink Floyd's Britannia Row, Marcus Musik; Bogota, Columbia, Fonovision Internacional, Reykjavik, Iceland, Hljodriti Studios; Brussels, Belgium, Studio Katy; Tokyo, Japan, Noah; New York, Tamarand Studio, A&R, Bearsville, Power Station, Electric Lady, Sorcerer Sound, RPM, MSP, Celestial Sound, Skyline, Don Casale, Mike Mantler's and Carla Bley's Watt Works, Los Angeles, Record Plant; Connecticut, Ace Frehley (Kiss) Studio; Mastering rooms—Sterling Sound, Frankford Wayne; discos, clubs and restaurants—Tokyo, Rock & Roll Diner, Bangkok, NASA, Spaceadrome; New York, Spo-Dee-O-Dee, The Sporting Club, World Yacht's Dinner Cruise Ships, America, Los Angeles, L.A. Stock Exchange, New York Health & Racquet Club Yacht; Hard Rock Cafe, Reykjavik, Tokyo, Cancun, New York, Dallas, Boston, Washington DC, Acapulco.

RPG DIFFUSOR SYSTEMS, INC.
Largo, MD

RPG DIFFUSOR SYSTEMS, INC.; 12003 Wimbleton St.; Largo, MD 20772; (301) 249-5647. Contact: Dr. Peter D'Anto-

nio. Services/Specialization: RPG Diffusor Systems now offers a complete acoustical treatment system consisting of an expanded line of broad-bandwidth, wide-angle sound diffusors, the QRD® Diffusor; a broad-bandwidth sound absorber, the Abffusor®, and a rotatable, triangular, variable acoustics module consisting of a diffusive, absorptive and reflective side, the Triffusor® The RPG Home Concert Hall provides the ultimate residential listening room acoustical treatment and The Wall™ provides the latest development in full-spectrum diffusion for the ultimate professional monitoring environment. Worldwide distributor, dealer, rep and sound contractor applications now being accepted. Applications: recording/broadcast/post/mastering facilities, audio/video and teleconferencing rooms, music rehearsal rooms, acoustical shells, worship spaces, auditoriums, performing arts facilities, audiophile listening rooms and schools. Installations: Ardent, Memphis, Battery Studios, NY; CBS, Los Angeles and London; Canadian Broadcasting Corporation, Toronto; Digital Recorders, Nashville; Digital Music Products, Stamford, CT; Eurythmics' Church Studio, London; Full Sail, Orlando; Granny's House, Reno; HBO, NY; The LA Studios, Los Angeles; Limelight Video, Miami; McClear Place, Toronto; NBC, NY; Burbank; Chicago; Peter Gabriel, Box Mill, UK; Rhinoceros Studios, Sydney; Spectrum Studios Portland; Sterling Sound, NY; Telarc Records, Cleveland; Whitney Houston, Mendham, NJ.

SONEX-SOURCE; *AC*; 58 Nonotuck St.; Northampton, MA 01060; (413) 584-7944. Contact: Win Ridabock.

JOHN M. STORYK, INC.
New York, NY

JOHN M. STORYK, INC.; *SD*; 31 Union Sq. W.; New York, NY 10003; (212) 675-1166; ★***See Our Ad in the Business-Pages!***★ Contact: Tobe Fitterman.

STUDIO CONSULTANTS, INC.; *SD, AC, SES, ER*; 321 W. 44th St.; New York, NY 10036; (212) 586-7376. Contact: Doug Simon.

TECHNICAL SERVICE SPECIALISTS, INC.; 187 East Market St., Ste. 190; Rhinebeck, NY 12572; (914) 876-3999; FAX: (914) 876-5432. Contact: Chris Wasserbach, B.E.E.E. Services/Specialization: Complete turnkey projects using our own construction crew, along with a full line of electroacoustical support services. System installations, maintenance and measurements/renovations by our in-house team of designers, electrical engineers, licensed master electrician and technicians. AIA plans, complete CAD/CAE/CAM, 24-hour scheduling, racks/cabinets shop and other services provide our clientele with a single point of contact. Our team has years of field experience, which overcomes the problems associated with designers who do not partake in the actual construction process! Reasonable rates and nationwide coverage makes Technical Service an ideal choice for your design, construction and service needs. If you don't want to pay for hype, we suggest that you contact us. Partial client list: Big Guy, Bruhaha, Clarity, Cliff Williams (AC/DC), Electric Reels, Fantasy Factory, In-Sync, Lighthouse, Mahopac Music, National Basketball, Production Plus, Ross-Gafney, Sound Scape, Turkisher Rehearsals, Unique Recording.

TEKCOM CORP.; *SD, AC, SES, EI, MR, ER*; 1020 N. Delaware Ave.; Philadelphia, PA 19125; (215) 426-6700. Contact: Lou Maresca, L. Richard Feld, Michael Mueller. Services/Specialization: TekCom is the leading supplier of professional audio equipment in the mid-Atlantic region. Offering the finest products in this field with full support services to back our products. TekCom is the exclusive mid-Atlantic distributor for Otari MX-70, MX-80, MTR-90, MTR-100, DTR-700 and DTR-800 tape recorders, Amek, DDA and Trident mixing consoles, Dolby noise reduction and SR processing systems, TimeLine time code synchronizers, Eventide and Lexicon advanced products, Dyaxis Digital Audio editing systems, Kurzweil music systems, Macintosh MIDI systems, B&K and Neumann studio condenser microphones. Including a wide variety of amplifiers, equalizers, signal processors, loudspeakers, stu-

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NORTHEAST

& DESIGNERS

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TEKCOM CORPORATION

TEKCOM CORP.
Philadelphia, PA

dio monitors, microphones, accessories, recording tape, sound reinforcement, MIDI devices, samplers, synthesizers and keyboards. TekCom offers complete design and installation of MIDI systems, engineered sound reinforcement, broadcast, video-post and recording studios. We also offer expert, factory-trained tape recorder and loudspeaker repair.

TLM ELECTRONICS, INC.; *SD, SES, EI, MR, ER*; 343 Manville Rd. #6B; Pleasantville, NY 10570; (914) 769-6423. Contact: Tony Marra, Lori Marra. Services/Specialization: TLM Electronics Inc. is Westchester County's largest professional

TLM ELECTRONICS, INC.
Pleasantville, NY

audio service center, providing authorized warranty service for AKA Professional, Biamp, BSS Audio, Carver, Fostex, Panasonic Commercial, Panasonic Digital, Ramsa, Rane, Roland, Yamaha and Nakamichi. In addition, we are factory trained and highly recommended by Aries, BSS Audio, Neve, Soundcraft, Trident and Turbosound. TLM Electronics provides same-day rush service, 24-hour-a-day service calls and standard 2 to 3 day turnover service. At TLM Electronics service is not an "after-the-sale" problem, it is our business!

THE TOY SPECIALISTS; *SES, ER*; 333 W. 52nd St.; New York, NY 10019; (212) 333-2206; (800) 445-3330. Contact: Bill Tesar, Rita Tesar. Services/Specialization: The Toy Specialists is a fast-growing company specializing in pro audio and MIDI instrument rentals. By combining personal expedient service with expert technical assistance 24 hours a day, seven days a week, the company has developed an enviable status in the U.S. rental marketplace. The Toy Specialists carry the largest inventory of digital tape and hard disk recorders anywhere. Most notably the Mitsubishi X-880, X-850, X-86HS, Sony 3348, 3324, 1630, and AMS AudioFile V. For classic tube buffs, our selection of equalizers, limiters and microphones is unrivaled. MIDI is our middle name. We stock a full line of computers, synthesizers, drum machines, synchroniz-

THE TOY SPECIALISTS

THE TOY SPECIALISTS
New York, NY

ers and interface boxes. Some of our most recent clients include Madonna, Joe Jackson, Yes, David Bowie and Eddie Murphy.

WPS Washington Professional Systems
Audio-Video Systems

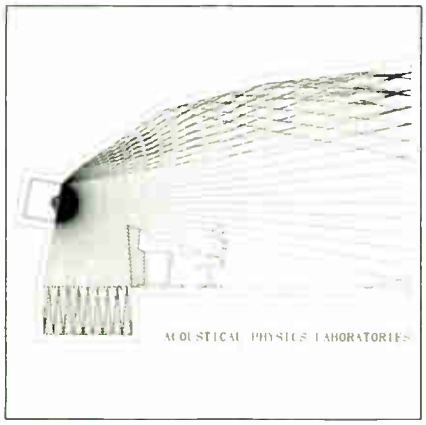
WASHINGTON PROFESSIONAL SYSTEMS
Wheaton, MD

WASHINGTON PROFESSIONAL SYSTEMS; *SD, AC, SES, EI, MR*; 11157 Veirs Mill Rd.; Wheaton, MD 20902; (301) 942-6800; FAX: (301) 946-3241. Contact: Greg Lukens, Rob Forman. Services/Specialization: Washington, DC's prime source for technical know-how and the proper hardware to solve your audio needs. We specialize in analog and digital recording systems, audio-for-video, synchronization and editing systems. WPS maintains a staff of design, construction and installation professionals to supply our clients with the complete turnkey installation. Manufacturers we represent are Sony Professional Audio, Lexicon Advanced Products, Dolby, Dyaxis Digital Audio, JBL/Soundcraft/UREI, TimeLine, Alpha Boss/2, Otari, JVC, Meyers, Tannoy, Soundtracs, AMS, Tascam ATR Series, Eventide, Aphex, BSS, Neumann, Bruel & Kjaer. Among our clients are Peabody Conservatory of Music, Groupe Andre Perry, Omega Audio, Premier Recording, Soundsters, Sheffield A-V, Hit & Run Studios, NFL Films and Maryland Public Television. We have recently completed an upgrade to the audio sweetening room at Henniger Video including the installation of the area's first Lexicon Opus random-access digital audio editing system.

SOUTHEAST

Alabama, Florida, Georgia, Kentucky
Louisiana, Mississippi, North Carolina, South
Carolina, Tennessee, Virginia, West Virginia

ACOUSTICAL PHYSICS LABS; *SD, AC, SES, EI, MR*; 3877 Foxford Dr.; Doraville, GA 30340; (404) 934-9217. Contact: Bill Morrison. Services/Specialization: Acoustical Physics Laboratories specializes in the design, analysis and installation of control rooms, studios and monitoring systems. Through the use of TEF® System 12 computer analysis, dual-channel FFT measurements, CADD acoustical models and acoustical scale models, high accuracy designs are developed, installed and performance certified. Control rooms and monitoring systems are designed for first arrival frequency and time domain accuracy. Each design incorporates correct room/monitor/console/equipment geometry combined with spec-



ACOUSTICAL PHYSICS LABS
Doraville, GA

trally accurate diffusion and absorption to achieve room monitoring accuracy. Acoustical Physics Laboratories designs, supplies and installs high-accuracy monitoring systems that incorporate cone and soft dome drivers in time-correct 3-way alignments. This proven approach to monitor system design results in the highest levels of time and frequency domain accuracy combined with the lowest levels of distortion and coloration. All designs are CADD prepared and presented in precision architectural E-size drawings with written, detailed specifications. Hard copy TEF® computer plots document all stages of design work from the initial model testing to the monitor design and the final installation. Installations include recording studios, video and film production facilities, theaters, auditoriums, concert halls and churches.

AMERICAN AUDIO, INC.; *AC, EI, MR, ER*; PO Box 1719; Ruston, LA 71270; (318) 251-0290. Contact: James F. Young.

API AUDIO PRODUCTS, INC.; *SES*; 7951 Twist Ln.; Springfield, VA 22153; (703) 455-8188. Contact: Paul Wolff, Kevin Raynor. Services/Specialization: API features a complete line of all-discrete audio products from the 550B modular equalizer and the 512B modular mic preamp to complete, all-discrete consoles.

M.A. BENINGTON, INC.; *SES, EI*; 2459 Cuchura Dr.; Birmingham, AL 35244; (205) 988-0707. Contact: Mike Benington.

BIG BEAR AUDIO VIDEO, INC.; *SES, EI, MR, ER*; 1419 E. Second St.; Sheffield, AL 35660; (205) 381-6812. Contact: Lane Sutherland, Larry Sutherland, Peter Akers.

BLEVINS AUDIO EXCHANGE, INC.; *SES, EI, MR, ER*; 1717 Elm Hill Pike, Ste. B-8; Nashville, TN 37210; (615) 391-0429; FAX: (615) 391-0456. Contact: Randy Blevins, Steve Howell.

COMMUNICATIONS ENGINEERING, INC.; *SD, AC, SES, EI, MR*; 4228 King St.; Alexandria, VA 22302; (703) 379-0711. Contact: Carlos Fernandini, Larry Brody. Services/Specialization: Engineering/management and technology consultation to the communications industry. Engineering technical design, fabrication and installation of communications systems, from small audio/video rooms to television, editing, production and post-production, teleconferencing, satellite, microwave systems, acoustics design. Extensive use of CAD/CAE (computer-aided design/computer-aided engineering) and computerized management tools from start to finish of projects. Turnkey installations.

DREAMHIRE; *ER*; 1217 16th Ave. South; Nashville, TN 37212; (615) 321-5544; FAX: (615) 321-0928. Contact: Patty Sprague. Services/Specialization: Dreamhire in Nashville opened for business during October 1988, being the first rental operation to carry a substantial inventory of equipment in "Music City." Patty Sprague, who manages the operation, was tracked down by Chris Dunn shortly after arriving from London, England, to set up rental offices in Nashville and New York City to complement the already-established UK operation. Patty has some years' experience in the pro audio rental world and is very familiar with Nashville and the Southeast and its particular needs. Equipment carried in Nashville includes an Otari DTR-900 32-track digital recorder, a Studer A827 24-track analog machine, a 12-channel Focusrite sidecar desk with SSL Logic interface and a 24-channel Dolby SR package. Also stocked are DAT recorders, tube and solid-state equalizers and compressor/limiters, vintage tube microphones and a large selection of digital effects units. 24-hour, year-round service.

DREAMHIRE
Nashville, TN

STEVEN DURR AND ASSOC.; *SD, AC*; 6216 Bresslyn Rd.; Nashville, TN 37205; (615) 352-0218; FAX: (615) 352-3346. Contact: Steve Durr.

D. HAYES & ASSOCIATES; *SD, AC, SES, EI, MR, ER*; 2922 Monterrey Blvd. #134; Baton Rouge, LA 70814; (504) 275-6463. Contact: Darrel Hayes, Bridget Hayes.

M.L.W. SYSTEMS; *SD, AC, SES, EI, MR, ER*; PO Box 8651; St. Thomas, VI 00801; (809) 774-7341. Contact: Milton L. Wuisehpard.

NATIONAL SOUND ENGINEERING; *SD, AC, SES, EI, MR*; 6500 McDonough Dr., C-9; Norcross, GA 30093; (404) 447-0101; (800) 541-9140; FAX: (404) 447-1355. Contact: Tom Hayward. Services/Specialization: Unlike music stores that offer very little in the way of acoustical or technical skills, we provide a broad base of recording, broadcast and video equipment lines. This is coupled with a "second to none" warranty program and a genuine knowledge of acoustical

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SOUTHEAST

& DESIGNERS

—CONTINUED FROM PREVIOUS PAGE

NATIONAL SOUND ENGINEERING
Norcross, GA

criteria, which we are not too proud to share with you. Whether your needs are as simple as a cassette or R-DAT to the complexity of an audio/video multitrack production studio, we'll be right beside you from start to finish. Design, equipment, installation, service. Let us make your dream come true. . . NSE.

NES NELSON ELECTRONIC SYSTEMS, INC.; *EI, MR*; 1600 S. Oates St., PO Drawer 2245; Dotham, AL 36302; (205) 793-7797; FAX: (205) 792-8913. Contact: Ed Nelson.

GASTON NICHOLS PROFESSIONAL AUDIO SERVICES; *SD, AC, EI, MR*; 5337 5th Terrace S.; Birmingham, AL 35212; (205) 591-7346. Contact: Gaston Nichols.

RELIABLE MUSIC
Charlotte, NC

RELIABLE MUSIC; *SES, EI, MR, ER*; 650 E. Stonewall St.; Charlotte, NC 28202; (704) 375-8662. Contact: Tom Fonner, Bill Evans, Tim Dixon, Don Kendrick, Gray Peck. Services/Specialization: Reliable Music has been serving pro audio and music retail needs in the Southeast for over 25 years. We have a progressive staff with hands-on experience in sound reinforcement, tape recording and broadcast equipment. Our keyboard division is thoroughly versed in MIDI applications for recording and live performance. We offer major brands and we have five factory-trained technicians in-house for prompt service on the equipment we sell. Our installation crews specialize in church, club and studio systems. For information on recording and broadcast equipment, contact Tom Fonner; for sound reinforcement, contact Bill Evans; and for sound installations, contact Don Kendrick at (704) 375-8662, Monday-Saturday 10 a.m.-6 p.m.

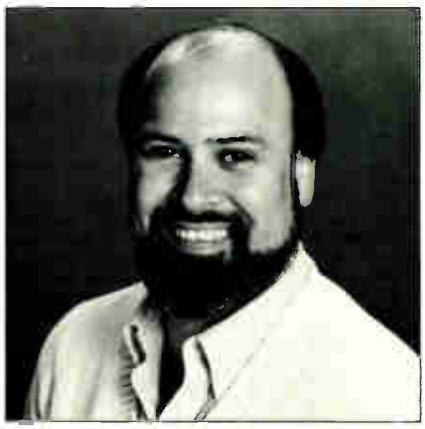
SOUND ADVICE; *SD, SES, EI, MR*; 111 39th St. N.; Birmingham, AL 35222; (205) 592-4555. Contact: Noah L. White, Barry Bailey.

STAGE & STUDIO CONSTRUCTION SERVICES, INC.; *SD, AC, SES, EI*; 1002 Wake Forest Rd.; Raleigh, NC 27604; (919) 834-6380. Contact: Gregory B. Shriver, president.

STUDIO SUPPLY COMPANY, INC.; *SD, AC, SES, EI, MR, ER*; 1717 Elm Hill Pike, Ste. B-9; Nashville, TN 37210; (615) 391-0050; FAX: (615) 391-4092. Contact: John Alderson, Linda Buchanan, Terry Palmer.

STUDIOWORKS
Charlotte, NC

STUDIOWORKS; *SD, AC, SES, EI, MR*; 1018 Central Ave.; Charlotte, NC 28204; (704) 375-1053; (800) 438-5921. Contact: Mike Edwards. Services/Specialization: Studioworks is the team with working experience in recording and pro audio. Studioworks is closely associated with Reflection Sound Studios, which means you can talk with the people who have actual session experience with the equipment they sell and real-world experience in studio acoustics (both design and construction). Studioworks has supplied recording companies all over the country and has been a leader in sales of consoles and full turnkey systems. In fact, over 60 session-proven lines of equipment and supplies are available. We also offer complete consultation about systems for recording film sound, broadcast, theater sound and sound contracting. Studioworks is very interested in helping the "Artist Studio" get a good start as well as building multimachine 24-track complexes. We want to begin a long-term relationship with your company and back it with experience.



TODRANK RAYMOND ASSOCIATES
Nashville, TN

TODRANK RAYMOND ASSOCIATES; *SD, AC*; PO Box 290125; Nashville, TN 37229; (615) 885-6553; FAX: (615) 883-3944. Contact: Bob Todrank. Services/Specialization: 20 years industry experience. TEC Award winner for studio design. Prompt, efficient and individualized services. Specializing in studio and technical facility design; pro audio systems consulting; acoustical consulting services; RPG & LFD diffusion; custom monitoring systems; traditional as well as LEDE® design concepts; technical documentation services. Exclusive U.S. distributor of the Boxer, all soft-dome control room monitoring systems. Recording studio monitoring evaluations and recommendations. On-site TEF®, TDS and ⅓-octave analysis services. Full computer-aided design and drafting facilities. Equipment selection assistance. Acoustical consultation services for architects. Latest projects include the Federal Bureau of Investigation; The Reel Thing, Pyramid Recording and Cook Sound Studios. All services are available internationally.

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NORTH CENTRAL & DESIGNERS

Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin

AUDIO CREATIONS/ALS; *SD, AC, SES, EI, MR, ER*; 5 West Waterloo; Canal Winchester, OH 43110; (614) 837-1936. Contact: Chet Hall

AUDIOLINE, INC.
Waukesha, WI

AUDIOLINE, INC.; *SD, AC, SES, EI, MR, ER*; 2323 J Bluemound Rd.; Waukesha, WI 53186; (414) 785-9166. Contact: John Loeper, president; Doug Mitchell, sales manager. Services/Specialization: AudioLine is a full-service professional audio dealer serving recording studios, broadcasting stations, post-production facilities and corporate media/production rooms. We provide the finest in audio consultation, studio designs, equipment (over 120 pro manufacturers represented) and complete turnkey installations. What sets AudioLine apart from the other dealers is our commitment to service. You'll benefit from our extended warranties, equipment lending, renting and trading services, financing and leasing packages, educational seminars, and our complete service department. Before you make a decision on any equipment, call AudioLine. We'll put over ten years of pro audio experience to work for you.

AUDIOLINE, INC.; *SD, AC, SES, EI, MR, ER*; 1238 West Columbia #2; Chicago, IL 60626; (312) 274-0330. Contact: Brian Bristo, branch manager.

AUDIOLINE, INC.; *SD, AC, SES, EI, MR, ER*; 4049 Pennsylvania, Ste. 100; Kansas City, MO 64111; (816) 931-9166. Contact: James "Ham" Strawn, branch manager.

FULL COMPASS SYSTEMS LTD.; *SD, AC, SES, EI, MR, ER*; 6729 Seybold Rd.; Madison, WI 53705; (608) 271-1100. Contact: Jeff Lipp.

HY JAMES—THE AUDIO PROFESSIONALS
Farmington Hills, MI

HY JAMES—THE AUDIO PROFESSIONALS; *SD, SES, EI, MR*; 24166 Haggerty; Farmington Hills, MI 48024; (313) 471-0027; (800) 875-5550. Contact: Henry Root, Tom Greenberg, Jay "Hot Sam" Barth. Services/Specialization: Digital audio—Otari DTR-900, Lexicon Opus, Dyaxis workstations, Yamaha DMP7D mixer, R-DAT by Sony, Fostex, Casio and Ramsa. Analog tape recorders—full line Otari, Fostex and Nakamichi. Synchronizing systems from TimeLine and Fostex. Mixing consoles—Harrison, Soundcraft, Ramsa and more. Signal processing—Lexicon, Yamaha, Eventide, UREI/JBL, Symetrix, Valley and dbx. Monitors—JBL, Tannoy, PAS, Digital Designs and Yamaha. Microphones—Neumann, Beyer, Tram and Audio-Technica. Hy James is a support- and service-oriented professional audio supplier with carefully chosen equipment to serve our clients' requirements.

ICB AUDIO COMPANY
Cincinnati, OH

ICB AUDIO COMPANY; *SD, AC, SES, EI, MR, ER*; 1349 E. McMillan; Cincinnati, OH 45206; (513) 281-5535. Services/Specialization: ICB Audio is a full-service, cost-conscious professional audio and video dealership. We carry over 100 leading brands of audio and video equipment suitable for recording studios, broadcast, video production, industrial, sound reinforcement and home applications. Our services extend way beyond equipment sales. We provide a very high

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level of service to our customers including equipment repair and on-site maintenance. We offer consultation services, education and design assistance in many states and outside the U.S.A. Each of our sales associates works regularly as an end user of the products we supply (musician, sound engineer, etc.) so when you talk to us, you know we understand your needs. Call us today for more information. Sales (513) 281-5535. Service (513) 281-3629 weekdays 10 a.m. to 6 p.m. EST

IRC AUDIO, INC.
Indianapolis, IN

IRC AUDIO, INC.; *SD, SES, EI, MR*; 8112 Castleway Ct. West; Indianapolis, IN 46250; (317) 849-6887. Contact: Paul Chadwick, Kevin Meeks. Services/Specialization: Complete studio packages, featuring Tascam and Otari tape machines, are our specialty. Everything from small self-contained 4-tracks to Otari MX-80s in stock and ready for demo in our demo control room. New AMR Production Series consoles in stock. Support equipment from JBL, UREI, Tannoy, Crown, KEF, dbx, Valley Audio, Alesis, AKG, Beyer, Carver, Soundcraft, Ramsa, TAC, DDA, Yamaha, Nakamichi, Shure, Symetrix, Audio Logic, E-V and many others. We also offer custom-designed sound reinforcement systems for any application.

JAMIESON AND ASSOCIATES, INC.; *SD, AC*; 5200 Willson Rd. #300; Minneapolis, MN 55424; (612) 920-3770. Contact: Dan Cincoski, director sales and marketing.

LINNEMANN SOUND, INC.; *SD, AC, SES, EI, MR, ER*; PO Box 452, 1020 Somonauk St.; Sycamore, IL 60178; (815) 895-8219. Contact: Terry Linnemann.

PI KEYBOARDS & AUDIO, INC.; *SES, EI, MR, ER*; 2121 Brookpark Rd.; Cleveland, OH 44134; (800) 541-2733. Contact: Joe or Dave. Services/Specialization: Pi Keyboards & Audio, Inc. has been specializing in supplying pro audio and keyboard equipment to the Ohio region since 1974. Our sales staff is among the area's most experienced in terms of combining recording technology with keyboard technology, namely MIDI/SMPTE interfacing and synchronization. We supply Otari, Tascam, Nakamichi and Fostex recorders; Soundcraft, Tascam, Studiomaster, DDA and Yamaha consoles; E-mu, Ensoniq, Akai, Kurzweil and Yamaha keyboards; all MIDI software; TCE, BBE, Eventide, Rane, dbx, ART, Lexicon, Valley, Aphex and Yamaha processing; JBL, UREI, Tannoy and Yamaha monitors. These products may be auditioned in our working showrooms. Our service department provides warranty and nonwarranty service on all brands that we sell. The speaker reconing department is the area's finest. We offer discount prices yet maintain full after-sale support. Many items are available for rent. Join the many satisfied Pi customers by giving us a call now!

PRO-TECH SERVICES, INC.; *SD, AC, SES, EI, MR*; 1922 Fargo; Des Plaines, IL 60018; (312) 699-8937. Contact: David Jack.

PYRAMID AUDIO, INC.; *SD, SES, EI, MR, ER*; 450 W. Taft Dr.; South Holland, IL 60473; (312) 339-8014. Contact: Rob Vukelich.

QUALITY SOUND DESIGN/CONSTRUCTION; *SD, AC, SES, EI*; 3215 Wild Horse Dr., PO Box 128; Foristell, MO 63348; (314) 673-2577. Contact: Gerard M. Quinn, Gary Manuel. Services/Specialization: Quality Sound has been influential in creating world-class acoustical environments for over a decade, specializing in design and construction of state-of-the-art video and audio recording studios, soundstages and pro listing rooms. Our work has taken us across the country, renovating older facilities and constructing new ones. We have designed and constructed such projects as "United Press International's World Headquarters" in Washington, DC, and "Jimmy Swaggart's World Headquarters" Baton Rouge, Louisiana. We have built surroundings that workers find aesthetically pleasing and conducive to work, without losing sight of the needs of the building owner. We provide quality working space to meet everyone's needs. Quality Sound is interested in working directly with the studio owner in designing new state-of-the-art audio/video complexes or remodeling your existing facility. So if you're looking for the most qualified acoustical contractor, give us a try. See why the professionals have.

RENT FX/SG AUDIO; *ER*; 445 W. Erie, Ste. 201; Chicago, IL 60610; (312) 266-1901; FAX: (312) 266-1904. Contact: Chris Kirby, Larry Schara, Sue Gosstrom.

SG AUDIO/RENT FX; *SES, MR*; 445 W. Erie; Chicago, IL 60610; (312) 266-1901; FAX: (312) 266-1904. Contact: Larry Schara, Sue Gosstrom, Chris Kirby. Services/Specialization: Larry Schara and Sue Gosstrom are proud to announce the opening of the Midwest's newest pro audio equipment facility. Centrally located in the River North section (just north of the Loop) in Chicago, SG Audio will be offering sales, service and rentals of some of the finest pro audio equipment and supplies available. At the present time SG Audio represents about 40 product lines, but this number will be growing at a steady rate to bring you the newest products available. In addition, a fine selection of used equipment will be available. If you are looking for a particular piece give us a call or FAX. SG Audio's in-house service, installation and modification of all pro audio equipment including digital and analog tape machines, synchronizer and automation systems, consoles and processing equipment. Service is available at SG Audio or on site. The service department will also be introducing new products such as tape machine hour meters (currently available). SG Audio has also joined forces with the Rent FX organization to bring you a large selection of rental equipment all under one roof. If you have anything you need or have any questions, please give us a call, FAX or drop in.

STEPHCO CONSTRUCTION, INC.; *AC, EI*; PO Box 351, 8605 E. 116th St.; Fishers, IN 46038; (317) 849-2844. Contact: Charles Ballard.

J.M. STITT & ASSOCIATES, INC.
Cincinnati, OH

J.M. STITT & ASSOCIATES, INC.; *SD, AC*; PO Box 14585; Cincinnati, OH 45214; (513) 621-9292; FAX: (513) 241-8896. Contact: James Stitt. Services/Specialization: Award-winning custom studio and facility design services, including architectural, acoustical, electrical, lighting, mechanical/HVAC, interior aesthetic and ergonomic designs and construction management. We specialize in the latest state-of-the-art LEDE® rooms, new or refurbished, tailored to your budget, serving the recording, broadcast and AV teleproduction industries. Acoustic and technical consultation including innovative systems design, impartial equipment selection, computer-aided design and room analyses and Techron TEF® and other audio measurements. Our design team, each with 15-plus years experience in their respective fields of expertise, possess a unique sensitivity and ability to combine the diverse needs of the owner, client, producer, musician and engineer into a harmonious, successful facility.

STUDIO DESIGN COMPANY/TUBE TRAPS; *SD, AC, EI*; 2247 Glenview Rd.; Glenview, IL 60025; (312) 657-7787. Contact: Sam Lynn.

WAB SYSTEMS; *SES, EI, ER*; 3908 54th St.; Des Moines, IA 50310; (515) 253-9924. Contact: Gary.

SOUTHWEST

Arizona, Arkansas, Las Vegas, New Mexico, Oklahoma, Texas

D.P. AYYAPPAN, CONSULTANTS IN ACOUSTICS; *SD, AC*; 1908 University Dr.; Richardson, TX 75081; (214) 644-2130. Contact: D.P. Ayyappan.

SOUTHWEST

& DESIGNERS

EAR PROFESSIONAL AUDIO VIDEO; 2641 E. McDowell Rd.; Phoenix, AZ 85008; (602) 267-0600. Contact: John Gibson, Tim Delaney. Services/Specialization: Sales, service, design and installation of professional recording, audio/video production and music scoring systems and facilities. EAR has been servicing the professional production and home recording market for over 10 years and enjoys one of the finest reputations nationwide for quality service and competitive pricing of audio, video and MIDI products. The company features a "Total Technology" approach to system design by specializing in the full integration of the latest audio/video/MIDI technology. The ability to offer such a broad and diverse range of products along with an experienced sales staff has established EAR Professional Audio/Video as one of the most comprehensive facilities of its kind anywhere. Authorized sales and service for: Otari, Trident, Sony, Yamaha, Tascam, Fostex, JVC, Soundcraft, Adams-Smith, Ampex, Roland, Neotek and over 100 other major audio/video/MIDI product lines.

E/F & ASSOC.; *SD, AC, EI*; 2235 Aspen; Dallas, TX 75227; (214) 388-4205. Contact: Jim Evans.

HARDIN ELECTRONICS; *SES, MR*; 5635 E. Rosedale St.; Fort Worth, TX 76112; (817) 429-9761. Contact: John Cordas. Services/Specialization: When you think of studio equipment, think of Hardin Electronics. Hardin has over 200 lines of pro audio and studio equipment and supplies. Lines such as AKG, dbx, Eventide, Fostex, JBL, Lexicon, Soundcraft and Yamaha. We stock bulk cassettes and Ampex 456 tape in many configurations through 2-inch. Are you considering a studio upgrade? In addition to the usual audio upgrade capability (mixer, recorder, f/x, monitors), Hardin specializes in equipment for audio-for-video, disk-based recording and digital mastering. We understand computers, integrating them into the studio or performance environment, being both Apple and Atari Mega dealers. Perhaps you're interested in studio automation or an integrated MIDI stack using SMPTE synchronization. We can help you with studio design and configuration and offer value-enhancing studio packages. Whether you're a large or small studio, give us a call and tell us your needs and interests.

THE JOINER-ROSE GROUP, INC.; *SD, AC*; 4125 Centurion Way, Dallas, TX 75244; (214) 392-7800; FAX: (214) 991-3781. Contact: Russ Berger, vice president. Services/Specialization: The Joiner-Rose Group is a full-service acoustical design/consulting firm that has accomplished over 400 recording and broadcast facility projects with over 4,200 total projects. In the area of broadcast facilities, clients have included NBC-NY, WUSA-DC, WBGO-Newark, WJHU-Baltimore, KPLX/KLIF-Dallas, Group W and GTE. Recording studio clients include Zomba—NY, Digital Services—Houston, Spectrum—Portland, Dallas Sound Lab, Chicago Recording, Blue Jay—Concord, Sound Stage—Nashville, Streeterville—Chicago, Different Fur—San Francisco and 39th Street—NY. Some film and video facilities clients are NFL Films, TAJ Soundworks—L.A., AMC, General Cinema, United Artists, Lucasfilm, Disney, LimeLite—Miami, AT&T, TeleImage—Dallas, Middle Tennessee State University, GTG/USA Today—DC—Chicago—Culver City, DLM/Argus Communications and GTN-Detroit. Other client names you may recognize: Chrysler, Bell Labs, Texas Instruments, Pennzoil, Prudential, Showco, Motorola, EDS, 3M, Marriott Corp., Arco, IBM, Firestone, Johnson & Johnson, IRS, Lockheed, SOHIO, American Airlines, Texaco, U.S. Postal Service, Army, Navy, and Air Force, Xerox, GM, Exxon, USDA, Mastercard and more.

L.D. SYSTEMS, INC.; *SES, EI, MR*; 467 W. 38th St.; Houston, TX 77018; (713) 695-9400. Contact: Bruce Coffman. Services/Specialization: Full line of equipment and services offered. Professional products include Otari MTR-10/90II, Amek, Tascam, Adams-Smith and others. Complete and functional showroom facility for all products as well as on-location demonstration if desired. Total service support for all products represented. Design and consulting services are available.

STUDIO SUPPLY COMPANY—DALLAS OFFICE; *SD, SES, EI, MR, ER*; 9978 Monroe Dr., Ste. 304; Dallas, TX 75220; (214) 358-0050. Contact: Leland Burns.

NORTHWEST

Alaska, California, Colorado, Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming

ACES/TUBE TRAPS; *SD, AC, SES*; 1909 Judah St.; San Francisco, CA 94122; (415) 661-4143. Contact: Paul Stubblebine.

DAN ALEXANDER AUDIO; *SES, ER*; 2944 San Pablo Ave.; Berkeley, CA 94702; (415) 644-2363. Contact: Dan Alexander. Services/Specialization: In the recording business since 1976, providing audio esoterica as well as the industry standards to the the major recording facilities in the U.S. Thousands

of clients include Ocean Way, Sunset Sound, Criteria, A&M, Unique, all three Record Plant Studios, Fantasy, Toto, Prince, The Jacksons, Michael McDonald, Van Halen, Merle Haggard, etc. Dan Alexander Audio has sold more Pultec and Lang equalizers, more LA-2A and Fairchild limiters, more Neumann and AKG tube microphones, more API consoles and more Telefunken 251s than any other used audio dealer on the planet! We buy, sell and trade used audio equipment of all types: recorders, consoles, outboard gear and everything else. We can get you almost anything you want—and we can save you money! We have just opened a retail store in Hollywood. You can still reach our San Francisco office. Make us an offer we can't understand, please!

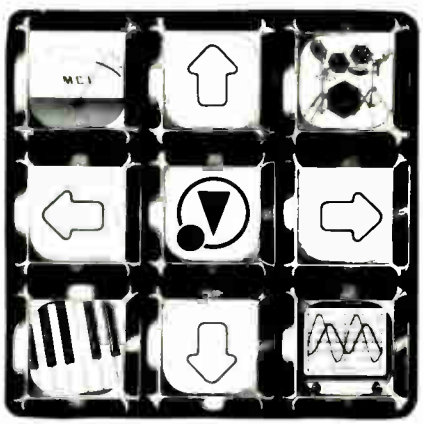
AUDIO IMAGES CORP. (AIC); *SD, AC, SES, EI, MR*; 70 Oakgrove St.; San Francisco, CA 94107; (415) 957-9131. Contact: Jim Chen

FRANK HUBACH ASSOCIATES
Richmond, CA

FRANK HUBACH ASSOCIATES; *SD, AC*; 2700 Rydin Rd., Ste. F; Richmond, CA 94804; (415) 528-1505; FAX: (415) 528-1509. Contact: Frank Hubach. Services/Specialization: FHA offers a unique blend of experience, skill and instrumentation for the design and testing of all types of studios, performance spaces and listening rooms. We are a professional partnership of consultants in acoustics, vibration and sound system design with no products to sell and no rigid design philosophy. Our partners have backgrounds in recording, electronics, video, live performance audio, music, structural and mechanical engineering and the construction industry. We also have experience as professional musicians and recording artists. FHA's laboratory has the finest instrumentation from Bruel and Kjaer. So, whether your project is large or small, complex or "no frills," you should consider our services: design, design review, HVAC noise control, noise and vibration control, room acoustics, site evaluation, sound systems, specification and testing. Previous clients include The Record Plant, Bill Graham Presents, FM Productions, Jefferson Starship, Alice Cooper and The Automatt.

KIMBER KABLE; *SES*; 2675 Industrial Dr.; Ogden, UT 84401; (801) 621-5530. Contact: Ray Kimber, Jeff Young. Services/Specialization: High-performance audio cables. Speaker cables, interconnects and microphone cables designed for pro and studio use. Call or write for more information.

LEFT MINUS RIGHT AUDIO; *SD, AC, SES, EI, MR*; 510-B S. Murphy Ave.; Sunnyvale, CA 94086; (408) 773-9793; (415) 960-4260. Contact: Marty Preece, engineer.



LEO'S AUDIO AND MUSIC TECHNOLOGIES
Oakland, CA

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Circle #081 on Reader Service Card

AES/New Products IN THE October Mix

Audio in the '90s

HDTV Update

NY Recording History

Our biggest issue of the year—with new products for 1990. Also, a grounding primer and trends in retail sales.

Bonus distrubution at AES in New York City, Oct. 18-22; SMPTE Technical Conference in L.A., Oct. 21-25.

Ad Closing: August 8
Materials Due: August 15

Chicago to Canada IN THE November Mix

North Central Recording

Console Developments

Acoustic Recording

Mix travels to America's heartland, then into Canada for a look at recording. Also, mixing consoles and techniques for recording acoustic instruments.

Directories of Canadian and North Central U.S. recording studios.

Ad Closing: Sept. 8
Materials Due: Sept. 15

NORTHWEST & DESIGNERS

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LEO'S AUDIO AND MUSIC TECHNOLOGIES; *SD, AC, SES, EI, MR*; 5447 Telegraph Ave.; Oakland, CA 94609; (415) 652-1553. Contact: Rosemary Rodd, Ron Webb. Services/Specialization: Sales, service and installation of Sony Professional Audio products, Tascam and Tascam ATR series equipment and Apple Macintosh-based digital workstations. Virtually every major brand of professional recording, broadcast and sound reinforcement equipment is represented by Leo's. Extensive inventory of keyboards, synthesizers, computers and software for studio and stage use. Leo's maintains four showrooms, including a working 24-track control room, and is uniquely able to demonstrate the complete product lines of over 120 manufacturers. Our sales staff is particularly attuned to the marriage of multitrack audio, computers and keyboards. Factory-trained service is available on most product lines.

LISTENUP PROFESSIONAL DIVISION; *SES, EI, MR*; 999 S. Logan St.; Denver, CO 80209; (303) 778-0949. Contact: Norm Simmer. Services/Specialization: ListenUp is a full-service pro audio/video dealer that has been serving the Rocky Mountain region for over 15 years. You'll find everything you need at consistently the lowest prices. ListenUp represents more than 100 manufacturers like: Allen & Heath, Auratone, Ampex, AKG, Biamp, BBE, Bose, Cetec-Vega, Crown, DeltaLab, DOD, E-V, Eventide, Fostex, Furman, Hafler, HME, JBL, JVC Klipsch, Lexicon, Nakamichi, NEC, Neumann, Numark, QSC, Shure, Soundcraft, Tascam, UREI, Yamaha and more. Our service department is factory trained, and our analysis equipment includes: Crown/Techron TEF® System-12, IVIE RTA and the Sound Technology tape recorder test system. Our experienced and knowledgeable sales and technical staff, and the finest selection of products, have made ListenUp the premier professional dealer in the Rocky Mountain region.

LUDE BROADCAST ENGINEERING
San Francisco, CA

LUDE BROADCAST ENGINEERING; *SD, EI, MR*; 458 Brannan St.; San Francisco, CA 94107; (415) 543-1300. Contact: Karyn Cap. Services/Specialization: Lude Broadcast Engineering is a design and installation firm providing high-quality, cost-effective audio-for-video facilities of all sizes. Services include designing operator-friendly systems using existing equipment, or consultation in specifying the appropriate new hardware. Custom equipment modifications and design is also available. Regardless of the size of the facility, Lude Broadcast Engineering installs all systems with logical design, impeccable craftsmanship and complete documentation. Specializing in video post-production, audio sweetening, broadcast control and mobile units, recent projects have ranged from state-of-the-art video disc premastering edit systems to modest cuts-only edit suites, and from mobile EFP units to broadcast studios. Clients have included commercial and noncommercial television stations, corporate media centers, educational and government institutions, production houses, equipment manufacturers and cable TV operators.

MCTECH ASSOCIATES; *SD, AC, EI, MR*; 484 Lake Park Ave., Ste. 341; Oakland, CA 94610; (415) 848-7917; (415) 528-7132. Contact: Mack Clark, Tim McGovern. Services/Specialization: McTech Associates offers audio design, engineering and technical support services for the film, video and recording industries of Northern California. We serve commercial recording studios as well as private recording and pre-production facilities designed around the professional musician or sound designer. Keeping in step with advancing

MCTECH ASSOCIATES
Oakland, CA

technology enables us to assist our clients to make the most informed decisions regarding the latest developments in studio design, system interfacing, video/film post systems, MIDI systems, synchronization, digital equipment and more. We provide technical support to suit your style of operation, whether you require a modification, renovation or complete system design. We are grateful for the good faith and confidence of our clients: Different Fur, Alpha & Omega, Soma Sync Studios, Frankie Beverly, Atlanta Productions, One Pass Video, Solid State Logic, Lucasfilm Ltd., Groupe Andre Perry, Spark, Zoetrope and others.

MENLO SCIENTIFIC; *AC*; 39 Menlo Pl.; Berkeley, CA 94707; (415) 528-1277. Contact: Michael Klasco.

MILOVICH GENERAL CONTRACTING; State License #396429; 140 Norlyn Dr.; Walnut Creek, CA 94596; (415) 944-9864. Contact: Steve Milovich.

MIRROMERE AUDIO
Wheatridge, CO

MIRROMERE AUDIO; *SD, AC, SES, EI, MR, ER*; 7150 W. 38th Ave.; Wheatridge, CO 80033; (303) 431-2348. Contact: Ron Oren. Services/Specialization: Full line of professional audio sales, service and installation. Complete acoustical design and consultation services from blueprint to hard copy analysis for recording studios, broadcast, multiuse facilities and touring reinforcement. Standard line and custom panel manufacturers. Installations hardware manufacturers and suppliers. High-quality loudspeaker cabinetry manufacturing of proprietary systems or industry standards. Studio furniture systems for recording, broadcast and touring packages. Complete maintenance, modification and reconing facility with factory-trained technicians. Supplier of magnetic tape ¼" to 2", analog or digital. Analysis equipment featuring Bruel & Kjaer, Crown, IVIE, Neutrik and Sound Technology. Audio production and test equipment rentals available. Innovative approach to the implementation of audio systems with 20 years of practical application.

RICHARD J. MOORE, PH.D., ACOUSTICS & TECHNICAL AUDIO; *SD, AC, EI, MR*; PO Box 2206; Novato, CA 94948; (415) 897-6462. Contact: Richie Moore, Ph.D. Services/Specialization: Studio design, acoustics design and consultation, equipment evaluation and installation and maintenance from a musician and mixer's point of view. Over 20 years experience as a mixer and producer, with the past ten years specializing in the design, construction and maintenance of musicians' studios. Small studios are a specialty. Use of acoustic CAD programs called ACOUSTICALC work out most problems in room design. My goal is systems that work if I were mixing myself. Some of the studios I have done include Studio D Recording and Gate Five Studios in Sausalito, CA; R.O. Studio and ATR Studios in Contra Costa; and home studios for Johnny Colla and Bill Gibson of Huey Lewis and the News and Johnathan Cain of Journey. We don't sell equipment, so studios are put together to the taste of the client. After all, in recording, it is "how it feels."

MORGAN SOUND, INC.; *SD, AC, SES, EI, MR, ER*; 2004 196th SW, Ste. 2; Lynnwood, WA 98036; (206) 771-7257. Contact: Charlie Morgan. Services/Specialization: Specializing in Sony sales and service. Complete listing of support electronics and equipment for sound reinforcement and studios. Rental contacts available for Sony Digital Recorders. Outboard processing and microphones available for rental; call for quotes. Complete repair facility on-site for electronics and speakers. Complete stock of analog and digital tape.

PAOLETTI/LEWITZ/ASSOCIATES, INC.; *SD, AC*; 40 Gold St.; San Francisco, CA 94133; (415) 391-7610; FAX: (415) 391-0171. Contact: Chips Davis, Kurt Graffy. Services/Specialization: Chips Davis and Kurt Graffy lead the Paoletti/Lewitz/Associates Inc. design team for studios, control rooms and post-production facilities. Chips was the recipient of *Mix* magazine's 1987 International award for Technical Excellence and Creativity in Acoustics and Studio Design, an accolade he duly deserves, having pioneered the LEDE® (Live End/Dead End) concept that is now commonly applied to studios and control rooms by most knowledgeable designers. Our designers have extensive hands-on experience evaluating sound environments and mixing for records, television and live performances. They are also highly recognized as authorities on the practical use of acoustic energy control and TEF® (Time Energy Frequency) measurements for recording, broadcast, post-production and home listening environments. Chips is frequently sought after to design, evaluate and improve studio facilities based on clients having experienced sound produced in rooms that he has designed. Paoletti/Lewitz/Associates, Inc. has provided acoustical and audio-visual consulting services on more than 1,900 projects throughout the United States and abroad during the past thirteen years. A broad-based staff of twenty have backgrounds in architecture, mechanical and electrical engineering, theater and audio. A fully equipped laboratory includes highly sophisticated instrumentation for the measurements and evaluation of sound.

PERFORMANCE AUDIO; *SES, EI, MR, ER*; 2358 S. Main; Salt Lake City, UT 84115; (801) 466-3196. Contact: Klay Anderson.

MICHAEL PFOHL ASSOCIATES DESIGN A.I.A./A.S.I.D.; *SD, AC, EI*; 1128 Alder, Ste. C; Eugene, OR 97403; (503) 342-2844. Contact: Michael Pfohl.

RLS ACOUSTICS
San Francisco, CA

RLS ACOUSTICS; *SD, AC*; 300 Brannan St., Ste. 610; San Francisco, CA 94107; (415) 541-0818. Contact: Randy Sparks. Services/Specialization: At RLS Acoustics, we provide quality design, engineering and consulting services. Whether you're expanding existing facilities or starting a new organization, we'll work directly with you in the development of your concept. Reinforcing your ideas with solid engineering principles and innovative design solutions, we can build a strong foundation for your successful venture. Our experience in the design and use of technical facilities can help you avoid costly mistakes. Proprietary engineering software, along with our CAD system, enables our personnel to arrive at design solutions quickly—and save you money in the process. If you're interested in creating a state-of-the-art audio control room, designing a recording studio with a variable acoustic environment, incorporating accurate stereo audio into your video production suite, installing an audio-for-video synchronization system, or anything in between, call us and we'll help develop your ideas and turn them into reality. Recent projects include: audio suite and film-to-tape facilities for One

Pass, Inc.; video production facilities for Tandem Computer; video production facilities for Apple Computer; conference facilities for EPRI; studio for Bay Records; production facility for First Nationwide Bank.

CHARLES M. SALTER ASSOCIATES, INC.; *AC*; 130 Sutter St., Ste. 500; San Francisco, CA 94104; (415) 397-0442; (415) 397-0454. Contact: David R. Schwind, Elizabeth A. Cohen, Thomas A. Schindler, Steven J. Thorburn. Services/Specialization: A full-range acoustical consulting firm providing services in the following areas: Architectural acoustics: achieving desired acoustical qualities in buildings such as performing arts centers (concert hall, theaters, opera), amphitheaters, recording studios film production and post-production facilities, radio and television broadcast facilities. Engineering acoustics: controlling noise and vibration of mechanical ventilation systems, plumbing systems, power generation electrical transformers and transportation systems; technology assessment. Audio-visual system design: reinforcement of music and speech in theaters, entertainment and performing arts facilities. Electronic enhancement of room acoustics. Design and specification of film, video and computer music systems. Research in music perception, psychoacoustics and measurement/recording techniques. Environmental acoustics: assessing environmental noise sources due to transportation sources, construction projects, power plants. Expert testimony/public presentation: communicating technical information at governmental hearings, expert testimony in judicial proceeding. Clients/projects: Apple Computer, Disney Pictures, Dolby Laboratories, Los Angeles Philharmonic, Lucasfilm Ltd., Sundance Institute and Todd AO/Glen-Glenn.

SOUND RESEARCH ASSOCIATES; *SD, AC, EI, MR*; 1650 Zanker Rd.; Goble Bldg., Ste. 120; San Jose, CA 95112; (408) 436-6040. Contact: Tom Paddock. Services/Specialization: Since 1976 Sound Research Associates has specialized in the latest studio design techniques such as LEDE® TEF® and RFZ. SRA is experienced in the use of proven scientific techniques and our engineering associates are qualified to provide economical and effective solutions to acoustic, isolation or vibration problems. Utilizing on-site measurements as well as computer evaluation techniques, SRA is experienced in acoustic environment planning, design and testing. SRA acoustic design projects have ranged from designing a single voice-over booth to planning the design of a multiple control room and recording space complex. SRA features quality Bruel & Kjaer test instruments and analyzers. Our client list includes: Grateful Dead, George Winston, The Tubes/Todd Rundgren, Different Fur, Joan Baez, Windham Hill Records, Bob Weir, E-mu Systems, Mickey Hart, Huey Lewis and the

SOUND RESEARCH ASSOCIATES
San Jose, CA

News, Stanford University, Seagate Magnetics, One Pass Video, Exxon Corporation, 360 Records and Fox Corporation.

WILSON, IHRIG & ASSOCIATES, INC.; *SD, AC*; 5776 Broadway; Oakland, CA 94618; (415) 658-6719. Contact: Rod Wetherill. Services/Specialization: WIA has been in the forefront of architectural and engineering acoustics consulting for over 20 years. Our services in studio design include control of noise and vibration, HVAC noise control, room acoustics and audio systems—from programming to final checkout. We combine extensive laboratory and field testing capabilities with practical and cost-effective design. Projects handled by our principals include the Dallas Communications Complex, Melnitz Hall, UCLA, Lougheed Building, Banff Centre for the Arts, and numerous other studios.

SOUTHERN CAL/HAWAII

ACOUSTIC SCIENCES OF CALIF.; *AC, EI, MR*; 6709 Ethel Ave.; North Hollywood, CA 91606; (818) 763-9587. Contact: Richard Lomax.

ADVANCED STUDIO; *SD, AC, SES, EI, MR, ER*; 15911 Acre St.; Sepulveda, CA 91343; (818) 892-9810; (213) 856-4533. Contact: Nick Spigel. Services/Specialization: A full-service company specializing in studio design, sales and installation. From conception, layout and planning consultation, to facility completion, personal attention is given to tailor each system to meet the client's individual needs. We maintain a full staff of qualified technicians for maintenance and repair of audio and video facilities. East and West Coast recording studios with full SMPTE interlock. Both equipped with Synclavier. Synclavier rentals with programmer available.

AMEK CONSOLES; *SES*; 10815 Burbank Blvd.; North Hollywood, CA 91601; (818) 508-9788. Contact: Sue Jones.

AMOS STUDIO DESIGNS
Northridge, CA

AMOS STUDIO DESIGNS; *SD, AC*; 18901 Malden St.; Northridge, CA 91324; (818) 701-0761. Contact: Ron Amos. Services/Specialization: Amos Studio Designs is an acoustic design, engineering and construction firm specializing in every phase of studio building. I can develop a working set of plans for you, or I will build it for you from a vacant lot through every phase of construction to a complete studio that is everything

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SOUTHERN CAL/HAWAII

& DESIGNERS

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you ever dreamed of. I also do remodeling and acoustic consulting. Do you have a room that isn't acoustically right? Does your studio need to be fine-tuned to visual and audio perfection? Then please call and make an appointment. Please feel free to inquire for more information and references. I have just touched on a small portion of the services I offer. Amos Studio Designs Lic. #511404, 18901 Malden St., Northridge, CA 91324, (818) 701-0761

BELCAN ENGINEERING; *SD, AC*; 6110 San Fernando Rd. #211; Glendale, CA 91201; (818) 409-1777. Contact: John Mayberry.

THE BERTECH ORGANIZATION; *SES*; 14447 Califa St.; Van Nuys, CA 91401; (818) 909-0262. Contact: Lee Berman.

BOTO DESIGN, INC.; *SD, AC*; 321 Hampton Dr.; Venice, CA 90291; (213) 396-3108. Contact: Bret Thoeny, Isabel Wyatt. Services/Specialization: Architects and construction managers specializing in the design and construction of recording studios, video post-production and film stage facilities. Recent clients include: Prince, Paisley Park Studios, Minneapolis; Jackson Browne, Los Angeles; Electric Lady Studios, New York; Britannia Row, London; Visual Eyes Digital Post, Los Angeles; Maryland Public Television, Baltimore. More than 100 projects completed worldwide. In-house services include: architecture, engineering, acoustical design, interior design/colors/materials and space planning.

JEFF COOPER ARCHITECTS, A.I.A./SYNERGY GROUP
Calabasas, CA

JEFF COOPER ARCHITECTS, A.I.A./SYNERGY GROUP; 4766 Park Granada, Ste. 106; Calabasas, CA 91302; (818) 887-9100. Services/Specialization: Architects and builders for the entertainment industry. Specializing in: recording studios, film studios, video post-production studios and theaters. Clients include: Directors Guild of America, MCA-Universal Studios, Burbank Studios, Warner-Hollywood, Capitol Records, PolyGram Records, Mann Theaters, Cannon Films, Columbia Pictures, Lucasfilm, Steven Spielberg. Plus UCLA, Australian Film and Television School, others. Services: Architectural design, acoustic consulting, electrical, mechanical and audio engineering, interior design, cost estimating, construction management. The new 1986 edition of *Building a Recording Studio* by Jeff Cooper is available through this office

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FEEDBACK

MORE SWEET THOUGHTS...

Eric Wenocur's article on video sweetening basics in your April issue was quite informative, but perhaps a bit *too* basic. Much of the piece was spent warning of time code and sync problems that might crop up during the various strip and relay processes mentioned. I have found that most audio post facilities in New York have eliminated nearly all these problems by employing equipment and procedures not mentioned in the article.

First, any facility specializing in APPV usually has its own one-inch VTR for direct strip and layback. This immediately eliminates the need for intermediate 2- or 4-track audio tapes with their inherent generation loss and possible time code problems. With an in-house VTR, you can produce a ¾-inch workprint and strip audio at the same time. Second, the use of a full-function multitrack tape recorder (gapless, seamless punch-in/out and high-quality sync playback) allows a mixdown to open tracks of the same machine that contains the layout—in sync. This eliminates yet another intermediate tape and possible problems. The final layback is directly from the mixdown tracks of the multitrack to the VTR or VCR, depending on what form the video master is in.

Additionally, mixdowns can be broken out over several tracks of the multitrack (e.g., voice on one track, sound effects on another track, music on still another) allowing for various layback permutations like voice on track 1, music and effects on track 2, or full mix on track 1, mix-minus-voice on track 2. It also makes revisions much easier. A change to the voice or effects track will not affect the rest of the mix.

I hope this information helps to clarify and simplify the audio-for-video process even further than Mr. Wenocur's fine article.

Bruce Kaiser
Tympanum Productions
Glen Rock, NJ

HOW SWEET IT IS...

I have just finished reading Eric Wenocur's "Video Sweetening Basics" article in the April issue, and I would like to thank you for a most informative, comprehensive and well-written piece.

Here in our little third world, we are beginning to get into time code for audio-for-video projects, and a lot of engineers—including myself—are still in the dark about SMPTE and synchronization. Even our video engineers don't understand how time code works—they just know it does.

Jim Sarthou
Alta Power Productions
Makati, The Phillipines

STOPPING ON N/DYM®

In your March issue, the "Preview" products section introduced the Peavey 380N N-Dym Microphone. This is to remind you that Electro-Voice was the first to align technology around a neodymium magnet, so E-V holds N/DYM® as a registered trademark.

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Bill Mullin
Electro-Voice

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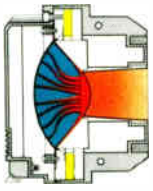
It Takes More Than A Little Neodymium To Change The Face Of Driver Technology.

2450J

Hailed as the catalyst for a new generation of high performance compression drivers, the rare earth compound neodymium showed up in our R&D lab shortly after it was first formulated. But its extremely high cost and sensitivity to heat had to be overcome before neodymium could live up to its full potential.

The availability of this highly magnetic, extremely lightweight material coincided perfectly with our development of the Coherent Wave™ phasing plug.



JBL's 2450J Neodymium Compression Driver with Coherent Wave™ phasing plug provides in-phase combining of sound waves for extended high frequency performance. JBL's patented diamond surround titanium diaphragm with new embossed dome greatly reduces distortion and damage at high SPL.

This new design, a phasing plug with annular apertures of constant path length, uniformly directs sound through to the throat providing in-phase combining of sound waves for extended high frequency performance. This new technology is combined with our patented diamond surround titanium diaphragm, incorporating a new embossed dome, to reduce the possibility of distortion or damage at high SPL.

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The 2450's smaller size translates to tighter spacing of horn arc arrays, more even and precise coverage and greatly reduced requirements for delay. Plus, the 2450 nets out at a mere 4.8 kg (10.5 lb). The benefits of this dramatic weight reduction include lower shipping costs to the site or on the road and significantly less load bearing requirements for both structures and rigging. With built-in mounting points, the 2450 will take much less time to install.

Yes, it took more than a little neodymium to change the face of driver technology. But we're confident you will find the breakthrough results were certainly well worth the wait and the effort.

JBL

JBL Professional
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